Total No. of Questions :6] **[Total No. of Pages 2**

P1382

[3865]-471

M.E. (Civil - Structures)

BIOMECHANICS AND BIOMATERIALS

(2008 Course) (Elective - IV)

Time : 4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Solve any two questions from each section.***
2) ***Answers to the two sections should be written in two different answer books.***
3) ***Use of non-programmable pocket calculator is permitted.***
4) ***Neat sketches must be drawn wherever necessary.***
5) ***Your answer will be valued as a whole.***

SECTION - I

Q1) Solve any three :

a) Define with suitable model the viscoelastic behaviour of biological material. **[7]**

b) Explain three dimensional anisotropic, transversly isotropic elastic behaviour of bone tissue **[10]**

c) Explain structure of adult human bone. **[7]**

d) Explain the mechanical tests required to be carried out on bone to determine its elastic properties. **[8]**

Q2) Solve any three :

a) What is bone cement, explain its properties with reference to bio compatibility and use. **[8]**

b) Explain biodegradable ceramic and its utility. **[8]**

c) Explain use of surgical stainless steel, Titanium alloy as replacement to biological tissue. **[9]**

d) Explain relevance of corrosion to orthopedic implant. **[8]**

Q3) Answer any three :

a) Explain new alloyes and their properties when used as bio compatible material. **[9]**

b) Explain with relevant example, biodegradation of polymer. **[8]**

P.T.O.

c) Explain composite bio materials with suitable example of each. **[8]**

d) What are fibrous composite bio materials. **[8]**

SECTION - II

Q4) a) Write down the composition of cartilage and the functions of cartilage. **[5]**

b) Explain various tests needed for finding out the mechanical properties of cartilage. **[6]**

c) Draw a sketch of bone showing its composition. State and explain mechanical properties of bone. **[14]**

Q5) a) Show knee-joint in detail explaining the mechanics of the same. **[10]**

b) Sketch the device used for carrying out study of wear of cartilage on cartilage. **[8]**

c) Write down the steps required for carrying out the design of artificial fixation devices. **[7]**

Q6) a) What is Gait Analysis? Write down the various measurement systems used in Gait analysis. How it is useful to clinitions? **[11]**

b) Write down various methods used for fixation of implant. **[8]**

c) Explain the test needed for knowing the strength of cement-bone bond used in joint prosthesis. **[6]**

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Total No. of Questions :6] **[Total No. of Pages :2**

P1383

[3865]-472
M.E. (Civil / Structures)
MECHANICS OF MODERN MATERIALS
(2008 Course)

Time : 4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

SECTION - I

Q1) a) What do you mean by "smart materials" or "modern materials"? **[12]**

Explain various modern materials used in engineering field, stating their mechanical properties.

b) What is peizoelectricity? **[7]**

State various materials exhibiting peizoelectric properties and their uses in engineering fields.

c) Write a note on shape memory alloys. **[6]**

Q2) a) Explain various types of composites used in engineering. **[5]**

b) Explain effects of fiber length, its orientation and concentration on the mechanical properties of fiber reinforced composites **[6]**

c) A continuous and aligned glass fiber reinforced composite consists of 40% volume of glass fibers and 60% volume of polyster resin modulli of elasticity for glass fiber and handened resin are 69Gpa and 3.4 Gpa compute. **[14]**

i) The modulus of elasticity of this composite in the longitudinal direction.

ii) If the cross section area in 250 mm^2 and stress of 50Mpa in applied in the longitudinal direction, the magnitudes of loads carried by fiber and matrix.

iii) Strain sustained by fiber and matrix.

P.T.O.

Q3) a) Explain structural composites. Write a note on laminar composite and sandwich panels. **[10]**

b) Explain various failure theories applicable to composite lamina [**15]**

SECTION - II

Q4) a) Discuss the laminate configuration for following laminates with neat sketches. **[18]**

i) Uni-directional laminates.

ii) Quasi-lsotropic laminates.

iii) Balanced laminates.

iv) Symmetric cross-ply laminates.

v) Symmetric Angle-ply laminates.

vi) Anti-symmetric Angle-ply laminates.

b) Derive the Strain-Displacement relationship for a laminate Normal to y-axis before and after Deformation. **[7]**

Q5) a) State the Basic assumptions made in classical laminated plate theory.**[5]**

b) Derive the Equilibrium Equations of laminated plates. **[10]**

c) Explain the layerwise theory for the analysis of composite laminates. **[10]**

Q6) a) Explain in detail Effect of Hygrothermal forces on Mechanical behaviour of laminates. **[6]**

b) Explain CTE and CME of laminates. **[5]**

c) Write short note on manufacturing defects observed in composites **[5]**

d) Explain Inter-laminar stresses. **[9]**

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Total No. of Questions :8] **[Total No. of Pages 2**

P1390

[3865]-530
M.E. (Mechanical) - Automotive Engineering
AUTOMOTIVE ENGINE DESIGN
(502301) (2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagram should be drawn where necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if required, but state the assumptions clearly.***
6) ***Use of calculator is allowed.***

SECTION - I

Q1) a) Discuss the principle of Similitude in engine design. **[6]**

b) Explain the concept of a heat balance sheet for IC Engines. **[4]**

c) A 4 cylinder square engine with bore 100 mm develops a BMEP of 12 bar. The rated speed is 3200 rpm and it uses a fuel at the rate of 5kg/hr and calorific value and 20,000kJ/kg. Calculate the Brake Power, Torque and BSFC. **[6]**

Q2) a) Discuss the criteria for selecting number of cylinders for any engine. Why is cylinder arrangement important and what are the factors affecting cylinder arrangement? **[8]**

b) Design the thickness of a cylinder wall for an engine if the bore is 80mm, circumferential stress is 1000N/mm^2. The reboring thickness is 4mm. The internal combustion pressure is 100N/mm^2. **[4]**

c) Explain in brief the various stresses acting on a piston. **[4]**

Q3) a) State the process of designing a connecting rod by Rankine formula. For a connecting rod, the stress is 1500N/mm^2. The cross sectional area is 100 mm^2 and the load is 500 N. The radius of gyration is 10 mm and the value of constant k is 1.6.calculate its length. **[8]**

b) Explain the process of design of flywheel. Derive the expression for mass moment of inertia for a flywheel and explain all the terms. **[8]**

P.T.O.

Q4) Write short notes on: **[18]**

a) Design of piston ring.

b) Thermodynamic analysis of CI engine.

c) Selection of bore to stroke ratio.

d) Materials for principal engine components.

SECTION - II

Q5) a) Discuss the effect of valve timing on engine performance? **[6]**

b) Explain the importance of a cam profile selection. **[4]**

c) Design a valve spring with square cross sections (b x d) if the spring deflection is 2 mm, radius is 1mm, load on the spring is 100N, number of active turns is equal to 10 and torsion modulus is 1,00,000. **[6]**

Q6) a) What are torsional vibrations? Write a formula for natural frequency of torsional vibrations and explain the terms. **[8]**

b) What are the different methods of damping torsional vibrations? **[4]**

c) Explain the process of balancing for a four cylinder engine. **[4]**

Q7) a) Explain the process of design of a simple carburetor. Write the expression for air to fuel ratio for a simple carburetor. **[8]**

b) Explain the importance of manifold design. How is the size and shape of manifold calculated and decided respectively? **[8]**

Q8) Write short notes on : **[18]**

a) Selection of Lubricant.

b) Design of Governer for CI engine.

c) Importance of firing order.

d) Need for engine balancing.

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Total No. of Questions :8] **[Total No. of Pages :2**

P1394

[3865]-547
M.E. (Electrical) (Control Systems)
ADVANCED DIGITAL CONTROL TECHNIQUES
(2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the concept of warping and prewarping. **[8]**

b) Obtain the pulse transfer function Y(2)/ R(2) of the system shown in figure 1 **[8]**

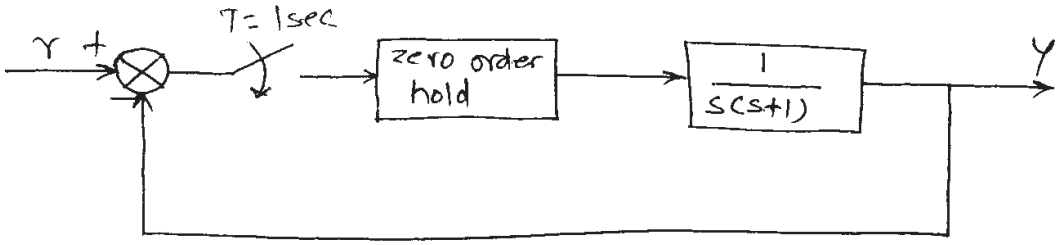

Figure 1

Q2) For the system with pulse transfer function. **[18]**

$$G(z)=\frac{z+1}{z^2+1.3z+0.4}$$

Draw state diagram and obtain state model in

a) Direct digital programming.

b) Cascade digital programming.

c) Parallel digital programming.

P.T.O.

Q3) a) State advantages of : **[8]**

i) State space approach over classical approach.

ii) Digital control systems over continuous time control systems.

b) List the steps in constructing root locus of a digital control system. **[8]**

Q4) a) List the steps in the design of state feedback regulator using pole placement approach. **[8]**

b) Obtain state variable feedback gain matrix K and control law u(k) for the system $x(k+1) = \begin{bmatrix} 0 & 1 \\ -0.16 & -1 \end{bmatrix} x(k) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(k)$

to place closed loop poles at $z_1 = 0.5 + j\ 0.5, z_2 = 0.5 - j\ 0.5$. **[8]**

SECTION - II

Q5) a) Explain the concept of decimation by factor D. **[8]**

b) Explain the concept of finite word length effect in digital filters. **[8]**

Q6) Design FIR filter using Hanning window to obtain following specifications. **[18]**

$$H_d(e^{jw}) = e^{-5jw}, \quad |W| \le \Pi/4$$
$$= 0, \quad |W| > \Pi/4$$

Q7) a) What is fixed point and floating point digital signal processor? **[6]**

b) Draw the schematic block diagram of internal architecture of TMS 320C5×DSP processor and explain the bus structure. **[10]**

Q8) a) List data addressing modes in TMS 320C 54 × DSP Processors and explain any one. **[8]**

b) Explain the concept of instruction pipeline. **[8]**

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Total No. of Questions :6] **[Total No. of Pages 2**

P1397

[3865]-555
M.E (Electrical) (Power Systems)
POWER SECTOR ECONOMICS MANAGEMENT AND RESTRUCTURING
(2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is option contracts? Explain it in detail. Also discuss contract for differences. **[8]**

b) Discuss salient features of regulatory process in Latin American nations and nordic pool. **[8]**

c) What is congestion? How congestion is negotiated? **[9]**

Q2) a) Explain various market structures based on number of participants. **[9]**

b) What are social implications and non price issues in regulatory process ? How these issues are addressed. **[8]**

c) Explain terms :

i) ATC.

ii) TRM.

iii) CBM.

Also explain methods used for assessment of ATC. **[8]**

Q3) a) Explain various methods used for transmission pricing. **[9]**

b) Write notes on retail competition model and Max ISO model. **[8]**

c) What is market power? How this is excersiced? How it affects market clearing process? **[8]**

P.T.O.

SECTION - II

Q4) a) In an industry for their power project a new boiler was installed worth of cost Rs.13.5 lacs. After installation, the annual savings for three years is Rs.5lacs, Rs. 5.5 lacs and Rs. 6.5lacs respectively. Considering cost of capital as 12% Calculate net present value of the proposal. Comment on the economic viability of the project. Also calculate pay back period. **[9]**

b) Explain role of planning commission and CEA in power sector. **[8]**

c) Explain price cap and revenue cap regulation. Where such type of regulations are being followed. **[8]**

Q5) a) Describe process of tariff determination in deregulated environment. **[8]**

b) Explain various performance indices used by regulators for camparing performances of various utilities **[9]**

c) What the reasons for initiating idea of deregulation in power industry? **[8]**

Q6) a) Explain performance based and rate of return regulation. **[9]**

b) i) Explain concepts of life line tariff, interruptible tariff. **[8]**

ii) State principles of tariff setting.

c) i) What are the key challenges before Indian power sector under going reforms. **[8]**

ii) Explain role of CERC.

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Total No. of Questions :8] **[Total No. of Pages :2**

P1410

[3865]-580
M.E. (E&TC) (Microwave)
MOBILE COMMUNICATION - GSM & CDMA
(2008 Course) (504230)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Assume suitable data, if necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of calculators is allowed.***

SECTION - I

Q1) a) Describe in short, the evolution of mobile systems from first generation to third generation. **[6]**

b) Write a note on TDMA and quote its advantages and disadvantages. Draw and explain TDMA frame. **[10]**

Q2) a) What is spectral efficiency? Discuss spectral efficiency of modulation and multiple access spectral efficiency. **[10]**

b) Calculate the capacity and spectral efficiency of a TDMA system using the following parameters :- **[6]**

Bandwidth efficiency factor n_b =0.9,

voice activity factor v_f =1.0, bit efficiency μ = 2,

one way system bandwidth B_w = 12.5MHz,

information bit rate R = 16.2 kbps and frequency,

reuse factor N = 19.

Q3) a) Discuss **[10]**

i) Cell splitting.

ii) Cell sectoring.

b) What are the traffic measurement units? Explain them. **[6]**

P.T.O.

Q4) a) Explain the sequence of actions taken when a call is initiated by a MS in GSM. **[10]**

b) Explain with a neat block diagram the GSM architecture. **[8]**

SECTION - II

Q5) a) Write a note on the following : **[8]**

i) GPRS

ii) EDGE

b) Discuss the security algorithms used in GSM. **[8]**

Q6) a) Draw and explain the flow diagram for CDMA call termination. **[8]**

b) Discuss the handoff strategies used in IS-95 CDMA. **[8]**

Q7) a) Discuss GMSK with its modulator and demodulator. **[8]**

b) Write a note on OFDM. **[8]**

Q8) a) Describe LMS algorithm **[8]**

b) What is a spread spectrum signal? With the help of a block diagram, describe the model of spread spectrum digital communication system. **[10]**

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Total No. of Questions :8] **[Total No. of Pages :2**

P1414

[3865]-599
M.E. (E&TC) (VLSI & Embedded Systems)
RF IC DESIGN
(504190) (2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Which are the dominant parasitic to limit the bandwidth of amplifier? What are the techniques to improve? Explain each method in detail. **[8]**

b) List characteristics of LNA. Compare single ended and differential LNA. **[8]**

Q2) a) Explain ASIC design flow. At what stage will you care for crosstalk. **[8]**

b) Design CMOS amplifier for BW of 200 MHz. Assume suitable data. **[8]**

Q3) a) What are the effects of channel length on RF design? Give the necessary analytical explanation. **[8]**

b) With the help of suitable schematics, explain crosstalk mitigation techniques in brief. **[8]**

Q4) Write short notes on any three : **[18]**

a) "S" Parameters.

b) Conversion gain of mixer.

c) EMI immune chip design.

d) Unilateralization.

P.T.O.

SECTION - II

Q5) a) What is SPICE model? Explain the MOSFET RF sensitive parasitic in detail. **[8]**

b) Derive an expression for conversion gain of single ended MOSFET mixer. MOSFET is operated in CS mode. **[8]**

Q6) a) What are the bandwidth estimation techniques? Explain any one in detail with the help of suitable example and its analysis. **[8]**

b) Explain Johnson noise as applied to RF amplifiers. Give the expression for noise figure. Compare with white noise. **[8]**

Q7) a) What is AM-PM conversions? What are its solutions. **[8]**

b) Design LNA to operate at 400 MHz. Design suitable bias. Compute device width, degenerating inductance, noise figure and Lg. Assume suitable data. **[8]**

Q8) Write short notes on any three : **[18]**

a) Short circuit time constant method.

b) Sources of EMI.

c) Super regenerative amplifier.

d) Linearity and isolation.

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Total No. of Questions :8] **[Total No. of Pages :2**

P1431

[3865]-633
M.E. (Electronics) (Digital System)
IMAGE PROCESSING AND PATTERN RECOGNITION
(2008 Revised Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if required***
5) ***Use of scientific calculator is allowed.***

SECTION - I

Q1) a) Draw a transformation function that will enhance the brightness of the pixel if the brightness value is between 150 to 200. Explain its operation. Explain the use of logarithmic transformation **[8]**

b) Explain what is gray level slicing and bit level slicing. **[8]**

Q2) a) Draw the sobel edge operator and prewitt edge operator. Explain its functioning. Can we find the direction of the gradient? **[8]**

b) Explain Laplacian operator. What is its drawback? Explain Laplacian of Gaussian operator. Sketch the gradient and Laplacian for a typical edge model. **[10]**

Q3) a) Draw histograms for a typical image with low contrast and high contrast. **[8]**

b) What is process of histogram equalization? Explain the algorithm for contrast enhancement using histogram equalization. **[8]**

Q4) a) On a campus $\frac{1}{5}$ of the students are freshmen and $\frac{1}{10}$ of the students are in engineering. But $\frac{1}{4}$ of the engineering students are freshmen. What fraction of the students are neither engineers nor freshmen? Draw a Venn diagram. **[8]**

b) Explain Binomial distribution and Poisson distribution. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain how will you choose a probability distribution for a typical application. When will you call a density P(x) a density with thicker tails? **[8]**

b) Find the expected value of a uniform random variable on the interval [a, b] and the expected value of an exponential random variable. **[8]**

Q6) a) Name different methods for estimation of parameters from samples. Explain maximum likelihood estimate. **[8]**

b) Calculate the mean and variance of this data set : 2, 4, 4, 6. Calculate an unbiased estimate of the variance of the population from which this data was obtained. **[8]**

Q7) a) Explain the use of calculation of unequal costs of error for choosing a class. **[4]**

b) Explain the method of simple counting for estimation of error rates. **[6]**

c) Explain learing ore out technique for estimation of error rates. **[8]**

Q8) a) Explain nearest neighbour classification technique. Explain K-nearest neighbour technique. **[8]**

OR

a) Explain the steps in adaptive decision boundary algorithm. **[8]**

b) Explain hierarchical clustering using ward's method. **[8]**

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Total No. of Questions : 6] **[Total No. of Pages : 3**

P1434

[3865]-641
M.E. Production
CAD / CAM / CIM
(Revised 2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Attempt not more than five questions of which at least two questions must be from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***All questions carry equal marks.***
6) ***Use of electronic pocket calculator is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Solve any two of the following

a) Perform the following transformation if the co-ordinates of the vertices of an pentagon are A (4, 1), B (8, 1), C(10, 4), D(6, 7) and E (2, 4). It is scaled by 2 units in X and Y direction and rotated by 30° anticlockwise about A. **[10]**

b) What are different approaches for solid modelling? Give salient features of half space boundary representation solid modelling approach. **[10]**

c) Given B (1, 1), C (2, 3), D (4, 3), and E (3, 1) as the vertices of a Bezier polygon. Determine some points at certain interval on the curve. **[10]**

Q2) Solve any two of the following

a) Write a CNC program in G and M code for a part as shown in figure 1. Write remarks for blocks. Assume componentor 5mm thick. **[10]**

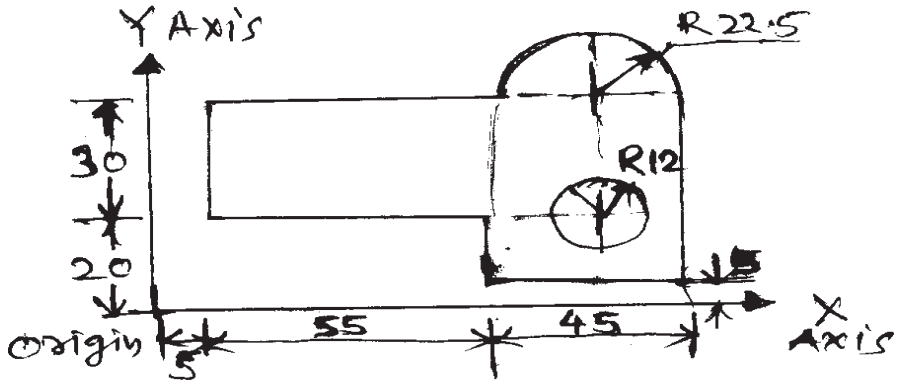

Figure : 1 Milled plate.

P.T.O.

b) Write a manual part program for finishing a forged component as shown in Figure 2. Assume suitable speed and feed data on the turning centre as 450 rpm and 0.4 mm/rev. Assume 1mm material is to be removed radially from external diameter **[10]**

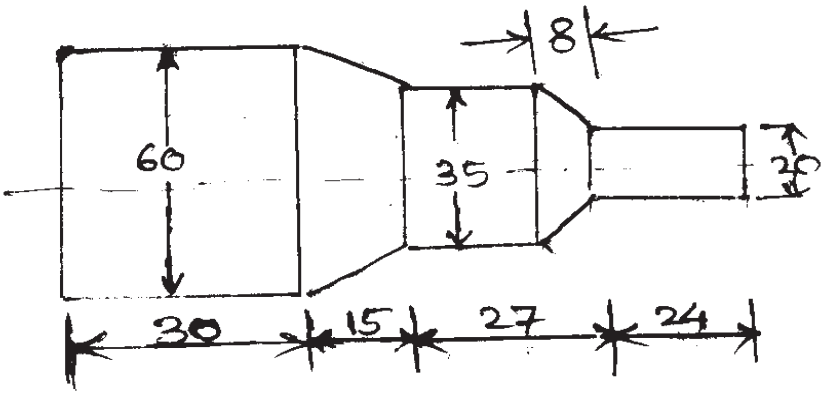

Figure : 2 Forged component.

c) Write notes on :

i) Petrinets audits use.

ii) Adv. system in FMS. **[10]**

Q3) Solve any two of the following :

a) A tapered bar of length 150mm is fixed at one end having area 120mm^2 and on the other end a force of 50kN is applied axially. The area at the other and is 50 mm^2. Determine the nodal deflections and stresses in bar using three elements. **[10]**

b) Write the steps followed in FEM analysis. Explain following terms

i) Node.

ii) Member.

iii) DOF.

iv) Stress concentration.

v) Half bandwidth. **[10]**

c) Consider a bar shown in figure 3. Determine the displacement stress and support reaction in the body. The load applied P is 125×10^3 N and modulus of elasticity E is 25×10^3 N/mm^2. **[10]**

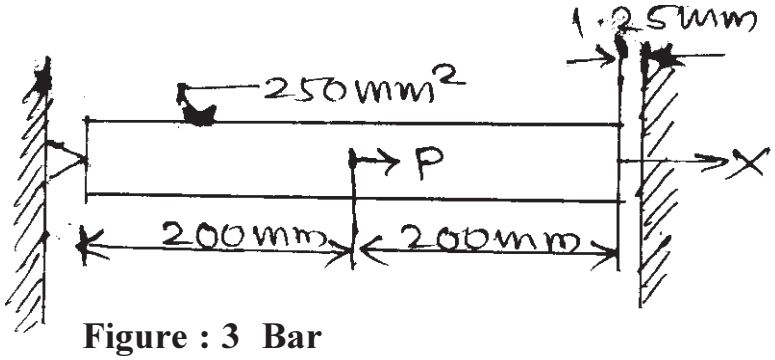

Figure : 3 Bar

SECTION - II

Q4) Solve any two of the following :

a) Explain in brief different methods of manufacturing cell formation. **[10]**

b) Differentiate variant type CAPP and generative CAPP. **[10]**

c) Enlist the benefits and limitations of Group technology. **[10]**

Q5) Solve any two of the following :

a) Explain with neat diagram computer aided material requirement planning. **[10]**

b) Enlist the steps for computer aided quality control. **[10]**

c) With a neat sketch, explain FMS layout and components. **[10]**

Q6) a) Write a note on Robot application in Industry. **[10]**

b) Explain computer Integrated manufacturing. **[10]**

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Total No. of Questions :8] **[Total No. of Pages :2**

P1441

[3865]-653

M.E. (Production) (Manufacturing And Automation)

INDUSTRIAL AUTOMATION.

(2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) A part to be produced on an automated transfer line has total work content of 40 min. and is equally divided among all workstations. The time required to transfer the part between two stations is 8 sec. Frequency of breakdown is 0.006 and average downtime per station is 10 min. Using upper bound approach determine the number of workstations that should be included in a line to maximize the production rate. Also compute the production rate and line efficiency for this number of workstations. **[8]**

b) The work elements, their times and precedence constraints are shown in table, for a assembly line. Determine the cycle time and balance delay using Ranked positional weights methods if the number of workstations are to be limited to 3. **[8]**

Element	Te(min.)	Preceded by	Element	Te(min.)	Preceded by
1	0.4	-----	6	0.2	3
2	0.7	1	7	0.3	4
3	0.5	1	8	0.9	4,9
4	0.8	2	9	0.3	5,6
5	1.0	2,3	10	0.5	7,8

P.T.O.

Q2) a) A hydraulic system is operating at 300 bar with pump flow 30 1/min. The input power to the pump drive is 15kW. The pump is loaded for 60% of the operating time. The overall efficiency when it is on load is 70% . If the ambient temperature is 20° and maximum permissible fluid temperature in the reservoir is 55°. Calculate the suitable size of the reservoir if it is of square section of size 'a' with length '2a'. **[10]**

b) Explain with neat sketch the working of deceleration valve. **[6]**

Q3) a) Draw a pneumatic circuit for a machine operated either by manual switch or automatic switch and to ensure that the workpiece is properly clamped and door of the machine is not open. **[8]**

b) Explain with suitable example the working of time delay valve used in pneumatic circuits. **[8]**

Q4) Write short notes on : **[18]**

a) Transfer line monitoring systems.

b) Proportional hydraulic valves.

c) Cascade method for pneumatic circuit design.

SECTION - II

Q5) a) What is microprocessor? Sketch the general architecture of microprocessor and explain the function of various parts. **[8]**

b) Write an assembly language program for addition of two numbers. **[8]**

Q6) a) Explain with neat sketch any two types of escapements. Also mention their industrial applications. **[8]**

b) Explain automated handling and loading system in transfer lines. **[8]**

Q7) a) Explain with neat sketch robot vision system. **[8]**

b) Which kinematic parameters are variables for a revolute joint and for prismatic joint? **[8]**

Q8) Write short notes on : **[18]**

a) Industrial applications of expert systems.

b) Use of oscillating disks for automated orientation of workpiece.

c) Programmable logic controllers.

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Total No. of Questions :8] **[Total No. of Pages :2**

P1479

[3865]-763
M.E. (IT)
MANAGEMENT TRENDS IN INFORMATION TECHNOLOGY
(2008 Course) (Sem. - II)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Question Nos. 4 and 8 are compulsory. Out of the remaining attempt 2 questions from Section I and 2 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Consider a competitive exam training institute / organisation. As a manager of the organisation, you have to roll out a new website/portal for the organisation. Interview different personnel of the organisation and formulate a set of goals for the project. Also build a charter for the project. **[8]**

b) What is corporate social responsibility? Explain with an example. Explain social accounting, auditing and reporting with respect to CSR. **[8]**

Q2) a) Explain group dynamics with respect to group types, group structure, size, roles, norms etc. **[8]**

b) Write a note on IT/IS audit. **[8]**

Q3) a) Consider a network upgradation project. The network consists of workstations, servers and network printers. The network will be segmented through switches. The workstations and printers will be on one segment and the server on another. What will be the budget estimate type for this project? What will be the issues to be considered while creating the budget? **[8]**

b) Explain any founds raising application (banking, insurance etc.) as a MIS. **[8]**

Q4) Write short notes on : **[18]**

a) Project Quality Standards.
b) Change management with an example.
c) Ethical conduct.

P.T.O.

SECTION - II

Q5) a) Consider a home-security system (Intrusion detection system). Elaborate on the need of a work breakdown structure for this system by listing the functionalities of the system. List down the WBS for the same. **[8]**

b) Draw the project network diagram (PND) for the system in [Q5 a] using different techniques of precedence diagramming method. Find the critical path for the said system from the PND. **[8]**

Q6) a) Write a note on ERP in terms of its architecture, solution structure, features, benefits etc. **[8]**

b) Write a note on energy audit/energy management. **[8]**

Q7) a) Consider the development of an e-commerce application. The system should be capable of

- Database searchable by any property of the product (cosmetic, kitchen appliance, electronic goods etc).
- Ability for the contact information to be downloaded to a PDA.
- Fax and email ability

in addition to the regular features. Create a milestone list and a contingency plan for each major phase of the project. **[8]**

b) Elaborate on conflict management beginning with what is conflict, reasons, indicators, constructive/ destructive conflict and techniques for avoiding/ resolving conflict. **[8]**

Q8) Write short notes on : **[18]**

a) CRM.

b) MIS and E-business.

c) Cyber laws and IT Acts.

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Total No. of Questions :8] **[Total No. of Pages :3**

P1485

[3865]-795

M.E. (Instrumentation) (Process &Biomedical)

MATHEMATICAL METHODS IN INSTRUMENTATION

(2008)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define orthogonal vectors. **[4]**

Which pairs are orthogonal among the vectors.

V_1, V_2, V_3 & V_4?

$$V_1=\begin{bmatrix}1\\2\\-2\\1\end{bmatrix}\ V_2=\begin{bmatrix}4\\0\\4\\0\end{bmatrix}\ V_3=\begin{bmatrix}1\\-1\\-1\\-1\end{bmatrix}\ V_4=\begin{bmatrix}1\\1\\1\\1\end{bmatrix}.$$

b) With suitable illustrations explain following operators. **[4]**

i) Reflection.

ii) Rotation.

c) Obtain orthonormal vectors of column vectors. **[10]**

$$A=\begin{bmatrix}1&2&1\\0&2&0\\2&3&1\\1&1&0\end{bmatrix}$$

P.T.O.

Q2) a) Find singular value decomposition of **[10]**

$$A = \begin{bmatrix} 1 & -1 \\ -2 & 2 \\ 2 & -2 \end{bmatrix}$$

b) Discuss the applications of orthogonal and unitary transformation in biomedical or process signal processing. **[6]**

Q3) a) Discuss various numerical methods in the view of biomedical signal processing or instrumentation signal processing. **[6]**

b) Obtain the solution of equation $\frac{dy}{dx} = x + y$, **[10]**

with initial conditions $y = 1$ at $x = 0$

for the range $0 \leq x \leq 0.3$ in the steps of 0.1 using

i) Euler's Method.

ii) Modified Euler's method.

Comment on results obtained using above methods.

Q4) a) Define : **[6]**

i) Linear transformation.

ii) Spanning set.

b) Represent vector (1, 2, 3) as a linear combination of vectors(4, 5, 6) & (2, 1, 0). **[10]**

SECTION - II

Q5) a) Define : **[8]**

i) Sample spaces.

ii) Experiment.

iii) Event.

iv) Classical probability.

b) In Economics there are a total of 500 students of which 300 are males, 200 are females. We know that 100 males and 60 females plan to major in economics. A student is randomly selected from the class and it is found that this student plan to major in economics. What is the probability that this student is a male? **[8]**

Q6) a) Write the density function for the following distribution functions and state their applications in signal processing / process instrumentation.

i) Binomial distribution.

ii) Gaussian distribution. **[8]**

b) Let the continuous random variable X denote the diameter of hole drilled in sheet metal component. The target diameter is 12.5mm . Most random disturbances to the process result in larger diameters. Historical data shows that the distribution of X can be modeled as probability density function.

$f(x) = 20e^{(-20\,(x\,-12.5))}$ for $x \geq 12.5$.

If a part with diameter larger than 12.60mm is scrapped, what portion of the parts is scrapped. **[8]**

Q7) a) A continuous random variable X has probability density given by **[10]**

$$f(x)=\begin{cases} 2.e^{-2x} & x>0 \\ 0 & x\leq 0 \end{cases}$$

Find

i) E(X).

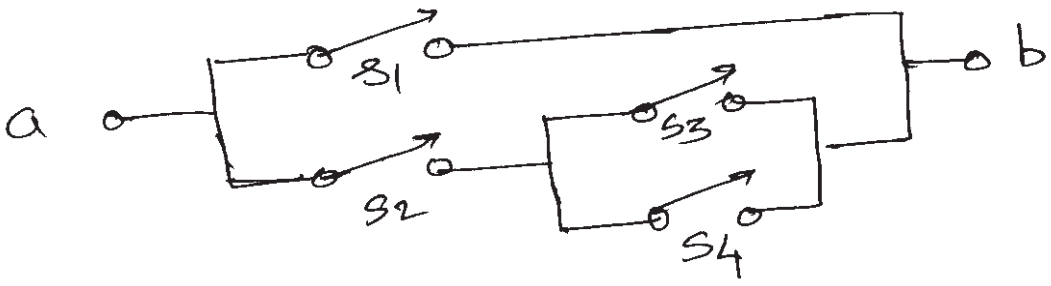
ii) $E(X^2)$

iii) Variance.

iv) Standard deviation.

b) Discuss the uses of mean, variance. standard deviation in biomedical image processing applications or instrumentation applications. **[8]**

Q8) a) Consider the switching network shown in following figure. It is equally likely that a switch will or will not work. Find the probability that a closed path will exist between terminals a & b **[8]**



b) State & Explain rules of probability. **[8]**

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Total No. of Questions :8] **[Total No. of Pages 2**

P1494

[3865]-811

M.E. (Instrumentation & Control) (Process & Biomedical)

ADVANCED PROCESS INSTRUMENTATION

(5061112(A)) (2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain with suitable example, a variety of requirements imposed by designers along with the general requirements, a plant must satisfy. **[8]**

b) Discuss in brief steps to follow during the design of an Internal Model Control System for second order process with RHP zero. **[8]**

Q2) What is the role of Model in Process Control? Derive fundamental model of liquid surge tank with constant cross sectional area. (Assume suitable data).**[16]**

Q3) Explain with suitable examples effect of zero's and delay time. **[16]**

Q4) Write note on : **[18]**

a) Multicapacity process.

b) SPC

P.T.O.

SECTION - II

Q5) Design Smith Predictor for FOPDT process. Also enlist its shortcomings. **[16]**

Q6) Design a Feedback-Feedforward control configuration for the shell & tube Heat Exchanger, controlling the outlet stream temperature using steam flow as the manipulated variable. Draw the instrumentation directly on the figure. Draw a control block diagram, labeling all the signals on the diagram. **[18]**

Q7) Explain with suitable examples : **[16]**

a) RGA

b) Selective Control.

Q8) Write note on : **[16]**

a) MPC model forms.

b) DMC controller tuning.

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Total No. of Questions : 12] **[Total No. of Pages : 3**

P1501

[3865]-833
M.E. (Polymer Engineering)
ELASTOMER TECHNOLOGY
(509126) (2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer three questions from Section - I and 03 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Explain in detail, the molecular requirements for a material to act as a rubber. **[8]**

b) Explain the various theories of rubber elasticity, with mathematical derivations. **[10]**

OR

Q2) a) Explain the following stages : **[8]**

i) Mastication.

ii) Compounding.

iii) Processing.

iv) Vulcanization with respect to raw rubber technology.

b) Draw and explain stress strain curve for raw and vulcanized rubber. **[5]**

c) Draw and explain mastication curve for natural rubber. **[5]**

Q3) a) What is the need for addition, mechanism of functioning, examples and level of addition for the following additives: **[8]**

i) Peptizers.

ii) Blowing agents.

iii) Antioxidants.

b) Write a short note on cords and Fabrics used with rubbers. **[4]**

c) What are tackifiers? Give three examples of tackifiers used in rubber industry. **[4]**

P.T.O.

OR

Q4) a) What is the need for addition, mechanism of functioning, examples and level of addition for the following additives : **[8]**

i) Accelerators.

ii) Activators.

iii) Antiozonants.

b) Write a short note on extender oils used with rubbers, **[4]**

c) Enlist various types of carbon blacks. Give basis for their classification. **[4]**

Q5) a) Enlist the different techniques used for characterizing a rubber compound, and explain any one in detail. **[8]**

b) Write an informative note on rheological testing of rubber compound. How rheological properties are influenced by compounding ingredients. **[8]**

OR

Q6) a) Explain in detail the following tests : **[8]**

i) Abrasion Test.

ii) Permanent Set in Tension carried out on vulcanized rubber?

b) Explain, How TGA can be employed for the analysis of rubbers and vulcanizates. **[8]**

SECTION - II

Q7) a) Explain the injection molding of rubbers. **[6]**

b) Name the type of extruders used with rubbers. Explain anyone in detail. **[6]**

c) Write a short note on compression molding process for rubbers, what are its advantages? **[6]**

OR

Q8) a) Explain the various types of tyre constructions. What are the advantages of radial ply tyres? **[6]**

b) Explain the manufacturing process for a conveyer belt, also give its construction. **[6]**

c) Explain the process for the manufacture of a high pressure hydraulic rubber hose. List the type of materials used. **[6]**

Q9) a) What are thermoplastic elastomers? Explain various types. What advantages they have over conventional rubbers. **[8]**

b) Give synthesis, compounding and cure characteristics of the following :

i) Natural rubber.

ii) Chloroprene rubber. **[8]**

OR

Q10)a) Explain two tests which are carried out on rubbers intended for use in cables. **[6]**

b) What is rebound resilience? How is it measured? **[5]**

c) What is fatigue? How will you measure fatigue resistance in rubbers? **[5]**

Q11)a) What is vulcanization of rubber? How it is carried out? Write chemical reactions for sulphur vulcanization of Natural rubber and metal oxide cure of chloroprene rubber. **[8]**

d) With the help of a suitable diagram explain the cure curve for rubber. **[4]**

c) How the following factors affect the rate of cure for rubbers; **[4]**

i) Temperature.

ii) Time.

iii) Concentration of curing agent.

OR

Q12)a) How are the following rubbers vulcanized? **[8]**

i) IIR

ii) NR

iii) NBR

b) Explain the test procedure to find peel strength of a vulcanisate. **[4]**

c) How DSC technique can be used to study cure rate of rubbers? **[4]**

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Total No. of Questions :6] **[Total No. of Pages :3**

P1507

[3865]-843

M.E. (Printing Engineering & Graphic Communication)

QUALITY CONTROL SYSTEM AND PRODUCTIVITY

(2008 Course) (508105C) (Elective - II)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Answer the following

a) Explain the different process configuration along with different process variables. **[15]**

b) Explain the role of pre-press in printing industry. **[10]**

Q2) Answer the following

a) With reference to press activity, explain the calibration process. **[15]**

b) Explain the SWOP for web off-set and how this standard is implemented. **[10]**

Q3) a) Define the following term **[10]**

i) Contrast.

ii) Dot gain.

iii) Density

iv) Trap.

v) Gamuts

b) Write a short notes on : **[15]**

i) Colour deviation.

ii) Quality Control Aids.

iii) Automatic viscosity Controller.

P.T.O.

SECTION - II

Q4) Answer the following

a) Explain the implementation of six sigma concept in printing industry. **[10]**

b) "Quality is basically the responsibility of one who produces" Discuss in this background explain the role of Quality control department. **[15]**

Q5) Answer the following

a) A double sampling plan is as follows select a sample of 2 from a lot of 20. If both the articles inspected are good accept the lot. If both are defective, reject the lot. If one is good, and one is defective take a second sample of one article. If the article in a second sample is good accept the lot. If it is defective reject the lot. If the lot with 20% defective is submitted what is the probability of acceptance of the lot? Compute by method that is theoretically correct and approximate method. **[12]**

b) A line inspector in an engineering company recorded dimensions of each of the five jobs selected at the end of every half an hour of the five hours in the morning. The quality characteristic is the measurement of diameter whose design specification is 25.0 ± 0.10. **[13]**

Invidual measurements of dia(mm)

sample No.	1	2	3	4	5
1	25.00	25.01	25.00	25.03	25.01
2	25.00	25.03	25.00	25.04	25.03
3	25.01	25.02	25.02	25.03	25.02
4	25.01	25.02	25.02	25.01	25.04
5	25.02	25.02	25.03	25.03	25.00
6	25.06	25.03	25.02	25.00	24.99
7	24.99	24.98	25.02	25.02	24.99
8	25.02	25.01	25.01	24.99	25.02
9	25.03	25.01	24.97	25.01	25.03
10	25.02	24.99	24.99	24.98	24.97

Plot $\overline{X}$ and R chart and find out which of the given observations are out of control given constants.

$A_2 = 0.5768$ $D_3 = 0$ and $D_4 = 2.114$

Q6) Answer the following

a) A company appoints four salesmen A, B, C, and D and observes their sales in three seasons-summer, winter and monsoon. The fig.(In lakhs) are given in the following table. **[13]**

Season	salesman				Total
	A	B	C	D	
Summer	36	36	21	35	128
Winter	28	29	31	32	120
Monsoon	26	28	29	29	112
Total	90	93	81	96	360

Carry out an analysis of variance.

b) For the following data calculate the sample size and AOQ for a single sampling plan. **[12]**

i) Probability of acceptance for 0.4% is 0.558.

ii) Lot size N = 10,000 units.

iii) Acceptance number C = 1.

iv) $n_p = 1.5$.

v) Defectives found in the sample are not to be replaced.

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Total No. of Questions :6] **[Total No. of Pages :2**

P1511

[3865]-851

M.E. (Printing Engg. and Graphic Communication)

ADVANCES IN CONVERTING AND PACKAGING (Elective - IV)

(508112(b)) (2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate book.***
3) ***Neat diagrams must be drawn wherever neceassary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain basic principle of operation of die cutting and lable punching processes used in printing industry. **[10]**

b) Discuss the operation of Holograms. Explain its importance in packaging. **[15]**

Q2) a) Explain the difference between varnishing and coating. **[10]**

b) Discuss the loose leaf technique used in stationary and publication. **[8]**

c) Explain the basic principle of operation of Embossing. **[7]**

Q3) a) What is dry lamination? Where it is more useful? **[12]**

b) Explain the process for lamination of 40 gsm paper with 12 micron foil. **[13]**

SECTION - II

Q4) a) Discuss basic principle of operation of co-extrusion? Explain the configuration of coextrusion for 5(five) layer film. **[10]**

b) Write short notes on :

i) Stretch wrapping. **[8]**

ii) Shrink wrapping. **[7]**

P.T.O.

Q5) a) Explain various types of pouches used in packaging. **[10]**

b) Discuss complete layout of Gusseted pouch

120 width ×25 ×25 Gusset ×200 length. **[8]**

c) Explain various requirements of microwave packaging. **[7]**

Q6) Write short notes on :

a) Refort packaging. **[10]**

b) Aseptic packaging. **[8]**

c) Begin box packaging. **[7]**

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Total No. of Questions :6] **[Total No. of Pages :1**

P1512

[3865]-852

M.E. (Printing Engg. & Graphic Communication)

ANALYSIS OF SPOT AND PROCESS INKS (Elective - IV)

(508112C) (2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate answer papers.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Figures to the right indicates full marks.***

SECTION - I

Q1) a) What is the need of Spot Inks Over Process Inks? **[15]**
b) What are the types drying used for Inks? **[10]**

Q2) a) What is the difference between Pigment Inks and Dye based Inks. **[10]**
b) Explain Ink vehicles and their properties. **[8]**
c) Explain the additives used in Ink. **[7]**

Q3) a) Explain Ink Rheology and surface Energy. **[15]**
b) Explain various types of Resins used for Inks. [**10]**

SECTION - II

Q4) a) What is alkyde Resin? How it is prepared? **[10]**
b) Explain different types of Inks. **[8]**
c) Explain function plastisizer in Inks. **[7]**

Q5) a) Explain different types of test carried out for Inks. **[10]**
b) Why C.O.F. and Rub Resistance is important for Inks. **[8]**
c) What is Ink receptivity? **[7]**

Q6) a) How printed product is Analysed? **[10]**
b) What are the printing problems. **[8]**
c) What are the printing process parameters. **[7]**

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Total No. of Questions :6] **[Total No. of Pages :2**

P1531

[3865]-803
M.E. (Instrumentation) (Process & Bio.)
CONTROL SYSTEM DESIGN
(2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) The forward path transfer function of a unity feedback control system is given below : $G(s)=\frac{K}{s(s+2)(s+8)}$

Design a lag compensating network using root locus method.

The system specifications are as below :

i) Peak overshoot $\leq 16.4\%$ for unit step input.

ii) Steady state error $\leq$ 0.16 radian for unit ramp input. **[16]**

b) Write a short note on MPC. **[9]**

Q2) a) Design a controller for the following system using direct synthesis approach :

$$G(s)=\frac{1}{(2s+1)(5s+1)}.$$

and given that the desired behavior is : **[16]**

$$9(s)=\frac{1}{\tau rs+1}.$$

With $\tau r = 5$. Compare this controller that resulting from choosing $\tau r = 1$

b) Write a short note on Internal Model Control. **[9]**

Q3) a) Consider the system

$$\dot{X} = AX + Bu$$
$$y = cX$$

P.T.O.

Where $A = \begin{bmatrix} 0 & 20.6 \\ 1 & 0 \end{bmatrix}, B = \begin{bmatrix} 0 \\ 1 \end{bmatrix}, C = \begin{bmatrix} 0 & 1 \end{bmatrix}$

we use the observed state feedback such that u = -k$\tilde{x}$.

Design a full-order state observer. Using Ackermann's formula. Assume that the desired eigenvalues of the. observer matrix are.

$\mu = -10, \mu_2 = -10.$ **[16]**

b) Write a short note on minimum order observer **[9]**

SECTION - II

Q4) Given that ess = 0.04 for a unit ramp i/p and phase margin 42°, Design a lag-lead compensator for the system having OLTF given below. : **[25]**

$$G(s)H(s) = \frac{k}{s(0.5s+1)(0.0166s+1)}$$

Using Bode plot Method.

Q5) A discrete-time regulator system has the plant **[25]**

$$X(k+1)\begin{bmatrix} 2 & -1 \\ -1 & 1 \end{bmatrix} X(k) + \begin{bmatrix} 4 \\ 3 \end{bmatrix} u(k)$$

$$y(k) = \begin{bmatrix} 1 & 1 \end{bmatrix} X(k) + 7\, u(k)$$

Design a state-feedback control algorithm u(k) = -kx(k) which places the closed loop characteristic roots at ± j0.5.

Q6) Derive an expression for MPC with step response model. Design MPC for a system with open loop transfer function. **[25]**

$G(s) = \frac{1}{(1+7s)}$ Assume P =4 N= 10 M = 1

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Total No. of Questions :6] **[Total No. of Pages :4**

P1532

[3865]-742

M.E. (Petroleum Engineering)

GIS AND COMPUTER APPLICATIONS IN PETROLEUM INDUSTRY

(2002 and 2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams should be drawn wherever necessary.***
4) ***Use of graph paper is allowed.***

SECTION - I

Q1) a) Raster and vector have developed as two partially independent traditions in GIS. Summarize the dimensions of the raster-vector debate, particularly in the importance of spatial objects in the two systems. **[15]**

b) How is scale and resolution helpful in understanding of properties of spatial objects? **[10]**

Q2) a) What makes the concept of a spatial database unique relative to other types of databases? List and define an example of a spatial object type from each of the 0-D, 1-D, 2-D and 3-D groups of object types. **[15]**

b) Values given adjacent to points are representation of depth of sandstone, a pay horizon, encountered and modeled during exploration. How is this database useful in the interpretation of continuous surface? What is the value at point P? **[10]**

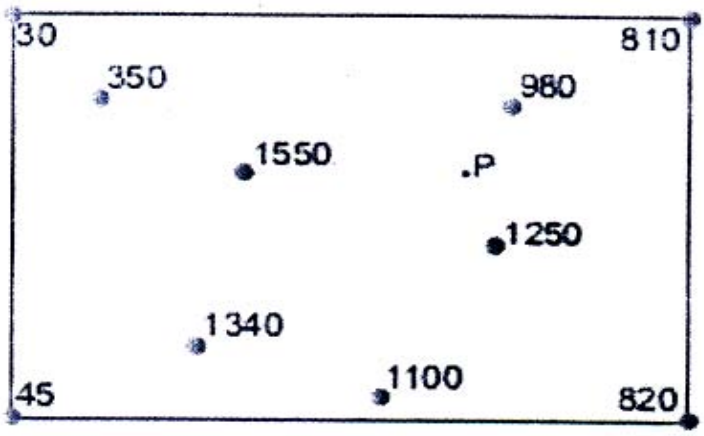

Figure for Q.2.B.

P.T.O.

Q3) a) Explain how are spatiotemporal changes and their mapping using GIS and remote sensing modelling carried out? Discuss this with suitable examples. **[15]**

b) A grid of 9 X 7 is given in the figure below in which depth to the top of an oil bearing sand is shown. Calculate the depth at the centre of each cell in integer form, then fill in the grid-table below and create a raster-based, grid DEM data set.

How will you develop 3 D information from this map? **[10]**

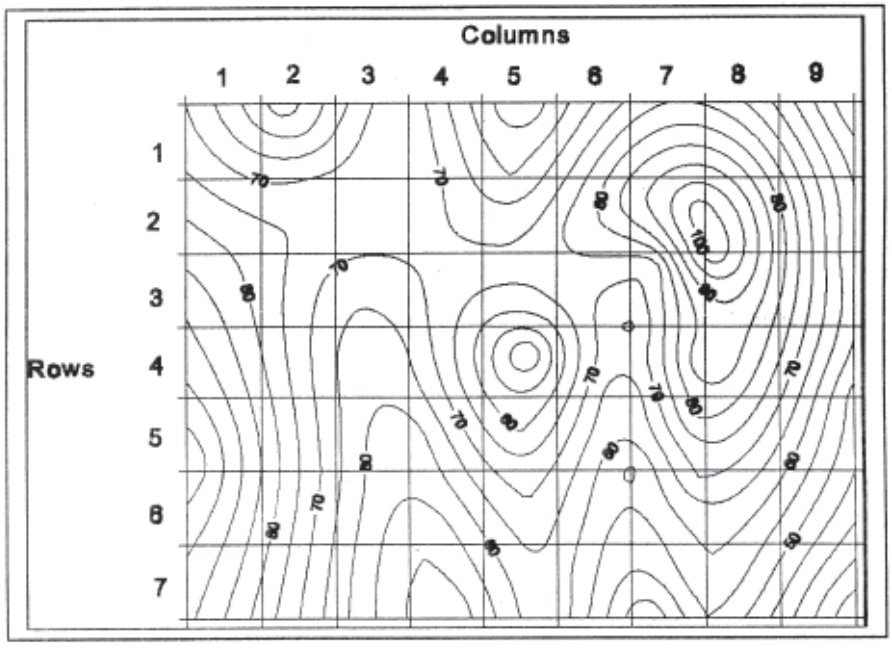

Figure for Q3.B.

SECTION - II

Q4) A terminal for the storage of oil is under consideration outside a metro city. The site must be located so that all conditions mentioned below are fulfilled : **[25]**

a) Be in an area where unconsolidated superficial material has minimum thickness,

b) Permeability of foundation material (bedrock) is low, preventing contamination below the surface,

c) Slope is gentle where river flooding is unlikely,

d) Bedrock is not fractured,

e) It should be located in the agricultural zoning outside the limit of metro city and near to the industry, it should not be a prime land,

f) The site should have excellent transportation facility,

g) There are certainly other factors like cost of land and size of the land (Approximately 2 km^2), which should be taken into consideration.

Develop a stepwise procedure starting with the types of maps required. How will you create a suitability map by using the above conditions for the selection of this site.

Q5) a) Design a template for the creation of a 3D Reservoir model taking into consideration available geologic, geophysical and detailed reservoir data. Also list out information on attributes to be included in the DBMS, which would allow a means to review the reservoir model and update the same. **[10]**

b) An oil refinery is in operation for last ten years adjacent to a perennial river, which is a major source of water for domestic purposes by many villages in the downstream area. This river is joined by many small streams. The company management is responsible for clean environment. River water, groundwater and soil are contaminated because of release of chemicals from refinery, which is clearly observed from change in color and quality of water and discoloration of soil. Last five years have seen tremendous growth in both adjacent and downstream of river due to urbanization.

You are requested to take into consideration following points for the design of GIS project for the creation of database : sources of contamination, the receptors (both human and ecological), ecological habitats, transport pathways, risks to the identified receptors.
Is it necessary to add temporal component to the project? **[15]**

Q6) a) Figure given below is a binary raster array showing a region of 1s (ones) surrounded by 0s (zeros).

0	0	0	0	0	1	1	0
0	0	0	0	1	1	1	0
0	0	0	1	1	1	1	0
0	0	0	1	1	1	1	0
0	1	1	1	1	1	1	0
0	1	1	1	1	1	1	0
0	0	0	1	1	1	1	0
0	0	0	0	0	1	0	0

Figure for Q.6.a

Complete following activities :

i) Decompose this into maximal blocks following the concept of Morton order and into a tree structure. **[10]**

ii) Compress this into BIP type of storage data and reorganize the information. **[5]**

b) Write notes on <u>any two</u> of the following : **[10]**

i) Georeferencing.

ii) Standard map projection systems.

iii) SQL operations.

iv) Autocorrelation.

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Total No. of Questions :8] **[Total No. of Pages :3**

P1533

[3865]-673

M.E. (Computer Engineering)

DISTRIBUTED SYSTEMS

(510108) (2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any Three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Why is scalability an important feature in the design of a distributed system? Discuss some of the guiding principles for designing a scalable distributed system. **[6]**

b) A service is implemented by several servers. Explain why resources might be transferred between them. Would it be satisfactory for clients to multicast all requests to the group of servers as a way of achieving mobility transparency for clients? **[6]**

c) Discuss how Denial of service attack takes place in a distributed network system using five real-time networking scenario. **[6]**

Q2) a) Give the characteristics of applications for which the batch-mode RPC facility may be useful. What are the main problems in using this facility?**[8]**

b) Explain how Lamport's logical clock is beneficial in managing process entry to a critical section. **[8]**

Q3) a) List out issues and difficulties related to design and implementation of middleware for peer-to-peer system? Suggest solutions to overcome such issues. **[8]**

P.T.O.

b) Which features of the AFS design make it more scalable than NFS? What are the limits on its scalability, assuming that servers can be added as required? **[8]**

Q4) Write short notes on (Any Three*)* : **[16]**

a) Global states.

b) Distributed objects.

c) External data representation and marshaling.

d) Logical time and logical clocks.

SECTION - II

Q5) a) What are the main causes of thrashing in a DSM system? What are the commonly used methods to solve the thrashing problem in a DSM system. **[7]**

b) What are some of the issues involved in building a DSM system on a network of heterogeneous machines? Suggest suitable methods for handling these issues. **[7]**

c) Explain how to deal with the problem of differing data representations for a middleware based implementation of DSM on heterogeneous computers? **[4]**

Q6) a) Describe two methods for solving the key distribution problem for a symmetric cryptosystem and discuss their relative advantages and disadvantages. **[8]**

b) Discuss how Diffie-Hellman based Key Agreement protocol is beneficial for providing security in group communication issues. How can this protocol be used for secured cash transfer in a bank? **[8]**

Q7) a) Documents protected by XML security may be signed or encrypted long before anyone can predict who will be the ultimate recipients. What measures are taken to ensure that the latter have access to the algorithms used by the former? **[8]**

b) A coordination protocol could be carried out in order to coordinate the actions of web services. Outline an architecture for **[8]**

i) A centralized and

ii) A distributed coordination protocol. In each case, describe the interactions needed to establish coordination between a pair of web services.

Q8) Write short notes on (Any Three) : **[16]**

a) Directory service for the Grid.

b) Kerberos authentication system.

c) WSDL.

d) Digital signature.

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Total No. of Questions :8] **[Total No. of Pages :2**

P1534

[3865]-761
M.E. CSE (Information Technology)
NET CENTRIC COMPUTING
(514426) (2008 Course) (Sem. - II)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Attempt any Three questions from section - I and Three question from Section - II.***
2) ***Answers to the both sections should be written in separate answer sheets .***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) List the defferent protocols at Internet Layer of TCP/IP model. What are the major functions of Internet layer protocols in TCP/IP model. **[8]**

b) How router determines the logical boundaries between groups of network segments? **[8]**

Q2) a) What is the prime role of gateway? How gateway can change the form of a network transmission from one communications architecture to another?**[8]**

b) How traffic requirement is calculated in the design of computer networks?**[8]**

Q3) a) Messages arrive to the system at the rate of 5 per minute. Their lengths are exponentially distributed with an average of 1800 characters. They are transmitted on a 11.2 kbps channel. A character is 16bit long. Find**[8]**

i) Average service time.
ii) Arrival rate.
iii) Service rate.
iv) Utilization of server.
v) Probability of 2 messages in the system.
vi) Average number of messages in the queue
vii) Average waiting time.
viii) Average time in the system.

b) Prove that the probability of system being idle is 1 minus utilization of server in M/M/1 queuing system. **[8]**

P.T.O.

Q4) Write short notes on (Any Three) : **[18]**

a) Repeater.

b) Fault diagnosis and recovery.

c) Optimizing network performance.

d) NetBIOS.

SECTION - II

Q5) a) What is the use of CMST algorithm? Explain the CMST algorithm in detail. **[8]**

b) Design the Frame Relay requirement for the following three sites. **[8]**

i) Site A to Site B needs 30 kbps.

ii) Site A to Site C needs 800 kbps.

iii) Site B to Site C needs 100 kbps.

Determine the site's PVC needs and port speed required.

Q6) a) How short cell length in ATM limits latency at each switch in the network? **[8]**

b) What problem was Kerberos designed to address? **[8]**

Q7) a) How firewall policy is created? **[8]**

b) Give and explain the VOIP system architecture. **[8]**

Q8) Write short notes on (Any Three) : **[18]**

a) Facsimile Compression.

b) RAID

c) Signaling Protocols for VOIP.

d) Backup and Mirroring.

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Total No. of Questions :12] **[Total No. of Pages :4**

P1535

[3865]-545

M.E. (Electrical) (Control Systems)

MULTIVARIABLE AND OPTIMAL CONTROL SYSTEMS

(2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any Three questions from section - I and Three question from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables and electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the advantages and disadvantages of representing the multivariable control systems into: **[6]**

i) State space form.

ii) Transfer matrix form.

iii) Differential operator form.

b) A multivariable control system is represented in state space form: **[10]**

$$\dot{x}(t)=\begin{bmatrix}0 & 1 & 0\\ -1 & -2 & 1\\ 0 & 0 & 3\end{bmatrix}x(t)+\begin{bmatrix}1 & 1\\ 1 & 0\\ 0 & 1\end{bmatrix}u(t)$$

$$y(t)=\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 1\end{bmatrix}x(t)$$

Obtain the transfer matrix form of the system

OR

Q2) a) Explain with suitable example the structure of any industrial multivariable control system. Draw neat block diagram. **[6]**

P.T.O.

b) The over all transfer matrix of a multivariable control system is given by **[10]**

$$T(S)=\frac{Y(S)}{U(S)}=\begin{bmatrix}\frac{1}{S+3} & \frac{1}{S+2}\\ \frac{1}{S+2} & \frac{1}{S+3}\end{bmatrix}$$

Obtain the state space model of the system.

Q3) a) State and explain the concept of observability of the multivariable control system. Discuss the method of testing the observability of the system.**[6]**

b) Investigate the observability of the following multivariable control system:

$$\dot{x}(t)=\begin{bmatrix}2 & 0 & 0\\ 0 & 2 & 1\\ 0 & 0 & 1\end{bmatrix}x(t)+\begin{bmatrix}1 & 1\\ 0 & 1\\ 2 & 0\end{bmatrix}u(t)$$

[12]

$$y(t)=\begin{bmatrix}1 & 0 & 1\\ 1 & 1 & 0\end{bmatrix}x(t)$$

OR

Q4) a) Define the concept of controllability and explain the conditions for full state controllability of the multivariable control system. **[6]**

b) Determine the state controllability of the multivariable control system represented by the state space model : **[12]**

$$\dot{x}(t)=\begin{bmatrix}0 & 1 & 0\\ 3 & 2 & 0\\ 1 & 1 & 1\end{bmatrix}x(t)+\begin{bmatrix}1 & 2\\ 1 & 1\\ 0 & 0\end{bmatrix}u(t)$$

$$y(t)=\begin{bmatrix}0 & 0 & 1\\ 1 & 2 & 0\end{bmatrix}x(t)$$

Q5) a) State the different methods extending the classical control theory for the analysis of multivariable control systems. What are their limitations? **[6]**

b) Discuss clearly the following design aspects of multivariable control system: **[10]**

i) Model matching control.

ii) Decoupling or Non-interactive control.

OR

Q6) a) Outline the procedure for pole allocation using linear state variable feedback in multivariable control system. Draw the block diagram showing the linear state variable feedback. **[8]**

b) What is the necessity of an observer? Explain with appropriate block diagram the structure of the state estimation problem using full order observer. **[8]**

SECTION - II

Q7) a) Obtain the typical performance index for optimal control of

i) Minimum Fuel Problem.

ii) Minimum Time Problem.

iii) Tracking Problem. **[9]**

b) State the finite-time and Infinite-time state regulator problem and discuss the procedure for obtaining the optimal control law for infinite-time state regulator problem. **[9]**

OR

Q8) a) Discuss the factors to be considered in formulation of an optimal control problem based on quadratic performance index. **[6]**

b) A linear time-invariant control system is represented by the state equation:

$$\dot{x}(t)=\begin{bmatrix}0 & -2\\ 2 & 0\end{bmatrix}x(t)+\begin{bmatrix}1\\ 0\end{bmatrix}u(t)$$

Determine the optimal control law $u^*(t) = -K\,x(t)$ so that the following quadratic performance index is minimized. 'K' is the feedback gain matrix.

$$J=\frac{1}{2}\int_0^\infty\left[x^T(t)Q\,x(t)+u^T(t)Ru(t)\right]dt$$

Assume : $Q=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$; $R=1$ **[12]**

Q9) State and explain the 'Pontryagin's minimum principle'. Outline the procedure for solving the optimal control problem using pontryagin's minimum principle. **[16]**

OR

Q10)a) Define Hamiltonian. Derive the state, co-state and control equations. **[6]**

b) Outline the procedure for solving the optimal control problem using Hamiltonian method. State its limitations. **[10]**

Q11)a) Discuss the relation between Pontryagin's minimum principle and Dynamic Programming. **[6]**

b) Draw the block diagram showing the structure of feedback time-optimal control system and discuss in detail the minimum-time optimal control problem. **[10]**

OR

Q12)a) Explain the Bang-bang control strategy and state the advantages of Bang-bang controller. **[6]**

b) For the system described by the state equation : **[10]**

$$\dot{x}(t)=\begin{bmatrix}0 & 1\\ -1 & 0\end{bmatrix}x(t)+\begin{bmatrix}1\\ 0\end{bmatrix}u(t)$$

Find the optimal control $u^*(t)$ satisfying the constraint $|u(t)|\leq 1$ which transfers the system from initial state $x^\circ = \begin{bmatrix}x^\circ_1\\ x^\circ_2\end{bmatrix}=\begin{bmatrix}1\\ 1\end{bmatrix}$ to the origin (i.e. $x_1 = x_2 = 0$) in minimum time

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Total No. of Questions :9] **[Total No. of Pages :2**

P1595

[3865]-194
M.E.(Production)
CAD - CAM-FMS
(Revised 2002 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Attempt not more than FIVE questions of which at least TWO questions must be from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***You are advised to attempt not more than five questions.***
6) ***All questions carry equal marks.***
7) ***Use of calculator is allowed.***
8) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) For a plane stress problem, derive element stiffness matrix using principle of virtual work. **[10]**

b) What are the methods of reducing the half-band width ? Explain any one in detail. **[10]**

Q2) a) Compare the various solid modelling approaches with their advantages and disadvantages used in CAD. **[10]**

b) A triangle ΔPQR with vertices P(1, 1), Q(7, 1), R(1, 6) is to be rotated about vertex P by 30° anticlockwise. Determine the co-ordinates of vertices after rotation. **[10]**

Q3) a) A cubic spline curve is defined by equation $P(u) = C_3u^3+C_2u^2+C_1u+C_0$ where $0 \leq u \leq 1$ and C_3, C_2, C_1 and C_0 are the polynomial coefficients. Assume that they are positive and known, find the four control points that define an identical Bezier curve . **[10]**

b) Explain the effect of multiple control points and degree of B-spline curve on its shape. **[10]**

Q4) a) What do you understand by automation strategy as regards the manufacturing industry? Explain one example. **[10]**

b) Classify flexible manufacturing systems in industries. **[10]**

P.T.O.

Q5) Write short note on any four : **[20]**

a) Tool monitoring and sensing.

b) Cellular manufacturing.

c) Codes used in Group technology.

d) Autolisp programming.

e) Serial and parallel communications.

SECTION - II

Q6) a) Draw the layout of a typical FMS system and explain main components of FMS. **[10]**

b) Write a short note on magnetic grippers used for Robot. **[10]**

Q7) a) Write a note on new trends in development in C.N.C. Technology. **[10]**

b) Write different methods used for clustering in manufacturing cell formation. **[10]**

Q8) a) Classify various types of A.G.V. used in F.M.S. Explain the measures taken to avoid over loading. **[10]**

b) Classify various methods of rapidprototyping. Write advantages and disadvantages of these methods. **[10]**

Q9) Write short notes on any four : **[20]**

a) King's rankorder clustering.

b) Similarity coefficient.

c) Tool probes used in CNC.

d) ASRS.

e) CAD/CAM data base.

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1613

[3865]-235

M.E. (Instrumentation)

ADVANCED ELECTRONIC INSTRUMENTATION

(506103) (2002 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever neceassary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain following triggering modes of the cathode ray oscilloscope with an application of each : **[25]**

a) Line trigger.

b) Internal trigger.

c) External trigger.

d) Auto trigger.

e) Normal trigger.

Q2) Explain counter type analog to digital converter with the help of internal blocks and timing diagram. What are the limitations of this technique? **[25]**

Q3) What are the types of errors occur in universal counter? Which techniques are used to overcome these errors? **[25]**

P.T.O.

SECTION - II

Q4) What are the internal blocks of sound level meter? Explain the calibration procedure for the meter. **[25]**

Q5) What is the Data Acquisition and monitoring System in industrial application? Support your answer with a detailed case study. **[25]**

Q6) Write short notes on : **[25]**

a) Recorders.

b) Hall sensor.

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Total No. of Questions :10] **[Total No. of Pages :2**

P1618

[3865]-265
M.E. (Information Technology)
SOFTWARE ENGINEERING
(510121) (2003 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) What are the five major areas of SQA? Explain. **[8]**

b) Describe the role that formal methods can play at each stage of the software life cycle. Explain any disadvantages of the uses of formal methods that you have discussed. **[8]**

Q2) a) If you were developing a security-critical system, how would you integrate the security requirements engineering and assurance processes into the model? **[8]**

b) What are the components of project plan? Explain. **[8]**

Q3) a) List and explain various tasks done in acceptance testing? **[8]**

b) Define TQM. Explain in brief quality planning and quality improvement. **[8]**

Q4) a) What are the three phases of Risk management? Explain. **[8]**

b) Explain forward engineering for Client Server Architecture. **[8]**

Q5) a) What are the important attributes, which all software products should have? **[8]**

b) What do you mean by process maturity? With the help of neat labeled diagram explain Capability Maturity Model? **[10]**

P.T.O.

SECTION - II

Q6) a) Define dependability of a Computer System. What are the four principle dimensions of dependability? **[8]**

b) State and explain different organizational paradigms for software Engineering teams. **[10]**

Q7) a) What are design Patterns? What are different elements of design pattern? **[8]**

b) Software is often a part of various devices and systems where malfunction can have a very dramatic effect on people or the entire society-consider for example banking systems or hospital equipment. What is the responsibility of software providers or software engineers for their work? **[8]**

Q8) a) Explain in detail the challenges in building global teams. **[8]**

b) Software process measurement often involves measuring the work of individual people in the process, such as time spent or faults made in certain tasks. What problems are there in collecting this kind of information and how could these problems be reduced? **[8]**

Q9) a) Explain why an object oriented approach to software development may not be suitable for real time systems. **[8]**

b) How do components differ from objects? Why does object-oriented design become easier when a new abstract entity, component, is added between subsystems and objects? **[8]**

Q10) **a)** What is change control? Explain the procedure of change control process? **[8]**

b) Suggest why it is important to make a distinction between developing the user requirements and developing system requirements in the requirements engineering process. **[8]**

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Total No. of Questions :8] **[Total No. of Pages :2**

P1624

[3865]-275
M.E. CSE (IT)
DATA WAREHOUSING AND DATAMINING
(2002 Course) (Elective - II)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Q.1 and Q.5 are compulsory. Of the remaining solve any two in section I and any two in section II.***
2) ***Draw labeled diagrams if necessary.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Design of star schema for Olympic events.

--Consider particular example of attendance at Olympic events. Facts are numbers attending , value of ticket sales. Dimensions include Olympiad (year of Olympic), venue, sport, type (common match, semifinal, final), men's/ woman's.Venues are classified by location and type of building into central enclosed, central open, remote. Sports are subdivided into events.

Assume a report representing attendance at various events. State your assumed report before you solve the following: **[18]**

a) Construct a fact table for this Olympic event.

b) What is the key of the fact table?

c) Design a star schema by using the fact table designed in a) and using dimension tables.

Q2) a) Explain in detail Projection Index and Bit Map Index with suitable examples, figures. **[10]**

b) Discuss issues in problems in storage and retrieval of data from DSS.**[6]**

Q3) a) Design a "Snowflake" schema solution for a Sales company that needs to track the customer, country, sales representative, his territory, Region, Product,Package, Brand and Category. Assume suitable fields for each table. **[8]**

P.T.O.

b) List the advantages and disadvantages of "Snowflaking" and explain with an example when to Snowflake. **[8]**

Q4) Write short notes on : **[16]**

a) Clustering and Classification in Data Mining.

b) Pattern Recognition techniques for exploring data in databases.

SECTION - II

Q5) a) List all the major activities that are part of the ETL process. Which of these is time consuming? Explain in detail any four of them. **[12]**

b) Write a note on Text Data Mining. **[4]**

Q6) a) Distinguish between Star Schema and Snowflake schema. **[8]**

b) Distinguish between OLTP and Data Warehousing system **[8]**

Q7) a) Which Indexing technique is best suitable for Data Warehouse? **[8]**

b) Write a short note on dimensional modeling. Explain the concept of aggregation hierarchies. **[8]**

Q8) Write short notes on : **[18]**

a) Write a short note on indexing. Distinguish between bitmap indices and join indices.

b) Information filtering techniques for exploring data in databases.

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Total No. of Questions :8] **[Total No. of Pages :2**

P1626

[3865]-290

M.E. (Chemical)

ADVANCED THERMODYNAMICS

(2002 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive the barometric equation. **[6]**

b) A weight is hung on a rubber band which elongates it. If hot air is blown over it the rubber band contracts. Explain this phenomenon on the basis of entropy. **[8]**

c) Define surface properties. **[4]**

Q2) a) Explain liquid-liquid equilibrium. **[8]**

b) Describe second order transitions. **[8]**

Q3) a) Explain the phenomenon of super conductivity. **[8]**

b) What is retrograde condensation? **[8]**

Q4) Give in detail the thermodynamics behind glucose cycle. **[16]**

P.T.O.

SECTION - II

Q5) a) What is the statistical analog of entropy. **[10]**

b) What are the following terms ensemble, occupation number, degeneracy and statistical weight factor. **[8]**

Q6) a) Discuss the enthalpy changes in open systems. **[8]**

b) Explain and derive the De Donder equation. **[8]**

Q7) a) Explain the vapour pressure method to determine activity of an electrolyte. **[12]**

b) What is affinity? **[4]**

Q8) a) Compare statistical and classical thermodynamics. **[8]**

b) Derive an equation for activity of unsymmetrical electrolyte **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1636 **[3865]-413**

M.E. (Civil) (Const. & Mgmt.)

PROJECT ECONOMICS AND FINANCIAL MANAGEMENT

(2008 and 2002 Course)

Time : 4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) An amount of Rs.80 lacs is invested in a construction equipment, the useful life of which is 5 years. The returns from the equipment when put to use are as follows. **[18]**

Year	Returns in Rs.(lacs)
1	10
2	30
3	35
4	25
5	20

Determine :

a) Payback period (PBP)

b) Discounted (PBP) at 10% cost of capital.

c) ARR based on average returns.

d) NPV at 15% .

e) IRR.

f) B/C ratio.

P.T.O.

Q2) a) Compare and contrast between **[8]**

i) ARR and IRR.

ii) NPV and PBP.

b) With an example explain the utility of the 'S' cost curve on a construction project in financial planning and in project cost control. **[8]**

Q3) Define any 8 ratios useful in financial planning, analysis, control and explain their utility with examples. [**16]**

Q4) Explain in detail, the following :- **[16]**

a) Recovery of various advances given to a contractor.

b) Portfolio Analysis.

c) Use of simulation in financial management.

d) Effect of inflation on financial decision making.

SECTION - II

Q5) Explain how the following sheets are prepared and also importance of each; in a construction company. **[18]**

a) Balance sheet.

b) Cash Flow statement/s.

c) Profit and loss account sheet.

Q6) What constitutes the working capital? How is the NWC requirement assessed for a construction organisation? Draw the cash flow cycle and explain it with an example. **[16]**

Q7) a) Explain with examples. **[10]**

i) JV

ii) Acquisition

iii) Amalgamation.

iv) Consortium.

v) Merger.

b) Explain the wealth maximization approach with an example. **[3]**

c) What is liquidation of assets? When is it done? Explain with an example. **[3]**

Q8) Explain the details of :- **[16]**

a) Basic Accounting principles.

b) Objectives of financial appraisal.

c) Preference shares.

d) Micro finance.

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1641

[3865]-447
M.E. (Civil-Hydraulic)
HYDROLOGY
(2008 Course) (501309)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answer any 3 questions from Section I and 3 questions from Section II.***
3) ***Answers to the two sections should be written in separate answer books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Your answer will be valued as a whole.***
7) ***Use of electronic pocket calculator is allowed.***
8) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) In a ten hours storm the following depths occurred over a catchment. It is presented in tabular form. **[8]**

Hour	01	02	03	04	05	06	07	08	09	10
Depth of rainfall(cm)	1.1	1.5	5.1	6.0	10.5	8.8	9.1	7.0	1.4	1.3

The surface runoff resulting from the storm is equal to 20cm over the catchment. Find the Maximum average infiltration.

b) What is Unit Hydrograph? Define the various parts of a Unit Hydrograph. The catchment area is 128 square kilometers. For the unit hydrograph what will be the volume of rainfall over this catchment area in million metre cube. **[8]**

Q2) a) Differentiate between the accuracy level in rainfall measurement by 'Theissen Polygon Method' and 'Arithmetic Mean Method.' **[6]**

b) There is a hydrograph triangular in shape. The base is equal to 96 hours. The highest ordinate is obtained at 60 hours after the starting of the storm. The value of the highest ordinate is 90 cumec. It increases and reduces linearly from the start to end of the storm. The catchment area is 120 square kilometers. What will be the average depth of the rainfall over the total catchment? **[6]**

P.T.O.

c) What are the different methods for measuring the frequency of rainfall and which is the most widely accepted and accurate method. Write in brief about all of them with required formulae. **[6]**

Q3) a) What is the importance of Flood Routing? Write in brief about Flood Routing along with all-important equations. Discuss Gumble's Method in brief. **[8]**

b) The ordinates of a three hour unit hydrograph are given in a tabular form. Determine the ordinates of the 12 hours unit hydrograph. **[8]**

Time (hr)	0	3	6	9	12	15	18	21	24
O.U.H. (cumec)	00	10	30	80	120	50	20	05	00

Q4) a) Derive the expression of discharge for an unconfined well by Thiem's formula. **[8]**

b) Given below are the ordinates of 2 hour unit Hydrograph. **[8]**

Time (hr)	00	02	04	06	08	10	12	14	16	18	20	22
Ordinates of 2 hour unit hydrograph(m^3/s)	00	35	85	210	170	145	95	70	45	25	12	00

Derive the ordinates of 4 hour unit hydrograph and the ordinates of flood hydrographs due to 2 cm rainfall excess in 4 hours. Assume a constant base flow of 15 cumec.

SECTION - II

Q5) a) In a confined aquifer the coefficient of permeability is 0.001m/sec. It rests over the impervious base of fully penetrating well of diameter 0.5 metre and draws a steady discharge of $180m^3$ /hr. Due to pumping the water table is lowered by 1.8m at a point 16m from the centre of the well. If the water table was 19m above the impervious base before the starting of the pumping, compute the drawdown at 33 m from the central line of the well. **[8]**

b) Discuss in detail about Perched Aquifer along with neat sketch. What is the speciality of Perched Aquifer and what are its advantages and disadvantages? **[8]**

Q6) a) Discuss about partial penetration of an Aquifer by a well along with sketches. **[6]**

b) With the help of schematic diagram explain Hydrologic Cycle. **[6]**

c) Discuss in detail about the recharging of wells. What is the influence of rainy season on recharging of well? **[6]**

Q7) a) Design an open well in coarse sand for a yield of 0.005 cumec when operated under a depression head of 3.5 metres. **[6]**

b) What are the basic differences between Surface Hydrology and Ground water Hydrology? **[6]**

c) What are the differences between Unit Hydrograph and Direct Run-off Hydrograph? Explain them in brief. **[4]**

Q8) Write short notes (any four) : **[16]**

a) Flood Frequency Analysis.

b) Darcy's Law.

c) Method of image.

d) Influence of high flood on Hydraulic Structures.

e) Transmissibility.

f) Aquifuge.

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Total No. of Questions :8] **[Total No. of Pages :2**

P1647

[3865]-487

M.E.(Mechanical)(Heat Power Engg.)

MEASUREMENT TECHNIQUES AND DATA ANALYSIS

(2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain classification of measuring instruments. **[8]**

b) Explain probable error and standard error. **[8]**

Q2) a) The following table shows the age distribution of persons in a particular region. Find median. **[8]**

Age(yrs.) Bellow	10	20	30	40	50	60	70	70 & over
No.of persons (thousands)	2	5	9	12	14	15	15.5	15.6

b) Compare regression and correlation analysis. **[8]**

Q3) a) Calculate Karl Pearson's co-efficient of correlation from following data, using 20 as mean for price and 70 as the mean for demand. **[10]**

Price	14	16	17	18	19	20	21	22	23
Demand	84	78	70	75	66	67	62	58	60

b) Explain properties of correlation co-efficient. **[8]**

P.T.O.

Q4) a) Explain the method of measurement of humidity using capacitance method. **[10]**

b) The measured vibrational acceleretion amplitude of vibrational body is 4g, express this in decibel, take reference value as $10^{-6}m/s^2$. **[6]**

SECTION - II

Q5) a) An accelerometer has a seismic mass of 50gram and spring constant of 30×10^3N/m. Maximum mass displacement is ± 0.02m (before the mass hits the top). Calculate ; **[8]**

i) Measurable acceleration (maximum)

ii) Natural frequency.

b) Explain the construction and working of Resistance temperature detector. **[8]**

Q6) a) Explain the working principle and construction of double beam spectro photometer. **[8]**

b) Explain Beer Lambart's law. **[4]**

c) State various thermophysical properties of a substance. **[4]**

Q7) a) Explain the working of P+I+D pneumatic controller for a typical application. **[8]**

b) Explain the principle and working of vortex flow meter. **[8]**

Q8) Write short notes on any three : **[18]**

a) Laser doppler anemometer.

b) Dialtometer.

c) Load cell.

d) Measurement of thermal diffusivity.

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Total No. of Questions :10] **[Total No. of Pages :2**

P1655

[3865]-508
M.E. (Mechanical - Design Engineering)
COMPUTER AIDED ENGINEERING
(502211) (2008 Course) (Elective -III)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of pocket non programmable electronic calculator is allowed.***

SECTION - I

Q1) a) Justify modeling and simulation as a design procedure with simple example. **[12]**

b) Enlist data exchange issue related to analysis and simulation. **[4]**

Q2) a) Explain the procedure to build any geometric model with the help of Blend and parent child feature available in commercial modeling software. **[8]**

b) Explain how to reduce idle time and effective time of modeling and analysis using CAD/CAM/CAE software's. **[8]**

Q3) a) Justify with suitable example which type of geometric modeling is preferred for Modular assembly. **[8]**

b) Discuss the set of issues that need to be addressed during development of conceptual model for simulation. **[8]**

Q4) a) Explain briefly effect of mesh density and biasing in critical regions of meshing. **[8]**

b) Explain stress tensors and their invariant in contest to von-misses stress. **[8]**

Q5) Write short notes on : **[18]**

a) Optimization in FEA Software.

b) Assembly modeling approaches.

c) Analytical techniques for fluid systems.

P.T.O.

SECTION - II

Q6) a) What is mesh refinement, Enlist limitations and advantages of 1D and 3D element meshing. **[8]**

b) Enlist and describe different steps used to develop finite element model. **[8]**

Q7) a) Discuss the conditions that are required to satisfy approximate functions used in variational methods of approximation. **[8]**

b) Enlist general considerations used during mesh generation related to discretization and generation of finite element data. **[8]**

Q8) a) Explain types of errors introduced into the finite element solution of a given differential equation. **[8]**

b) Explain different levels of approximations CFD. **[8]**

Q9) a) Differentiate between finite difference and finite volume method of discretization used in CFD. **[8]**

b) Explain different types of grids used in CFD. **[8]**

Q10) Write short notes on : **[18]**

a) Basic fluid motions in CFD.

b) Space time decoupled FE formulation of time dependent problems.

c) Non linear analysis used in CAE.

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Total No. of Questions :10] **[Total No. of Pages :2**

P1659

[3865]-521
M.E. (Mechanical) Mechatronics - II
INDUSTRIAL AUTOMATION
(502809) (2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of Scientific calculator is allowed.***

SECTION - I

Q1) a) Compare Mechanization and Automation with 4 points of comparison. **[8]**

b) Write a short note on Boolean Algebra with two examples. **[8]**

Q2) a) Write a PLC program to control direction of DC motor with to NO, Push-to-on Switches. **[10]**

b) Compare Ring and Bus Topologies with three points of illustrations. **[8]**

Q3) a) Explain Sourcing inputs and sinking outputs w.r.t. PLC. **[8]**

b) Compare Contactor Logic and Ladder Logic with two suitable examples. **[8]**

Q4) a) Explain three User Requirement Specification Formats with respect to Automation. **[9]**

b) Write a short note on Counters used in PLC programming with three corresponding ladder diagrams. **[9]**

Q5) a) With Block Diagram explain working of PLC. **[8]**

b) Explain Examine ON and Examine OFF Conditions with suitable examples of ladder diagrams. **[8]**

P.T.O.

SECTION - II

Q6) a) Compare transfer lines with flexible manufacturing with four points of comparison. **[8]**

b) Explain the significance of absolute coordinates and incremental co-ordinates with suitable example. **[8]**

Q7) a) Compare tool offset and wear offset in CNC programming. **[8]**

b) Write a short note on DCS in enterprize resource planning. **[8]**

Q8) a) Explain two position sensors in CNC with principle of working and repeatability. **[8]**

b) Explain linear interpolation used in CNC programming with corresponding G codes. **[8]**

Q9) a) Explain preparatory functions G00, G02, G03 with significance thereof. **[9]**

b) Explain advantages and limitations of CNC with conventional machine tools with three illustrations. **[9]**

Q10) **a)** Explain four advantages of subprograms in APT programming. **[8]**

b) What are M codes? Explain any three M Codes. **[8]**

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Total No. of Questions :6] **[Total No. of Pages :2**

P1667

[3865]-561
M.E. (Electrical) (Power Systems)
POWER SYSTEM DYNAMICS
(503208) (2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of pocket electronic calculator is allowed.***
5) ***Assume suitable data, if necessary and state clearly the same.***

SECTION - I

Q1) a) Discuss the different states of operation of power systems as per the classification proposed by fink and carlson. **[10]**

b) Present a simplified representation of excitation control used in classical approach for dynamics analysis. **[15]**

Q2) a) An alternator is connected to an infinite bus through an external impedance of (jx_e). If $E_b = V_{to} = 1$p.u., $p_t = 1$p.u. Find the initial conditions if $x_e = 0.2$ p.u and the generator data is ;- $x_d = 1.8$p.u; $x'_q = 1.7$p.u; $x'_d = 0.23$p.u.; $r_a = 0$; $T'_d = 0.4$sec; $T'_q = 0.1$ sec; H = 4sec; $f_B = 60$ Hz. **[12]**

b) Explain how the network solution is to be carried out if one SVC in control region

i) Is to be considered. In the control region.

ii) Of SVC the following limits apply :$V_1 < V_{SVC} < V_2$ and $I_1 < I_{SVC} < I_2$ where the limits can be time varying. **[13]**

Q3) a) A single salient-pole synchronous machine is connected to a bus through an impedance ($r_e + jx_e$). The bus voltage is $E_{bus} \angle 0°$. The synchronous machine is represented by model 1.0 which neglects damper windings in both 'd' and 'q' axes as well as $r_a \equiv 0$. The excitation system of the machine is represented by a single time-constant system carry out small signal analysis and obtain the expressions for $\Delta \vartheta_d$ and $\Delta \vartheta_q$. **[15]**

P.T.O.

b) Explain the concepts of synchronising and damping torques w.r.t. power system analysis, bringing out the significance of the concepts. **[10]**

SECTION - II

Q4) a) With a block diagram of a PSS, explain the function of each block and state the guidelines for the selection of parameters of individual blocks **[13]**

b) The AVR system of a generator has the following parameters :- **[12]**

System component	gain	Time const. (sec)
Amplifier	K_A	$\tau_A = 0.1$
Exciter	$K_E = 1$	$\tau_E = 0.4$
Generator	$K_G = 1$	$\tau_G = 1.0$
Sensor	$K_R = 1$	$\tau_R = 0.05$

Use the Routh-Hurwitz criterion to find the range of K_A for control system stability.

Q5) a) Explain what is meant by " voltage stability". Discuss the factors affecting voltage instability and collapse. **[13]**

b) Describe the steps in the investigation of dynamic stability of a multimachine power system. State the assumptions made. **[12]**

Q6) Write short notes on the following :-

a) Islanding in power systems; **[9]**

b) Synchronous machine models; and **[8]**

c) PSS design and application. **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1674 **[3865]-632**

M.E. Electronics (Digital System)

COMMUNICATION NETWORK AND SECURITY

(2008 Course) (504202)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from Section I and 3 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the requirements of Mobile IP? Define MN, FA, COA and HA for mobile IP system. **[8]**

b) Explain IP in IP encapsulation and Minimal encapsulation for mobile IP system. **[8]**

Q2) a) Compare the following **[8]**

i) Traditional TCP versus Mobile TCP.

ii) Traditional IP versus Mobile IP.

b) Explain advantages and disadvantages of following. **[8]**

i) Indirect TCP.

ii) Snooping TCP.

iii) M-TCP.

iv) Transaction Oriented TCP.

Q3) a) Explain the reactive routing, proactive routing and power-aware routing. **[8]**

b) Explain data dissemination, data gathering and sensor management in wireless sensor network (WSN). **[8]**

P.T.O.

Q4) Write short note on any Three : **[18]**

a) MAC Protocols in Mobile Ad Hoc networks.

b) Frame relay BECN and FECN.

c) Wireless adaptation layer (WAL).

d) Bluetooth Security.

SECTION - II

Q5) a) Explain the DSS approach and RSA approach in Digital signature standard. **[8]**

b) What are the different 8 types of attacks are identified while discussing the Authentication requirements. **[8]**

Q6) a) Explain six requirements for the HASH functions. **[6]**

b) Explain RSA algorithm in detail and compare with Diffie-Hellman algo. **[6]**

c) Explain the group attacks on Hash functions and MACs (Bruit force and Cryptanalysis). **[4]**

Q7) a) Explain the DES algorithm in detail. **[8]**

b) Explain HMAC and IPSec. Briefly **[8]**

Q8) Write short note on any Three : **[18]**

a) Kerberos and X.509 formats.

b) S/MIME.

c) WEB security.

d) AES algorithm.

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Total No. of Questions :8] **[Total No. of Pages :2**

P1675

[3865]-636
M.E. (Elex-Digital Systems)
EMBEDDED VIDEO PROCESSING
(2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the various issues in compression method selection. **[6]**

b) Draw the 2-D DCT architecture used to transform 1–D data & explain the different stages required to calculate a complete 2D–FDCT or IDCT. **[8]**

c) Explain briefly the features of HVS. **[4]**

Q2) a) Draw and explain the structure of the coded video bit stream in MPEG-1 **[8]**

b) What are the different types of data structures which may be employed for entropy based coding of pixels in JPEG? Using any one of them, write and explain algorithm for Huffman encoding or decoding. **[8]**

Q3) a) State and explain the practical issues to be considered with respect to hardware and software in case of arithmatic coding. **[8]**

b) Explain the motion estimation and compensation using a neat block diagram. **[8]**

Q4) a) Define Rate-distortion function. Using the same, compare the performance of motion compensation based and intra-frame based video coding techniques. **[8]**

b) Write notes on :– **[8]**

i) Different video coding standards.

ii) H.263 video format.

P.T.O.

SECTION - II

Q5) a) Draw and explain the block diagram of video CODEC with prediction. **[8]**

b) Explain how the in-loop filter used in the decoder improves the quality of reconstructed reference frame. **[8]**

Q6) a) Using a neat block diagram explain the operation of H.263 encoder/ decoder. **[8]**

b) State the features of :– **[8]**

i) Embedded processors.

ii) Media processors.

iii) Digital signal processors.

Q7) a) Explain the various issues in video codec interface. **[8]**

b) Compare – **[8]**

i) Single Vs Multiple sample based compression.

ii) MPEG Vs H.261.

Q8) a) State and explain the factors on which computational complexity depends. **[6]**

b) Using abstract model of MPEG-4 system, explain the concept of audio/ video objects and their spatio-temporal relationships to generate encoded bit streams. **[6]**

c) What are the specifications of software CODEC? **[6]**

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Total No. of Questions :10] **[Total No. of Pages :2**

P1678

[3865]-654
M.E. (Production)
PLASTICS PROCESSING
(2008 Course) (Elective -III)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable electronic calculators is allowed.***

SECTION - I

Q1) With respect to mechanical properties–strength,stiffness, fatigue and toughness, explain the characteristics of plastics, considering most engineering components. **[16]**

Q2) a) A solid polyethylene beam is 10mm thick and 15 mm wide. If it is to be replaced with a sandwich section with solid polyethylene in the two outer skins and polyethylene foam (density = 200Kg/m^3) in the centre, calculate the dimensions of the sandwich beam if it is to have optimum, stiffness at the same weight as the solid beam. If the foam material costs 20% more than the solid material, calculate the increase in cost of the sandwich beam. **[8]**

b) Explain with neat sketch basic elements of single screw extruder. **[8]**

Q3) a) Explain the procedure for compression Molding. **[8]**

b) A series of Charpy impact test on uPVC specimens with a range of crack depths gave the following results. **[8]**

Crack length (mm)	1	2	3	4	5
Fracture Energy(mJ)	100	62	46.5	37	31

If the sample section is 10 mm×10 mm and the support width is 40 mm, calculate the facture toughness of the uPVC. The modulus of the uPVC is 2 GN/m^2.

P.T.O.

Q4) a) Explain with neat sketch transfer moulding of thermosetting materials. **[8]**

b) Explain constructional features and layouts of runners and gates. **[8]**

Q5) Write short notes on (Any three) : **[18]**

a) Limitations of compression molding.

b) Polymerization techniques.

c) Blow Moulding.

d) Calendering.

SECTION - II

Q6) a) Explain the overall advantages of radii and fillets in the design of a molded articles. **[8]**

b) Explain the standards of tolerances for ABS material. **[8]**

Q7) a) Explain how will you avoid warpage with specific reference to molding conditions : **[8]**

i) Fill Speed.

ii) Mold temperature.

iii) Melt temperature.

iv) Pressure.

b) Explain with neat sketch cross section of typical steam chest mold. **[8]**

Q8) a) Explain different types of inserts : **[8]**

i) Leak-proof inserts.

ii) Non metallic Inserts.

b) Explain the process for Reaction Injection Molding. **[8]**

Q9) a) Explain various software available optimum gate location. **[8]**

b) Explain the design of component for balanced flow. **[8]**

Q10) Write short notes on (Any three) : **[18]**

a) Hot dipping process.

b) Injection Molding Pressess.

c) Compression Molds.

d) Vents.

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Total No. of Questions :8] **[Total No. of Pages :2**

P1679

[3865]-655
M.E. (Production)
PRODUCT LIFE CYCLE MANAGEMENT
(511111) (2008 Course) (Elective - III)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts,electronic pocket calculator and steam tables is allowd.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the dimensions of product quality. **[8]**

b) Explain the product life cycle with suitable illustration of any two-wheeler company. **[8]**

Q2) a) Explain the dimensions of product manufacturability. **[8]**

b) Explain basic principles of DFA. **[8]**

Q3) a) Explain various driving elements of PLM. **[8]**

b) Explain the importance of PDM system in the organisation. What are the barriers to PDM implementation. **[8]**

Q4) Write short note on : **[18]**

a) PLM strategies.

b) Technological advancement and product life cycle.

c) Techo-feasibility study in PLM.

P.T.O.

SECTION - II

Q5) a) Explain why product life cycle shortened now-a-days. State the reasons and suggest some strategies to improve it. **[8]**

b) Explain the role of modeling and simulation in product design. **[8]**

Q6) a) Explain the concept 'Bench marking' and 'Re-engineering' in product design. **[8]**

b) What are the different methods to carryout customer survey in the market before and after launching the product. **[8]**

Q7) a) Explain in detail the term 'DFX'. **[8]**

b) Explain 'market segmentation'. **[8]**

Q8) Write short note on : **[18]**

a) Technology forecasting.

b) Market entry decision.

c) Mass customization.

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Total No. of Questions :8] **[Total No. of Pages :2**

P1684

[3865]-707
M.E. (Chemical)
CATALYSIS AND SURFACE PHENOMENA
(509111) (2008 Course) (Elective -III)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is dual site mechanism? **[6]**

b) What are the different steps involved in a catalytic reaction? **[6]**

c) Explain synthetic zeolites. **[6]**

Q2) a) Explain the BET method for finding surface area of catalyst. **[8]**

b) Derive the Elovich equation. **[8]**

Q3) a) Discuss the different isotherms in detail. Derive the equation for Langmuir isotherm giving all the assumptions. **[10]**

b) Compare Langmuir-Hinshelwood and Eley-Riedel mechanisms **[6]**

Q4) Answer any two : **[16]**

a) Explain XRD technique.

b) Describe one method of catalyst preparation.

c) Describe any one type of hysteresis loop.

P.T.O.

SECTION - II

Q5) a) Describe the effect of internal transport on selectivity. **[10]**

b) Derive Thiele-modulus for a spherical particle. **[8]**

Q6) a) What are poisons and how do they deactivate the catalysts? Give examples **[8]**

b) Describe any one deactivation model. **[8]**

Q7) a) Describe the working of monolithic catalyst in automobile exhaust application. **[8]**

b) Discuss the process of oxygen generation by photo-induced oxidation of water. **[8]**

Q8) a) What is the random pore model? **[8]**

b) What are perovskites? Give examples. **[8]**

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Total No. of Questions :6] **[Total No. of Pages :2**

P1688

[3865]-743

M.E. (Petroleum Engineering)

ENVIRONMENT MANAGEMENT AND SAFETY MEASURES & ENVIRONMENT MANAGEMENT TECHNOLOGY AND SAFETY MEASURES

(2002 & 2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Solve any two questions each from section I and section II.***
2) ***Answers to the questions of both the sections should be written in separate answer books.***
3) ***Use graph paper wherever necessary.***
4) ***Assume additional data if required.***

SECTION - I

Q1) If you are In-charge of an exploratory project in a remote tribal area, what activities will you carry out as a part of Corporate Social Responsibility? Explain the points on the basis of which you will convince local people that oil exploration is a development project and it will be beneficial to them in the long run. **[25]**

Q2) Discuss the methods and procedures of **[25]**

a) Abandoning oil wells and,

b) Decommissioning offshore structures.

Q3) a) List and explain in brief various unit operations that are applied for chemical treatment of hazardous waste in general. **[15]**

b) Explain in brief mechanical methods to clean-up oil spills. **[10]**

P.T.O.

SECTION - II

Q4) Write notes on any two of the following : **[25]**

a) Precautions taken during handling radioactive material during operations in oil industry,

b) Safety in H_2S environment,

c) Formation conditions and manifestation of smog in an urban environment,

d) Survival techniques at sea.

Q5) Discuss the case of recent major "Oil Spill" from a BP well offshore USA, with reference to technical, political, social and economic perspectives. **[25]**

Q6) Write an essay in about 500 words on "Climate Change phenomenon and the responsibility of the petroleum industry". **[25]**

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Total No. of Questions :8] **[Total No. of Pages :2**

P1710

[3865]-7
M.E. (Civil) Construction And Management
CONSTRUCTION TECHNIQUES
(2002 Course)

Time : 4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain with sketches sequence of construction of a "Sheet Pile Cofferdam" for a Bridge pier foundation in a river having with the following data. **[18]**

a) Size of the Footing 2.00×5.00 × 1.5m. depth.

b) Founding level 3.00 m. below bed level.

c) Type of steel sheet piles used 'Larsan Z' type piles.

d) Standing water level of 3.00 meters.

For the above data workout the following,

i) Size of the cofferdam required,
ii) Size and length of the sheet piles.
iii) Number of steel sheet piles required to complete the cofferdam.

Q2) a) List the factors on which selection of method of tunneling depends for tunneling in rock.

b) Draw a neat sketch of full faced Tunnel Boring Machine (T.B.M.) for functioning in rock and list out and explain basic operations involved in one boring cycle. For ideal conditions what is the "Rate of Advance" you would expect per day for the TBM in hard rock? **[16]**

Q3) a) What do you understand by displacement piles and non-displacement piles? Give advantages and limitations of each.

b) What is Bentonite? Give properties and specifications for Bentonite used in bored piles and draw a sketch and explain the function of " Bentonite Installation Plant".

[16]

P.T.O.

Q4) Write shorts notes on any three of the following : **[16]**

a) Tremmie Concreting Method used in construction of diaphragm wall.

b) Well point system of dewatering.

c) Negative-drag on piles.

d) Slipform shuttering.

e) Use of pump concreting in high rise buildings.

SECTION - II

Q5) a) What is Grout-mix? How do they vary with different types of soils? **[8]**

b) Give details of 'Grout-Mixes' used for following problems. **[8]**

i) Seapage through core wall of an Earthen dam.

ii) Earth retaining-Masonry wall.

iii) Underpinning of machine foundations.

Q6) a) Draw a sketch and explain in details 'Well point system' you will use in carrying out dewatering in a deep excavation of 5.0 metres in sandy silt stratas for huge reactor foundations with (water table-at1.0m. below G.L.) **[9]**

b) List out the factors influencing selection of type of cotterdam. List out import types of cotterdam used and explain any one in details. **[9]**

Q7) a) Explain method of shifting and launching of three P.S.C. girders of span 20m. from carting yard to any particular span using launching girder.**[9]**

b) Explain placement and side shifting of girder in that particular space.**[7]**

Q8) Write short notes on any four of the following : **[16]**

a) Slip form shuttering in high rise buildings.

b) Tilting of Caissons and remedial measures.

c) Properties of Bentonite slurly.

d) Advantages of Alv-formwork.

e) Advantages and limitations open Caissons and Pneumatic Caissons.

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Total No. of Questions :6] **[Total No. of Pages :2**

P1712

[3865]-33
M.E. (Civil/ Structures)
PLATES AND SHELLS
(501506) (2002 Course)

Time : 4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non programmable electronic calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Distinguish between thin and thick plate bending. Write assumption in thin plate bending theory. **[5]**

b) State the 4^{th} order differential equation for the plate. Find the expressions for moment, shear using various boundary conditions. **[8]**

c) A rectangular plate of size a × b with four edges simply supported carries a central concentrated load 'P'. Derive the expression for the deflection of the plate. **[12]**

Q2) a) Derive Levy's solution for a rectangular plate with two opposite edges simply supported and the other two edges clamped; under uniform intensity of loading q. **[20]**

b) How energy methods are applied to the plate analysis? **[5]**

Q3) Derive the governing differential equation in polar coordinates for circular plates. A clamped circular plate of radius '*a*' carries uniform loading of intensity q. Find the maximum values of radial and tangential moments. **[25]**

P.T.O.

SECTION - II

Q4) A thin RCC hemispherical dome of radius 6m and thickness 120mm is supported on its lower edge by roller supports all along the periphery. Determine the membrane forces in the dome considering self weight only. Plot the variation of the internal forces along the meridian. Is there any bending effect to be considered near the lower edge? **[25]**

Q5) a) Using membrane theory. analyze a cylindrical open roof shell supported at the four corners for its dead weight only. **[20]**

b) State the merits and demerits of a shell structure against a plate structure. **[5]**

Q6) a) Explain the need for the bending theory for the analysis of the shell structure. Also state the limitations of the theory. **[5]**

b) Using Lundgren's beam theory, analyze a semicircular cylindrical shell of 3.5m radius, simply supported over a span of 8 m . It is subjected to uniformly distributed load, inclusive of the self weight of intensity 3 kN/m^2. Calculate the maximum compressive stress at the crown in the mid span section. **[20]**

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Total No. of Questions :8] **[Total No. of Pages :2**

P1719

[3865]-207
M.E. (Computer)
ADVANCED COMPUTER NETWORK
(Revised 2002 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer three questions from Section I and three questions from SectionII.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) A FHSS system employs a total bandwidth of Ws = 200 MHz. and an individual bandwidth of 100Hz. What is the minimum number of PN bits required for each frequency hop?

b) Explain in detail the ESAU William's Algorithm. **[16]**

Q2) Write short notes : **[18]**

a) Internal and external representation of networks.

b) Unified Algorithm.

c) Shannon's Channel Capacity.

Q3) a) With the help of a neat diagram and equilibrium state, explain the M/M/1 queue.

b) A multipoint line serves 200 stations. The probability that a given station has a message is 0.01. What is the probability that no station has a message? **[16]**

Q4) a) Discuss in detail COMA and its standard.

b) Discuss in detail SCSI protocol and architecture. **[16]**

P.T.O.

SECTION - II

Q5) a) What are the different issues of network design? Also discuss the different tools for network design.

b) Elucidate structure of a typical network design tool. **[16]**

Q6) Consider a system with calls arriving at rate A and holding line H. The departure rate D is the inverse of H. We define the quantity A/D (i.e. the quantity U) as the call intensity and its units in Erlangs. Let B(E,m) be the probability of blocking when E Erlangs of traffic is offered to m channels. We say that EB (E,m) Erlangs are lost and E(1 – B(E,m)) Erlangs are carried. Derive the expression for B(E,m). **[16]**

Q7) Write short notes on : **[18]**

a) Minimum Spanning Tree(MST).

b) Ford-Fulkerson Algorithm.

Q8) a) Discuss in detail the properties of Jackson type network of queues.

b) Explain VOIP system architecture. **[16]**

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Total No. of Questions :6] **[Total No. of Pages :1**

P1729

[3865]-538

M.E. (Electrical Engg.) (Control System)

PROCESS CONTROL MANAGEMENT

(503102) (2008 New Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Solve any two questions from each section.***
2) ***All questions carry equal marks.***
3) ***Assume suitable data, if necessary.***
4) ***Draw neat diagram wherever required.***

SECTION - I

Q1) Explain the following terms : **[25]**

a) Leadership style-models and theories.

b) Conflict management.

c) Stress management.

d) Group dynamics.

e) Destructive conflicts.

Q2) Explain the block diagram of process control system in details. Also explain mathematical modeling and dynamic behavior of typical system. **[25]**

Q3) What is tuning of controller for dynamic performance of system? Explain PID controller tuning using Zeigler-Nichols method in details. How tuning of controller affects the stability of system. **[25]**

SECTION - II

Q4) Draw block diagram of Digital control system. Explain each block in details. Explain the effect of sampling on stability of system with suitable example.**[25]**

Q5) Explain the control of heat exchanger system using cascade and feed forward control technique with neat diagram and compare these two techniques. **[25]**

Q6) Explain Interaction and decoupling in multivariable process control systems with suitable example. Also explain Relative gain array in details. **[25]**

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Total No. of Questions : 6] **[Total No. of Pages : 3**

P1612 [3865]-234

M.E. (Instrumentation) (Process & Bio)

CONTROL SYSTEMS

(2003)

Time : 3 Hours*]** **[*Max. Marks : 100

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Obtain State space and transfer function representation for the system shown in fig.1. **[16]**

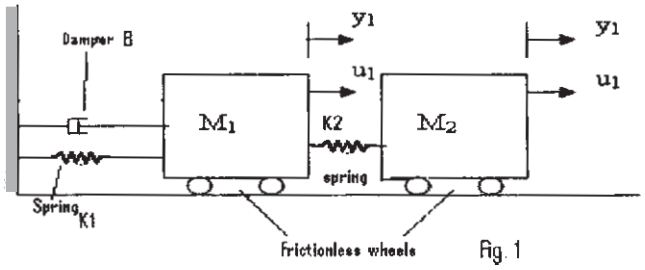

Fig. 1

b) Check the stability of the system and find eigenvectors if

$$A = \begin{bmatrix} 0 & 1 & 2 \\ 0 & -2 & -3 \\ -2 & -3 & -6 \end{bmatrix}$$

[9]

P.T.O.

Q2) a) Investigate the stability of the system shown in fig. 2 for sampling period T = 0.4 second. T = 3 second, and without sample. Comment on effect of sampling period on stability **[15]**

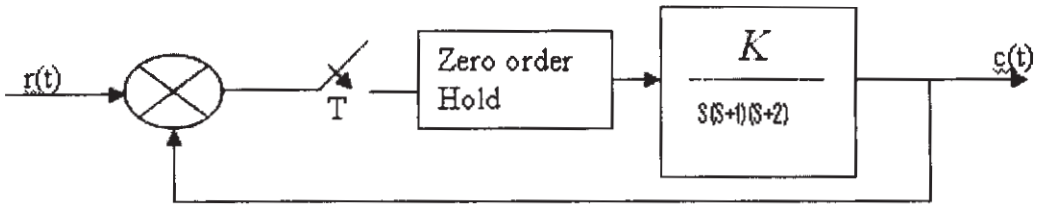

Fig. 2

b) Check the Controllability and observability of the continuous system if **[10]**

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\\ \dot{x}_3\end{bmatrix}=\begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ -24 & -26 & -9\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}+\begin{bmatrix}0\\ 0\\ 1\end{bmatrix}u$$

$$y=3x_3+8x_2+2x_1$$

Q3) a) Obtain the state transition matrix for the system

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}0 & 1\\ -6 & -5\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}0\\ 1\end{bmatrix}u$$

$$y=8x_1+2x_2 \text{ with } \begin{bmatrix}x_1\\ x_2\end{bmatrix}=\begin{bmatrix}0\\ 1\end{bmatrix}u=\text{unit step}$$

Using

i) Cayley-Hamilton theorem.

ii) Similarity transformation.

iii) Laplace transform.

Also compute the state response i.e. $x(t)$, $t > 0$ **[20]**

b) Explain in detail zero order hold and first order hold in digital control systems. **[5]**

SECTION - II

Q4) Design a digital control scheme for the system shown in fig. 3 to meet the following specifications

a) The velocity error constant should be equal or greater than 10.

b) Peak overshoot to step input should be equal or less than 25 percent.

c) Settling time should be less or equal to 2.5 seconds.

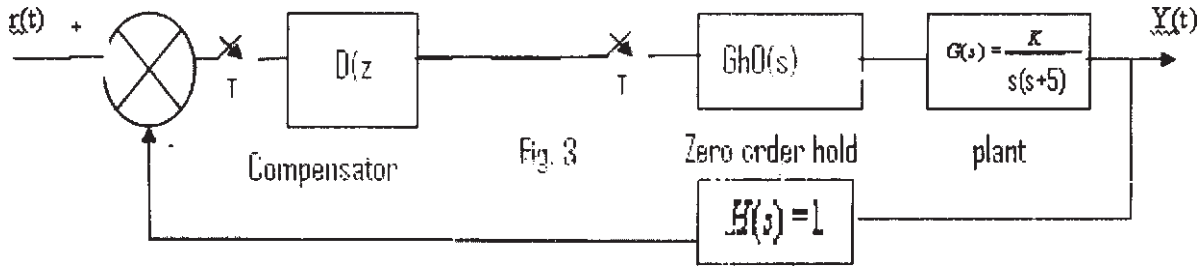

Fig. 3

[25]

Q5) a) Explain the concept of parametric and non-parametric system identification with suitable example. Explain the important steps of parametric and non-parametric methods to obtain the empirical model with neat diagram. **[15]**

b) Design a PI controller for the system

$$G(s) = \frac{1}{s+1}$$

using the controller synthesis. Select suitable tuning parameter (filter) α **[10]**

Q6) a) Explain the design steps of digital controllers for deadbeat performance with suitable second order system. **[15]**

b) Write short note on (Any Two) : **[10]**

i) Jury stability criteria.

ii) Advantages and disadvantages of digital control system over analog control system.

iii) Direct synthesis method of controller design.

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Total No. of Questions : 10] **[Total No. of Pages : 3**

P1617 **[3865]-264**

M.E. CSE (IT)

ADVANCED DATABASE SYSTEM

(2002 Course)

Time : 3 Hours*]** **[*Max. Marks : 100

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare Centralized systems and Client-Server Systems. **[8]**

b) Describe speed-up and Scale-up with reference to Parallel architectures. **[8]**

Q2) a) Compare Horizontal fragmentation with Vertical Fragmentation. How does mixed fragmentation strike a right balance? Give suitable examples. **[8]**

b) Describe the locking protocols in Distributed Databases. **[8]**

Q3) a) Compare Round-robin, Hash partitioning and Range partitioning techniques with reference to I/O Parallelism. **[8]**

b) Write a note on 'Handling of skew'. **[8]**

Q4) a) With suitable examples explain 'Querying with Complex Types'. **[6]**

b) Explain Reference types in object oriented databases with a suitable example. **[4]**

c) Compare Object Oriented and Relational Databases. **[6]**

P.T.O.

Q5) Write short notes on: **[18]**

a) Application servers.

b) XSLT.

c) Storage of XML data.

SECTION - II

Q6) Consider the following six relations for an order-processing database application in a company:

CUSTOMER (Cust#, Cname, City)

ORDER (Order#,Odate, Cust#, Ord_Amt)

ORDER_ITEM (Order#, Item#, Qty)

ITEM (Item#,Unit_Price)

SHIPMENT (Order#, Warehouse#, Ship_date)

WAREHOUSE (Warehouse#, City)

Assume that the order can be shipped from several warehouses. Specify the foreign keys for this schema, stating any assumptions you make.

Write the following queries in Relational algebra.

1. List the orders that were not shipped within 30 days of ordering.
2. List the Order# for orders that were shipped from all warehouses that the company has in New York.
3. Produce a listing Custname, #oforders, Avg_order_amount, where the middle column is the total number of orders by the customer and the last column is the average order amount for that customer.
4. List the Warehouse information from which the Customer named 'Jose Lopez' was supplied his orders. Produce a listing Order#, Warehouse#.

[18]

Q7) a) For each of the queries written above, draw a query tree that represents the query. Show how the tree can be optimized using a query-tree optimization algorithm. Compare the original query tree with the optimized query tree. **[10]**

b) A file of 4096 blocks is to be sorted with an available buffer space of 64 blocks. How many passes will be needed in the merge phase of the sort-merge algorithm? Make any additional assumptions if needed and state them. **[6]**

Q8) Write short notes on: **[16]**

a) Importance of Lossless Join and Dependency Preservation in Normalization.

b) OLAP v/s DSS.

Q9) a) Describe the various TP monitor architectures with suitable diagrams. **[8]**

b) Describe main memory databases with examples of their applications. **[8]**

Q10) Write short notes on: **[16]**

a) Time in Databases.

b) Spatial and Geographic databases.

c) Multimedia databases.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1370 **[3865]-437**

M.E. (Civil-Hyd.)

COMPUTATIONAL METHODS IN HYDRAULIC ENGINEERING

(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answer any three questions from Section-I and three questions from Section- II.***
3) ***Answers to the two sections should be written in separate answer books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Your answer will be valued as a whole.***
7) ***Use of electronic pocket calculator is allowed.***
8) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What do you mean by grid analysis in case of Finite Difference Method? In any grid if one or more than one arm is having partial length due to end conditions then weighted formula is used and correction factors are used? Discuss in detail about the correction factor λ. **[9]**

b) Write about the importance of Finite Difference Methods in the Computational Methods in Hydraulic Engineering. What is the basis of FDM? Discuss about the basics of Finite Difference Method from the view point of Taylor's series. How you can get the first derivative from the view point of Taylor's series. Can you change the equal interval of Taylor's series to unequal interval? Justify your statement with valid logic. **[9]**

Q2) a) Describe Binomial Distribution along with all the required formulae. **[8]**

b) What are the various applications of Finite Difference Method? Write in detail about the methods of obtaining the first order and second order derivative from the Taylor's series. Discuss about Diagonal five point method by the help of which we can solve the grid analysis in case of relaxation method. **[8]**

P.T.O.

Q3) a) Discuss in detail about the flow past an asymmetric aerofoil along with neat diagrams. Discuss about Polar Diagram along with neat sketches. **[8]**

b) Derive Kutta-Jukowski Equation for the flow past a cylinder and prove that $\Gamma = \rho VL$. What do you mean by stagnation point? **[8]**

Q4) a) What do you mean by 'Markov Chain'? What is the importance and significance of Markov Chain in Computational Methods in Hydraulic Engineering? **[8]**

b) What do you mean by Conformal Mapping? What are the applications of conformal mapping in classical Hydrodynamics? **[8]**

SECTION - II

Q5) a) What do you mean by Relaxation Method? Do you think it is the most convenient method for drawing the flow net for any Hydraulic Structure? Show the application of Relaxation Method in a case when flow is taking place around a cylindrical object. **[9]**

b) Write in detail about Schwartz-Christoffel Transformation along with all the mathematical expressions. How the '*t*' plane and '*z*' planes are explained in this transformation? **[9]**

Q6) a) Discuss about the flow pattern around the trailing edge of an Aerofoil along with necessary sketches. **[8]**

b) What are the various applications of Finite Difference Method? Write in detail about them. **[8]**

Q7) a) Discuss about Gamma Distribution and Poisson's Equation. **[8]**

b) What is the role of Simpson's rule in Numerical Integration? Write all the mathematical expressions for the Simpson's rule. What do you mean by multiple regression? **[8]**

Q8) In case of flow around a Horizontal cylinder there are various kinds of flow patterns. Discuss about any two kinds of flow patterns and discuss about the 'Stagnation Point' and significance of 'Stagnation Point'. If the cylinder is kept at an inclination of fifty-five degree with the direction of flow, will the flow pattern change? If yes, draw the new flow pattern. What do you mean by 'Vortex Shedding'? What is 'Karman Vortex Trail'? Is it applicable in this case? Does the staggered vortex shedding is an algebraic function of the degree of inclination with the flow field? **[16]**

Total No. of Questions : 10] **[Total No. of Pages : 4**

P1495 **[3865]-817**

M.E. (Polymer)

MATHEMATICAL AND STATISTICAL METHODS

(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Solve the following tri-diagonal system, using LU-decomposition method.

$2x_1 - x_2 = 3$

$-x_1 + 2x_2 - x_3 = -3$

$-x_2 + 2x_3 = 1$ **[9]**

b) Solve the following system of equations, by Gauss-Seidel method, obtain solution, at the end of the 5^{th} iteration.

$7x_1 + 2x_2 - 5x_3 = -18$

$x_1 + 5x_2 - 3x_3 = -40$

$2x_1 - x_2 - 9x_3 = -26$ **[8]**

Q2) a) Find z - transform of the following (any two) : **[8]**

i) $f(k) = \left(\frac{1}{2}\right)^{|k|}$ for all k.

ii) $f(k) = e^{-3k} \cos 4k$, $k \geq 0$

iii) $f(k) = (k + 1)2^k$, $k \geq 0$

b) Find the largest eigen value and corresponding eigen vector of the following matrix, using Power method, choosing the initial vector as $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$.

$$A = \begin{bmatrix} 4 & 1 & 0 \\ 1 & 2 & 1 \\ 0 & 1 & 1 \end{bmatrix}$$

[9]

P.T.O.

Q3) a) Find inverse z - transform of the following (any two) : **[8]**

i) $\dfrac{1}{(z-3)(z-2)}$, $2<|z|<3$ ii) $\dfrac{z}{\left(z-\frac{1}{4}\right)\left(z-\frac{1}{5}\right)}$, $|z|>\dfrac{1}{4}$

iii) $\dfrac{z^2}{z^2+1}$, $|z|>1$

b) Apply Gauss Jordan method to solve the system of equations : **[8]**

$x_1 + x_2 + x_3 = 9$

$2x_1 - 3x_2 + 4x_3 = 13$

$3x_1 + 4x_2 + 5x_3 = 40$

Q4) a) Use Newton-Raphson method to solve the equations : **[8]**

$x^2 + xy + y^2 = 7$

$x^3 + y^3 = 9$

with the initial values

$x_0 = 1.5, y_0 = 0.5.$

Perform three iterations.

b) Solve the following by Cholesky's method **[8]**

$2x_1 + x_3 = 1$

$3x_2 - 2x_3 = 8$

$x_1 - 2x_2 = -3$

Q5) a) Using Householder's transformation, reduce the matrix $A=\begin{bmatrix}1 & 3 & 4\\ 3 & 1 & 2\\ 4 & 2 & 1\end{bmatrix}$

into tridiagonal matrix. **[8]**

b) Solve the following difference equation : **[8]**

$12f(k+2) - 7f(k+1) + f(k) = 0, k \geq 0$ Given that $f(0) = 0, f(1) = 3.$

SECTION - II

Q6) a) Use Runge-Kutta method to solve the following system at $t = 1.5$. **[8]**

$$\begin{bmatrix}y_1'\\ y_2'\end{bmatrix}=\begin{bmatrix}0 & 1\\ -5 & -2\end{bmatrix}\begin{bmatrix}y_1\\ y_2\end{bmatrix}$$

Given that at $t = 0$, $\begin{bmatrix}y_1\\ y_2\end{bmatrix}=\begin{bmatrix}2\\ -4\end{bmatrix}$ taking step size equal to 1.5.

b) Using Adams-Bashforth method, obtain the solution of

$$\frac{dy}{dx} = 1 + y^2$$

at $x = 0.8$, given $y(0) = 0$, $y(0.2) = 0.2027$, $y(0.4) = 0.4228$, $y(0.6) = 0.6841$. **[8]**

Q7) a) Use modified Euler's method to find the value of y when $x = 0.1$, given that

$$\frac{dy}{dx} = x^2 + y,\ y(0) = 1,$$

Also given that the step size $h = 0.05$. **[7]**

b) Solve $\frac{\partial^2 u}{\partial t^2} = 4\frac{\partial^2 u}{\partial x^2}$

subject to the conditions

$u(0, t) = 0$

$u(4, t) = 0$

$u(x, 0) = x(4 - x)$

$\frac{\partial u}{\partial t} = 0$ at $t = 0$

Taking $h = \Delta x = 1$ and $k = \Delta t = 0.5$, find the values of u upto $t = 1.5$. **[9]**

Q8) a) Find the extremals of the functional $\int_{x_0}^{x_1} \left(y'^2 / x^3 \right) dx$. **[8]**

b) Solve the boundary value problem $y'' - y + x = 0$, $(0 \le x \le 1)$, $y(0) = y(1) = 0$, by Reyleigh-Ritz method. **[8]**

Q9) a) Prove, using Euler's equation, that the shortest distance between two points in a plane is a straight line. **[8]**

b) A random sample of five motor-car tyres is taken from each of 3 brands manufactured by three companies. The lifetime of these tyres, is shown below. On the basis of the data, test whether average lifetime of the 3 brands of tyres are equal or not.

	Life time of tyres ('000 miles)		
Brand	A	B	C
	35	32	34
	34	32	33
	34	31	32
	33	28	32
	34	29	33

(Given $F_{.05} = 3.89$ for d.f (2, 12)) **[8]**

Q10)a) A manufacturer claims that only 4% of his products supplied by him are defective. A random sample of 600 products contained 36 defectives. Test the claim of the manufacturer. Given $|z|=1.96$ at 5% level of significance. **[5]**

b) A random sample of 16 values form a normal population showed a mean of 41.5 cm and the sum of squares of deviations from the mean equal to 135 sq.cm. Test the hypothesis that the mean of the population is 43.5 cm, at 5% level of significance. **[6]**

Given : $|t|=2.13$, for degrees of freedom = 15.

c) Test the hypothesis that the colour of the Son's eyes is not associated with that of the father's, from the following data : [Table value of χ^2 at 5% level of significance is 3.84] **[7]**

Eye colour of sons / Eye colour of falbers	Light	Not Light	Total
Light	471	151	622
Not Light	148	230	278
Total	619	381	1000

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1372

[3865] - 439
M.E. (Civil) (Hydraulic Engineering)
FLUID MECHANICS
(2008 Course) (501303)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive the continuity equation in polar co-ordinates for steady compressible fluid flow. **[8]**

b) The stream function in a two-dimensional flow is $4 = 6x - 4y + 7xy$ verify whether the flow is irrotational. Determine the direction of streamline at a point (1, –1) Also determine velocity potential. **[8]**

Q2) a) Derive Navier-stokes equation of motion for viscous fluids. **[10]**

b) What are the limiting cases of Navier-Stokes equation? Also explain 'no slip' condition. **[6]**

Q3) a) A smooth flat plate with a sharp leading edge is placed at zero incidence in free stream of water flowing at 3 m/s. Determine the distance from leading edge where the transition from laminar to turbulent flow may start. Also calculate boundary layer thickness at this transition point.**[8]** Take viscosity of water = 1 centipoise.

b) For the given velocity distribution, **[8]**

$$\frac{u}{V} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2$$

Find the value of δ/δ^*

P.T.O.

Q4) Write short notes on <u>any three</u> : **[18]**

a) Laminar & turbulent boundary layer.

b) Separation of boundary layer.

c) Karman's momentum integral equation.

d) Graphical method of flow net.

SECTION - II

Q5) a) Explain what do you mean by : **[6]**

i) Transonic flow.

ii) Shockwave.

iii) Mach angle.

b) Up to which limit of mach number can we neglect the compressibility effects and treat the fluid as incompressible? and how, prove it. **[10]**

Q6) a) A supersonic aircraft flies at an attitude of 1800 m where the air temperature is 4°C. Determine the velocity of aircraft if its sound is heard 5 seconds after its passage over the head of the observer. **[8]**

b) Derive the energy equation for compressible fluids. **[10]**

Q7) a) Write a note on Prandtl's mixing length theory. **[8]**

b) What do you understand by i) intensity of turbulence ii) Scale of turbulence. **[8]**

Q8) a) Derive Karman-Prandtl velocity equation and discuss the role of laminar sublayer on velocity distribution. **[10]**

b) What are the characteristics of turbulent flow? How does that head loss vary with mean velocity? **[6]**

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1373

[3865]-446
M.E. (Civil-Hyd.)
OPEN CHANNEL HYDRAULICS
(2008 Course) (501308)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer any 3 questions from Section - I and 3 questons from Section - II.***
3) ***Answers to the two sections should be written in separate answer booklet.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Your answer will be valued as a whole.***
7) ***Use of electronic pocket calculator is allowed.***
8) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) "For Open Channel Flow free surface itself is the Hydraulic Grade Line." Explain this statement in detail. What is the difference between Specific Energy and Specific Force? The unit of specific force is m^3. Explain this Specific Energy equation is a cubic equation. How to solve it and how many valid roots you can derive after solving it. **[9]**

b) Differentiate between actual loss and theoretical loss in a Hydraulic Jump in an open channel. Derive the relation between the pre-jump and post-jump depth in terms of Froude Number. **[9]**

Q2) a) What do you mean by channel transition? Discuss about formation of Hydraulic Jump in expanding channel. What are the various uses of Hydraulic Jump? **[8]**

b) Derive the Dynamic Equation of Gradually Varied Flow. Discuss in detail about M1 and S3 flow profile. **[8]**

P.T.O.

Q3) a) Discuss in detail about the 'Standard Step Method' of 'Gradually Varied Flow'. In manual calculation you are supposed to take three to four steps. If the calculation is done by computer then one can even take one hundred steps. Comment on the convergence of the error, if the calculation is done with the help of computer programming. **[8]**

b) What do you mean by 'Spatially Varied Flow'? Discuss it in detail and give the general solution of the Differential Equation which is applicable to Spatially Varied Flow'. **[8]**

Q4) Write Short Notes (Any Four) : **[16]**

a) Back Water Curve.

b) S-1 Profile.

c) Velocity Correction Factor.

d) Strong Hydraulic Jump.

e) Use of FDM in Open Channel Flow.

SECTION - II

Q5) a) What do you mean by 'Flood Routing'? Discuss about Momentum Equation in detail and derive its differential form. **[9]**

b) Discuss about Chow's Method in detail. What is the specialty of this method? **[9]**

Q6) a) What do you mean by Surge? Explain it with neat diagrams. What is the difference between positive and negative surge? Give one example for each. **[8]**

b) A 12 metre wide rectangular channel supplies 48 m^3/s water at a normal depth of 2.6 metre to a turbine installation site. Due to a major reduction in load, the supply to the turbine is cut down to 6 m^3/s only. Determine the velocity of propagation of the surge wave and also the height of the surge. **[8]**

Q7) a) What do you mean by Exchange coefficient in Stratified Flow. Discuss in detail about that. **[8]**

b) A rectangular channel carries a discharge of $12m^3/s$ per metre width over a bed slope of 0.0004. If the depth of flow at a section is 6m, how far upstream or downstream the flow depth will be within 10% of the normal depth. Take Manning's 'n' as 0.015, use direct step method and take three steps. Sketch the profile and classify it. **[8]**

Q8) Write short notes (any four) : **[16]**

a) Muskinghum method.

b) Standing and Progressive Waves.

c) Celerity.

d) Difference between mild and oscillating jump.

e) Dam Break Problem.

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Total No. of Questions : 8] **[Total No. of Pages : 4**

P1374

[3865] - 453
M.E. (Civil/Structures)
STRUCTURAL MATHEMATICS
(501401) (Revised Course 2008) (Sem. - I)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non programmable electronic calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Analyze the beam shown in Fig 1.a, using stiffness member approach or flexibility method. **[12]**

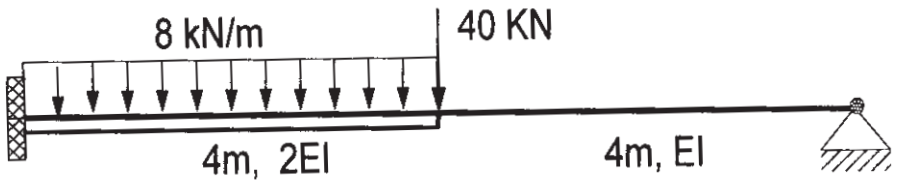

Fig.1.a

b) i) Show with a suitable example that stiffness and flexibility are reciprocal of each other.

ii) Explain with a suitable example half bandwidth of stiffness matrix. **[5]**

Q2) a) A steel truss is as shown in the Fig. 2.a. The modulus of elasticity is 210 GPa. The cross sectional area of member AB is 200 mm^2, BC is 300 mm^2, and CA is 350 mm^2. Calculate the internal forces in the members of the truss. Use stiffness method. **[12]**

P.T.O.

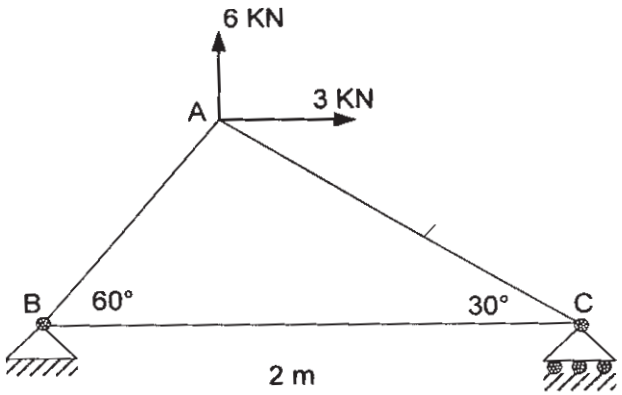

Fig. 2.a

b) Derive the transformation matrix for a plane frame member. **[5]**

Q3) a) Find the nodal displacements for the given portal frame in Fig. 3.a using stiffness matrix method. **[8]**

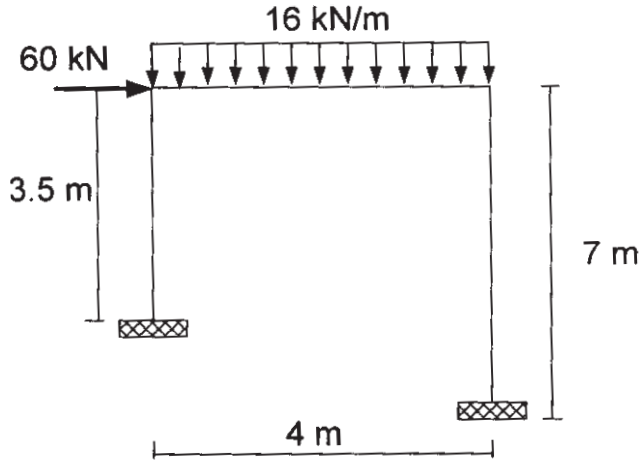

Fig. 3.a

b) Derive the expression for the critical load P for a simply supported beam column shown in Fig. 3.b with a concentrated load at the centre. **[8]**

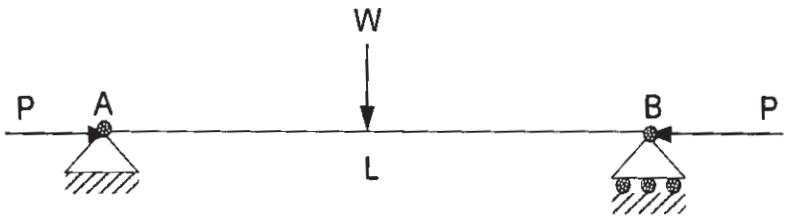

Fig. 3.b

Q4) a) Using Runge-Kutta method of order 4, find y for $x = 0.1, 0.2$ given $dy/dx = xy + y^2$, $y(0) = 1$. **[8]**

b) Solve the following equation for y (0.2) **[8]**

$10\ d^2y/dx^2 + (dy/dx)^2 + 6x = 0$

Given $y(0) = 1$, $y'(0) = 0$.

SECTION - II

Q5) a) A square plate of size 4 m × 4 m is simply supported on all the four edges and supports a uniformly distributed load over the whole surface of intensity 4000N/m^2. It has uniform flexural rigidity D. Use finite difference technique to obtain deflection at the centre of the plate. Use an interval of 1m. **[9]**

b) A bar fixed at one end and free at the other end has a rectangular cross-section of uniform thickness of 30 mm. It has width of 50 mm at the free end and 100 mm at the fixed end. It has a length of 2m. Modulus of elasticity for the material of the bar is 2×10^5 N/mm^2. Calculate the axial buckling load for the bar using finite difference technique. Use 0.5 m interval. **[8]**

Q6) a) Table below, shows the values of y at selected values of x. **[10]**

x	3	4	5	6	7
y	4	6	10	16	24

Develop a polynomial equation for y in terms of x using least square method.

b) If $q = 4 + 3x$, obtain an expression for q in Fourier series form, and check the values of q at points $x = 2$, $x = 4$ and $x = 6$ using first two terms of the Fourier series and compare with actual values. **[7]**

Q7) a) Values of independent variable x and corresponding values of y at points A, B, C, D are given below. **[10]**

x	2.5	4.5	6.0	7.0
y	55	63	48	28

Develop spline fit equations for ABC and BCD.

b) From the same set of values at points A B C D as given in part a) of this question, interpolate the value of y at $x = 5$. **[6]**

Q8) a) From the following set of values of v at prescribed values of u **[8]**

u	7	8	9	10	11
v	20	30	24	14	02

Obtain area under the curve from $u = 7$ to $u = 11$ using

i) Trapezoidal rule and

ii) Simpson's Rule.

b) Write short notes on : **[8]**

i) Fast Fourier Transform.

ii) Gauss Quadrature.

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Total No. of Questions : 6] **[Total No. of Pages : 3**

P1376

[3865] - 455

M.E. (Civil) Structures

STRUCTURAL DYNAMICS

(2008 Course)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections must be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is degree of freedom of vibrating system? Describe types of vibrating system based on DOF. **[5]**

b) Obtain equation of motion for under-damped free vibrations of SDOF system. **[10]**

c) A system vibrating with natural frequency 6Hz starts with an initial amplitude of 20 mm and initial velocity of 200 mm/s. Determine i) Natural period ii) Amplitude iii) Max. velocity and max. acceleration iv) Phase angle v) Equation of Motion. **[10]**

Q2) a) Obtain general solution for equation of motion of undamped forced SDOF system subjected to harmonic loading F = Fo sin (wt). Also show that forced vibrations depend on frequency ratio. **[7]**

P.T.O.

b) An SDOF system consists of a mass 20kg, a spring of stiffness 2200 N/m and a dash pot with a damping coefficient 60N-s/m is subjected to a harmonic force F = 200 sin (5t). Determine i) critical damping ii) frequency ratio iii) damped frequency iv) static deflection v) steady state response. **[8]**

c) What is impulsive loading? Obtain expression for total displacement produced by an exciting force F(t) acting on undamped oscillator using Duhamel's Integral. **[10]**

Q3) Write notes on : **[25]**

a) Non-Linear analysis by step-by-step method.

b) Response of undamped system to rectangular pulse.

c) Logarithmic Decrement.

d) Transmissibility and Vibration Analysis.

e) Mathematical Modeling of vibrating system.

SECTION - II

Q4) a) Describe the concept of 'Shear Building'. What are the assumptions made in idealizing the shear building? **[5]**

b) Describe 'Orthogonality and Normality Principles' of mode shapes of MDOF. **[5]**

c) Determine the natural frequency and mode shapes of a two storey structure shown in Figure 4.1. Assume $I = 5 \times 10^5$ mm^4 and $E = 2 \times 10^4$ N/mm^2. **[15]**

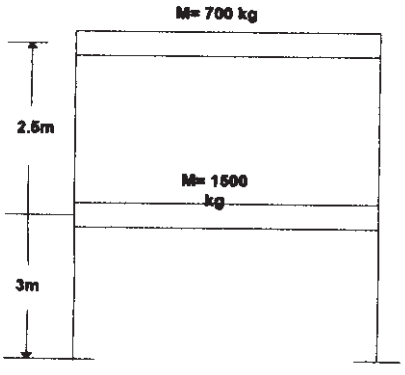

Figure 4.1

Q5) a) Derive equation for free vibrations of uniform shear beam. **[7]**

b) Discuss applications of Finite Element Method in vibration problems. **[8]**

c) Using Rayleighs Method, obtain the natural frequency for uniform cantilever of mass 'm' and span 'L' supporting mass 'M' at free end. **[10]**

Q6) Write notes on : **[25]**

a) Wilson Theta Method.

b) Power and Stodola Method.

c) Tuned Mass Damper.

d) Mode Superposition Method.

e) Forced vibrations of shear building.

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Total No. of Questions : 12] **[Total No. of Pages : 5**

P1384

[3865] - 477
M.E. (Mechanical)
(Design, Heat Power, Mechatronics and Automotive Engg.)
TECHNOLOGY AND FINANCIAL MANAGEMENT
(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any one question from each unit.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn, wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Unit - I

Q1) a) Distinguish between : **[10]**

i) Primary and Secondary capital markets

ii) Shares and Debentures

b) A company has prepared the following sales budget for the first five months of 2009 **[8]**

	Sales Budget (Units)
January	10,800
February	15,600
March	12,200
April	10,400
May	9,800

Inventory of finished goods at the end of every month is to be equal to 25% of sales estimate for the next month. On 1st January, 2009 there were 2,700 units of product on hand. There is no work-in-progress at the end of any month. Every unit of product requires to types of materials in the following quantities :

P.T.O.

Material A - 4 kg and Material B - 5 kg

Materials equal to one half of the requirement of next month's production are to be in hand at the end of every month. This requirement was met on 1st January 2009. Prepare the following budgets for the quarter ending 31st March 2009

i) Production budget (Quantitative)

ii) Material purchase budget (Quantitative)

OR

Q2) a) Explain the following in brief: **[8]**

i) Sources of long term finance

ii) Financing and Dividend decisions of finance

b) A department of company X attains sale of Rs. 6, 00,000 at 80% of the normal capacity and its expenses are given below: Draw up a flexible budget based on this data for operating at 90%, 100% and 110% of normal capacity. **[10]**

	Rs.
Office salaries	90,000
General expenses	2% of the sales
Depreciation	7,500
Rates and taxes	8,750
Salaries	8% of the sales
Traveling expenses	2% of the sales
Sales office	1% of the sales
General expenses	1% of the sales
Wages	15,000
Rent	1% of the sales
Other expenses	4% of the sales

Unit - II

Q3) a) Distinguish between : **[8]**

i) Cost control and Cost reduction

ii) Direct and indirect labor cost

b) A company has a production capacity of 12,500 units and normal capacity utilization is 80%. Opening inventory of finished goods on 1-1-1999 was 1000 units. During the year ending 31-12-1999, it produced 11,000 units while it sold only 10,000 units.

Standard variable cost per unit is Rs. 6.50 and standard fixed factory cost per unit is Rs.1.50. Total fixed selling and administration overhead amounted to Rs.10,000. The company sells its product at Rs.10 per unit. Prepare the income statement under Marginal Costing. **[8]**

OR

Q4) a) What are the distinctive characteristics of process costing? Explain. **[8]**

b) The following data are available pertaining to a product after passing through two processes A and B. Output transferred to process C from process B, 9120 units for Rs. 49,263. The expenses incurred in process C are as follows : **[8]**

Sundry materials	: Rs. 1,480
Direct Labor	: Rs.6,500
Direct expenses	: Rs. 1,605

The wastage of process C is sold at Rs. 1.00 per unit. The overhead charges were 168% of direct labor. The final product was sold at Rs. 10.00 per unit fetching a profit of 20% on sales. Find the percentage of wastage in process C and prepare process C account.

Unit - III

Q5) a) Explain the theory of consumer's demand with the help of indifference curve analysis. Also explain. **[10]**

i) Income effect and

ii) Substitution effect.

b) How does international trade affects domestic trade? Explain. **[6]**

OR

Q6) a) Explain the effect of inflation on business and economy. **[6]**

b) Explain the following in brief : **[10]**

i) Types of unemployment.

ii) Monopoly and Oligopoly.

SECTION - II

Unit - IV

Q7) a) "Standards make an enormous and positive contribution to most aspects in our lives" Elaborate the above statement with examples. **[6]**

b) Explain in brief the essential clauses of ISO - 9000 and ISO - 14000 family? **[10]**

OR

Q8) a) Draw a flow chart for a typical JIT process and elaborate its advantages as well as disadvantages? **[8]**

b) Explain Juran's ten steps to quality improvement in manufacturing industry? **[8]**

Unit - V

Q9) a) Explain the stages involved in project life cycle with a neat line diagram? **[6]**

b) A project consists of 8 activities having precedence relation and activity times as given below. Draw the network diagram, compute the critical path and show the EST,EFT,LST, LFT, Slack for each activity in a tabular form. **[12]**

Activity	Immediate predecessor	Activity time (weeks)
P	-	12
Q	-	20
R	-	28
S	R	12
T	P,Q	28
U	T,S	12
V	S	8
W	U,V	8

OR

Q10)a) Explain the optimization of project cost with time in project network problems. **[6]**

b) Consider the details of a project as shown in table below. The normal time in days, normal cost, crash time in days and crash cost for each of the activities in the project are given. The indirect cost of the project is Rs. 100 per day. Find the crashed duration of the project with optimal total cost. **[12]**

Activity	Immediate predecessor	Normal time (days)	Normal cost (Rs.)	Crash time (days)	Crash cost (Rs.)
A	-	6	600	4	750
B	A	5	400	4	450
C	A	6	1200	3	1650
D	A	7	1000	4	1360
E	B	10	500	8	550
F	C,E	5	800	4	910
G	D	4	1500	3	1660

Unit - VI

Q11)Write short notes on : **[16]**

a) Management by objectives.

b) Training and development of man power.

c) Role of R&D centre in a automobile Industry.

d) Recruitment and selection of man power for a MNC.

OR

Q12)Write short notes on : **[16]**

a) Organizational behavior models.

b) Technology transfer and innovation.

c) Factors affecting man power planning.

d) Essential welfare and motivational activities in an industry.

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Total No. of Questions : 10] **[Total No. of Pages : 3**

P1391

[3865] - 535

M.E. (Mechanical) (Automotive Engineering)

AUTOMOTIVE SAFETY AND REGULATIONS

(2008 Course) (502303(C))

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from section I and three questions from section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic non programmable calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What do you understand by Vehicle Safety? What are objectives of it? List out various provisions of safety aspects incorporated in a modern car. **[8]**

b) Explain the term "Active Safety system" and "Passive safety system". Give suitable example of each. **[8]**

Q2) a) Define and explain with neat sketch how a vehicle structure is designed for crashworthiness. **[6]**

b) Describe various steps involved in crash testing of vehicles. What parameters are studied in crash test? Discuss in detail. **[6]**

c) What instrumentation is needed to study various parameters in a crash test? Give details. **[4]**

Q3) a) Draw sketch of a typical seat and driver while seated in automobile fully belted. Indicate the directions of forces on various body part and seat belt anchorage system. **[6]**

P.T.O.

b) Draw approximate dimensions to the arrangement in the figure mentioned in Q3 (a) above. Calculate forces on anchorage when sudden brake is applied to vehicle running at high speed. Consider mass of driver 70 kg. Assume declaration at sudden braking to be equal to 20 g. **[6]**

c) What are types of automobile seats? Explain with neat sketch construction of front seat. **[4]**

Q4) a) What is pedestrian safety? Justify need of it. Explain pedestrian accidents observed by hitting various vehicles causing fatal and non fatal injuries. **[6]**

b) Explain "Injury measurement and criteria" for human body undergone with impact during accident. What is injury rating? Explain. **[6]**

c) Discuss importance of ergonomics in Automotive safety. **[4]**

Q5) Write short note on the following (any three) : **[18]**

a) Anthropometry data for automobile occupancy.

b) Crash testing.

c) Seat belt and its anchorage.

d) Head Restraint.

e) Crash dummies.

SECTION - II

Q6) a) What is the role of proper lighting and reflecting devices in automobile safety? Name different types of lighting and signaling devices used in modern automobile. **[8]**

b) What testing procedure is followed for lamps and reflectors in automotive testing laboratory? Explain beam pattern and specification followed for head lamp testing as per CMVR rules. **[8]**

Q7) a) Explain the optics of human eye. **[6]**

b) Explain briefly construction and working principle of head lamp used in automobile. **[6]**

c) What is LED? State merits and demerits of LEDs used in automobile lighting systems. **[4]**

Q8) a) Write a detail note on various Automotive Standards giving procedure for type approval and conforming safety of critical components. **[8]**

b) Name the different types of environments tests defined in the Indian standards for evaluation of lighting and signaling devise. Explain them briefly. **[8]**

Q9) a) Draw neat sketch specifying dimensions and color code as per Motor vehicle Act 1988 for following signs. **[8]**

i) No Entry or Straight prohibited.

ii) Right turn prohibited.

iii) Cross Road.

iv) Parking Both Sides.

b) Explain briefly what procedures to be followed for passing a permit of commercial vehicles by regulatory authority RTO. **[8]**

Q10)Write short note on the following (any three) : **[18]**

a) Adoptive front lighting system.

b) CMVR rules and standards.

c) Testing Tracks for vehicles.

d) Luminance meter and its principle.

e) Types of rear view mirrors.

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Total No. of Questions : 12] **[Total No. of Pages : 4**

P1392

[3865] - 539
M.E. (Electrical) (Control System)
NONLINEAR CONTROL SYSTEM
(Revised 2008 Course) (503103)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Attempt Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6 from Section - I & Q.No.7 or 8, Q.No.9 or 10, Q.No.11 or 12 from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the characteristics of nonlinear system : **[8]**

i) Frequency - Amplitude dependance.

ii) Jump resonance.

iii) Limit cycle.

iv) Soft and Hard excitation.

b) Explain following terms : **[8]**

i) Phase plane.

ii) Phase plane trajectory.

iii) Isoclines.

iv) Phase portrait.

OR

Q2) a) Explain different singular points for non-autonomous system. **[8]**

b) Compare phase plane, Describing function method and Liapunov method for the analysis of nonlinear system. **[8]**

P.T.O.

Q3) a) Explain Delta method for phase plane analysis. **[8]**

b) Using Isocline method draw phase plane trajectory of second order system $\frac{d^2x}{dt^2}+4\frac{dx}{dt}+5x=0$. Taking starting point as $\dot{x}$ = 1.5 x = 0. **[8]**

OR

Q4) A unity feed back control system consists of a nonlinear element in series with linear transfer function G(s) = $\frac{y}{s(s+1)}$

The nonlinear function is defined by

$f(e) = 0.1$ for $e \geq 0.1$

$f(e) = 0$ for $-0.1 \leq e \leq 0.1$

$f(e) = -0.1$ for $e \leq -0.1$

where e is error signal. Construct phase plane trajectory in (e, $\dot{e}$) plane using isocline method. Take step input amplitude 1 unit and initial condition (1, 0). Also comment on stability. **[16]**

Q5) a) Derive describing function for Backlash. **[9]**

b) Determine frequency and amplitude of limit cycle if it exists and comment on stability of the system for unity feed back control system with a gain saturating amplifier with **[9]**

$f(e) = +1 \quad e \geq 1$

$f(e) = e \quad -1 \leq e \leq 1$

$f(e) = -1 \quad e \leq -1$

and forward transfer function is $\frac{100}{s(s+2)}$.

OR

Q6) Explain the following for absolute stability : **[18]**

a) Circle criterion.

b) Popov criterion.

SECTION - II

Q7) a) Test the following function for positive definiteness **[8]**

$$4x_1^2 + 3x_2^2 + 5x_3^2 + 2x_1x_2 - 3x_1x_3 + 2x_2x_3$$

b) Explain Liapunov's direct method and its mathematical representation for stability determination. **[8]**

OR

Q8) a) Select Liapunov function and determine stability **[8]**

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -2 & -5 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

b) The system equations are given below **[8]**

$$\dot{x}_1 = 2x_2,\ \dot{x}_2 = -x_1 - 3x_2$$

Select i) $V = 2x_1^2 + x_2^2$ & ii) $V = x_1^2 + 2x_2^2$ as Liapunov function and determine stability for each case.

Q9) a) Apply Krasovski method to assess the stability of equilibrium point $x(0)$ of the system given below **[8]**

$$\dot{x}_1 = 2x_1,$$

$$\dot{x}_2 = x_1 - x_2 - \frac{x_2^2}{4}$$

b) Show that the system described below is unstable using characteristic equation $\dot{x} = \begin{bmatrix} 0 & 1 \\ 3 & -2 \end{bmatrix} x$

verify the result using Liapunov method. **[8]**

OR

Q10)a) Explain Krasovski method to assess the stability of equilibrium point. **[8]**

b) For linear time-invariant system $\dot{x} = Ax$ derive the expression

$$A^T P + PA = -Q$$

Where P & Q are symmetric positive definite matrices. **[8]**

Q11)a) Explain the terms : **[9]**

i) Sliding phase.

ii) Reaching phase.

iii) Chattering as used in sliding mode control.

b) Consider Vander pol's equation **[9]**

$\dot{x}_1 = x_2$

$\dot{x}_2 = - x_1 - (x_1^2 - 1)\, x_2 + u$

Calculate relative degree taking out put y as

i) $y = 3x_1$ ii) $y = x_2$ iii) $y = x_1^2 + x_2$.

OR

Q12)a) Explain the terms : **[9]**

i) Input - output linearization for SISO system.

ii) The relative degree of a system.

b) Determine the sliding dynamics along sliding set for the system **[9]**

$\dot{x}_1 = - 2x_1 - x_2 + \text{sign}\,(- x_1 - x_2)$

$\dot{x}_2 = x_1$.

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1404

[3865] - 571
M.E. (E & TC) (Microwave)
RF WAVE AND MICROWAVE CIRCUIT DESIGN
(2008 Course) (504223)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any two questions from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data whenever necessary.***

SECTION - I

Q1) a) Explain the concept Inter Symbol Interference. How ISI affects the wireless communication? Derive expression for rolloff factor. **[12]**

b) What is intermodulation? Derive an expression for third order intercept point. **[13]**

Q2) a) Explain in detail n-channel MOSFET along with its operating frequency and electronic applications. **[13]**

b) An abrupt p-n junction made of Si has the acceptor and donor concentration of $N_A = 10^{15}$ cm^{-3} and $N_D = 5 \times 10^{12}$ cm^{-3} respectively. Assuming that device operates at the room temperature, determine:

i) The barrier voltage.

ii) The space charge width.

iii) The peak electric field across the junction

The junction capacitance for a cross sectional area is 10^{-4} cm^2 and $\varepsilon'_r = 11$. **[12]**

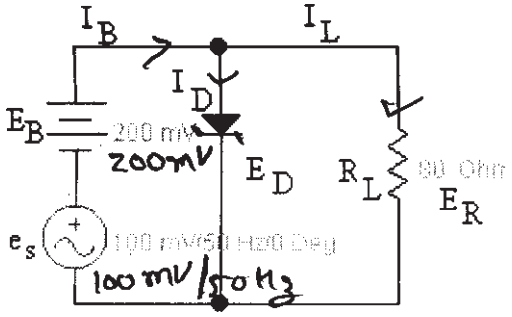
Q3) a) Design N-type three phase surface channel CCD. **[12]**

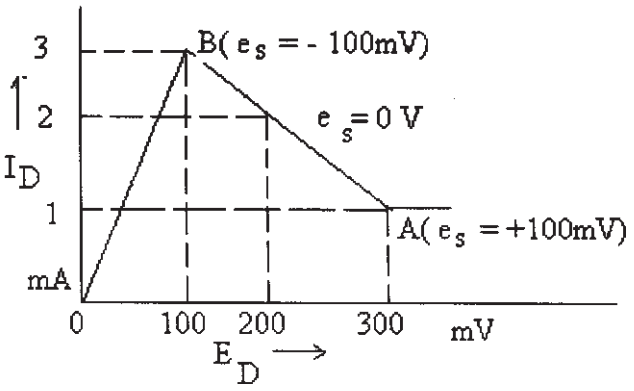
b) Describe in detail operating principal of BARITT diode. **[13]**

P.T.O.

SECTION - II

Q4) a) For the tunnel diode circuit shown, assume E_B and e_s have zero source resistance, calculate the current gain, voltage gain and power gain for tunnel diode in parallel loading. **[13]**





b) Explain in detail High Power Amplifier. **[12]**

Q5) a) Focus on bilateral design approach for microwave amplifier. **[12]**

b) Find the stability regions of a transistor whose S parameters are as : S_{11} = 0,7 – 70°, S_{12} = 0.2–10°, S_{21} = 5.585° and S_{22} = 0.7–45°. [angle to be rawn]. (note : angles are expressed in degree). **[13]**

Q6) a) Design a BJT Colpitts oscillator for 200 MHz. The parameters are V_{ce} = 3v, Ic = 3 mA at room temperature. C_{bc} = 0.1pF, R_{be} = 2KΩ, R_{ce} = 10KΩ, C_{be} = 100pF. If the inductance should not exceed L_3 = L = 50nH, find the value of capacitances in the feedback loop. **[13]**

b) Write short notes on DR oscillator and YIG tuned oscillator. **[12]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1407

[3865] - 576

M.E. (E & T/C)(Microwave)

SPEECH PROCESSING AND APPLICATION

(Revised Course 2008) (504225) (Elective - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the following acoustic characteristics of speech : **[8]**

i) Frequency analysis. ii) Formants.

iii) Consonants. iv) Vowels.

b) Explain the various linguistic units of speech. **[6]**

c) Explain the following terms with respect to articulation : **[4]**

i) Bilabial.

ii) Alveolar.

iii) Nasals.

Q2) a) Explain the speech recognition process with the help of neat diagram. **[6]**

b) Explain the difference between speech recognition and speaker recognition. **[6]**

c) Explain any one method of speech enhancement. **[4]**

P.T.O.

Q3) a) Explain the various measures of assessing the quality of coded speech. **[8]**

b) Explain how neural network architecture can be used in speech recognition. Explain TDNN (Time Delay Neural Network) architecture used for stop consonants recognition. **[8]**

Q4) Explain what do you mean by speech digitization. Explain the various speech digitization techniques and compare their performance. **[16]**

SECTION - II

Q5) a) Explain what do you mean by spectral distance measures of speech recognition. **[4]**

b) Explain the steps in LPC analysis. **[4]**

c) Explain LPC spectral matching measure. **[8]**

Q6) a) Explain how Hidden Markov Model (HMM) can be used for speech recognition. **[8]**

b) Explain the three basic problems in HMM. **[8]**

c) Explain the strengths of HMM. **[2]**

Q7) a) Explain the major elements of a voice processing system. **[6]**

b) Explain the hardware architecture of voice processing system with the help of block diagram. **[6]**

c) Explain stand alone versus network controller voice processing architecture. **[4]**

Q8) a) Explain line echo cancellation and acoustic echo cancellation with the help of neat diagram. **[8]**

b) Draw the ensemble interval histogram computational model of auditory nerve system and explain the characteristics of model. **[8]**

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1408

[3865]-578

M.E. (E & TC) (Microwave)

MICROWAVE INTEGRATED CIRCUITS

(2008 Course) (504228)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any two questions from each section.***
2) ***Figures to the right indicates full marks.***
3) ***Assume suitable data, whenever necessary.***

SECTION - I

Q1) a) What are the methods of MIC synthesis? Discuss any one of them. **[15]**

b) Design a microstrip line for 100 ohm characteristic impedance. The substrate thickness is 0.138 cm with €r = 2.0. What is the guide wavelength on this X-line, if operating frequency is 3.0 GHz. **[10]**

Q2) a) What are microstrip discontinuities? Discuss in details. **[12]**

b) Design a microstrip antenna to operate at 1.8GHz given the substrate used in the design is FR4 PCB material with the following parameter: **[13]**

$\varepsilon_r = 4.6$

$\tan \delta = 0.022$

h = 1.6 mm

copper thickness = 35μm

Q3) a) Explain, discuss and compare hybrid and monolithic microwave integrated circuits. **[13]**

b) Describe the technological steps involved in the fabrication of hybrid ICs. **[12]**

P.T.O.

SECTION - II

Q4) a) Explain in detail the technique involved in the measurement of noise in MIC circuits. **[13]**

b) Design Chebyshev band pass filter with following specification. **[12]**
Cut off frequency = 100MHz,
Number of order = 3 and
Impedance = 50 ohm.

Q5) a) Discuss MIC differential phase shifter in detail. **[13]**

b) Design 12.5 to 14.5 GHz *Ku*-band Monolithic analog frequency divider. **[12]**

Q6) a) Draw the layout diagram and the equivalent circuits of the following microstrip Components : **[13]**

i) An equivalent split Wilkinson power divider.
ii) An unequivalent split Wilkinson power divider.
iii) A quadrature (90°) hybrid branch line coupler.
iv) A hybrid or Rat-race in microstrip form.

b) Write short notes on (any two) : **[12]**

i) GaAs-FET digital attenuator.
ii) Various types of integrated circuit antennas and their circuit topologies.
iii) Application of MICs in satellite communication systems.
iv) Feature trends in MICs.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1415

[3865] - 444

M.E. (Civil-Hydraulic)

HYDROINFORMATICS AND SIMULATIONS

(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer booklet.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answer will be valued as a whole.***
6) ***Use of electronic pocket calculator is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Define Hydroinformatics. What are the techniques used in Hydroinformatics? Explain use GIS as Hydroinformatics tool. **[16]**

Q2) Discuss Multi-criteria decision support system. Discuss design of decision support system for flood control. **[16]**

Q3) Discuss various methods of simulations. Discuss possible simulation model for predicting reservoir operation. **[16]**

Q4) Write short notes on (any two) : **[18]**

a) Any practical simulation model.

b) Role of Decision support system in Hydraulic Engineering.

c) Scope of internet in Hydroinformatics.

P.T.O.

SECTION - II

Q5) What is conjugate gradient algorithm? Explain different search routines of conjugate gradient algorithm. **[16]**

Q6) Give step by step working of Genetic Algorithm. **[16]**

Q7) a) Explain the terms epoch, normalization, performance function, activation function, delta rule, overfitting in relation to artificial neural networks. **[8]**

b) Write short notes on : **[8]**

i) Crossover in GA.

ii) Comparison between artificial neural networks and statistics.

Q8) Write short notes on (any two) : **[18]**

a) Gradient descent algorithm with momentum.

b) Applications of GA in Water resources Engineering.

c) Recurrent Neural Networks.

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Total No. of Questions : 10] **[Total No. of Pages : 4**

P1417

[3865] - 503
M.E. (Mechanical) (Design Engineering)
VIBRATIONS AND NOISE CONTROL
(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic table and electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) For the system shown in Fig. No. 1, obtain three natural frequencies and corresponding mode shapes. Sketch all modes. **[16]**

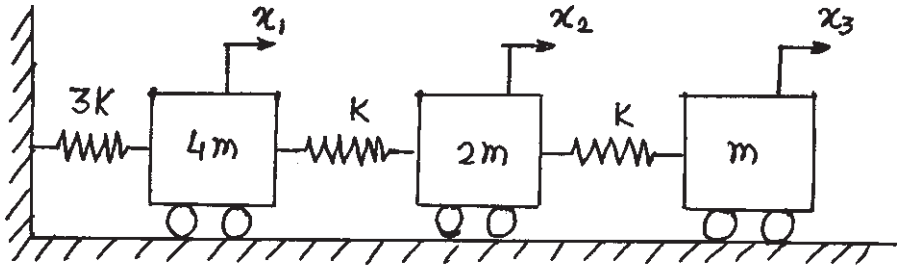

Fig. No. 1

Q2) A bar fixed at one end is pulled at the other end with a force 'F' as shown in Fig. No.2. The force is suddenly released. Investigate the vibration of the bar. **[16]**

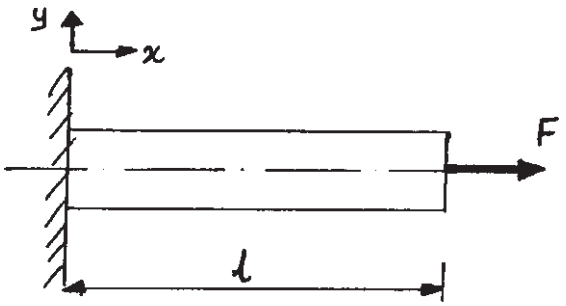

Fig. No. 2

P.T.O.

Q3) Analyze undamped dynamic vibration absorber and show frequency response for main system and absorber system. **[16]**

Q4) a) What is the maximum acceleration of mass '*m*' and spring stiffness '*k*', if it is dropped on a hard surface through height '*h*'? **[6]**

b) Find the response equation of an undamped spring mass system subjected to an isosceles triangular pulse force of height 'F_0' and duration 'τ'. **[10]**

Q5) Write the short notes of the following (any two) : **[18]**

a) Duhamel's Integral.

b) Influence coefficients.

c) Holzer's Method.

SECTION - II

Q6) a) State and explain different machine vibration monitoring techniques. **[8]**

b) With a suitable example explain Experimental Modal Analysis. **[8]**

Q7) a) Derive an expression for the spectral density of a derived process. **[6]**

b) Give three examples of random input. How will you proceed to find their Spectral Density? **[10]**

Calculate the Autocorrelation function corresponding to the ideal white noise and to the unit step function.

Q8) A system with dry friction damping has its differential equation of motion given by $\ddot{X} + \phi(\dot{X}) + X = 0$ **[16]**

where $\phi(\dot{X})$ = F when $\dot{X}$ is positive

= -F when $\dot{X}$ is negative

Obtain the trajectory of motion when the system is given an initial displacement and released.

Q9) a) Define and explain sound power level and sound intensity. What is the sound pressure level of a sound source radiating energy at the rate of 0.6 W? **[8]**

b) Explain Noise absorber. **[8]**

Q10)Write the short notes of the following (any two) : **[18]**

a) Jump Phenomenon.

b) Octave band analysis of sound.

c) Auto correlation function.

Laplace Transform Pairs

	$f(t)$	$L[f(t)]$
1.	$f(t)$	$\int_0^\infty f(t)e^{-st}dt = F(s)$
2.	$x(t) + y(t)$	$X(s) + Y(s)$
3.	$K\, f(t)$	$K\, F(s)$
4.	$u(t)$ *or* 1	$\frac{1}{s}$
5.	$\partial(i)$	1
6.	t	$\frac{1}{s^2}$
7.	t^n	$\frac{n!}{s^{n+1}}$
8.	$\sin \omega t$	$\frac{\omega}{s^2 + \omega^2}$
9.	$\cos t$	$\frac{s}{s^2 + \omega^2}$
10.	e^{-at}	$\frac{1}{s + a}$
11.	$e^{-at} \sin \omega t$	$\frac{\omega}{(s + a)^2 + \omega^2}$
12.	$e^{-at} \cos \omega t$	$\frac{s + a}{(s + a)^2 + \omega^2}$
13.	$e^{-at} f(t)$	$F(s + a)$
14.	$u(t - a)$	$\frac{e^{-as}}{s}$
15.	$\partial(t - a)$	e^{-as}
16.	$\begin{bmatrix} 0 \text{ when } t < a \\ f(t-a) \text{ when } t > a \end{bmatrix} = f(t-a)u(t-a)$	$e^{-as} F(s)$
17.	$\frac{d\, f(t)}{dt}$	$s\, F(s) - f(0)$
18	$\frac{d^2 f(t)}{dt}$	$s^2 F(s) - s\, f(0) - \frac{d\, f(0)}{dt}$
19.	$\int_0^t f(t)\, dt$	$\frac{F(s)}{s}$

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1421

[3865] - 607
M.E. (E & TC)
SIGNAL PROCESSING
(Signal Processing Techniques)
(2008) (504502)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the advantage of DFT over DTFT and hence, find N = 4 point DFT of $x(n) = \{1, 0, 1, 0\}$. **[6]**

b) State and explain Convolution Property of Z-Transform, and hence, find the inverse Z-transform of **[6]**

$X(Z) = \frac{1}{1-3z^{-1}+2z^{-2}}$, Using Convolution Property of Z-Transform.

c) Obtain the relation between Z-Transform and DTFT, and hence find H(Z) and H(ω) For a given difference equation **[6]**

$$y(n) - 3y(n-1) + 2y(n-2) = x(n) - x(n-1)$$

Q2) a) Determine the Z-Transforms of the following signal and sketch the corresponding pole-zero patterns. **[8]**

i) $x_1(n) = (a^n + a^{-n})u(n)$, a real and ≤ 1

ii) $x_2(n) = \frac{1}{2}(n^2)\left(\frac{1}{3}\right)^{n-1} u(n-1)$

P.T.O.

b) For a given sequence $x(n) = \{1, 2, 3, 1\}$ and $h(n) = \{1, 1, 1\}$, find **[8]**

i) Linear Convolution.

ii) Linear Convolution using Circular Convolution without zero padding.

iii) Linear Convolution using Circular Convolution with zero padding.

iv) Show that answer in part ii is aliased in time domain.

Q3) a) Find N = 8 point DFT using Radix-2 FFT DIT algorithm for given sequence. **[8]**

$x(n) = \{1, 1, 1, 1, 0, 0, 0, 0\}$

b) Using DFT and IDFT method, find the circular convolution of given sequence. Do not use matrix method. **[4]**

$x_1(n) = \{1, 2, 3, 1\}$

$x_2(n) = \{4, 3, 2, 1\}$

c) Define ROC. State and explain and three Properties of ROC. **[4]**

Q4) a) Using Hanning window Design a low pass filter with gain of unity, cutoff frequency of 1000 kHz and sampling frequency of 5 kHz for M = 7. **[8]**

b) Explain Gibb's Phenomenon. **[3]**

c) Explain Symmetric and Antisymmetric FIR Filters. **[5]**

SECTION - II

Q5) a) Write note of Warping effect in IIR filter Design and how to avoid it? **[6]**

b) For the analog transfer function $H(s) = \frac{2}{(s+1)(s+2)}$ determine H(z) using impulse invariance method. Assume T = 1 sec. **[6]**

c) Explain the difference between impulse invariant method and bilinear transformation method in detail. **[6]**

Q6) a) Design an FIR digital filter to approximate an ideal low pass filter with gain in pass band of unity, and cutoff frequency $\omega_c = 3\pi/4$. The length of the impulse response should be M = 7. **[8]**

b) The impulse response of FIR filter is given by $h(n) = \{1, 2, 3, 2, 1\}$ **[8]**

i) Realize using Direct from using minimum delay.

ii) Is the system is linear in phase? If yes then how.

iii) Is above system is stable? If yes then how.

Q7) a) Design a Butterworth low pass filter using Bilinear Transform method for the following specification. **[8]**

$$0.707 \leq |H(e^{j\omega})| \leq 1 \qquad 0 \leq \omega \leq 0.5\pi$$

$$|H(e^{j\omega})| \leq 0.2 \qquad 0.75\pi \leq \omega \leq \pi$$

b) Obtain the Direct Form - II and Parallel Form realization for the given difference equation. **[8]**

$y(n) = y(n-1) - 0.5y(n-2) + x(n) - x(n-1) + x(n-2)$

Q8) a) Explain Frequency sampling method. **[6]**

b) Find the impulse response and step response for a given difference

$y(n) - 5y(n-1) + 6y(n-2) = x(n)$ **[6]**

c) Difference between IIR and FIR. **[4]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1424

[3865]-614
M.E. (E & TC) Signal Processing
STATISTICAL SIGNAL PROCESSING
(2008 Course) (504507) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State and explain Prony's method of signal modeling. **[6]**

b) Implement the third order FIR filter $H(Z) = 1 + \frac{13}{24}z^{-1} + \frac{5}{8}z^{-2} + \frac{1}{3}z^{-3}$, using Lattice filter structure. **[6]**

c) Write a note on one step forward linear predictor. **[6]**

Q2) a) Define and explain AR, MA, and ARMA process. **[4]**

b) Consider the ARMA Process generated by the difference equation **[8]**

$x(n) = 1.6x(n-1) - 0.63x(n-2) + w(n) + 0.9w(n-1)$

i) Determine the system function of the whitening filter and its poles and zeros.

ii) Determine the power density spectrum.

c) Using Spectral Factorization Method find H(z) for a MA(1) process that has an autocorrelation sequence given by **[4]**

$r_x(k) = 17\delta(k) + 4[\delta(k-1) + \delta(k+1)]$

Q3) a) State and explain Levinson Durbin algorithm. **[6]**

b) Using Levinson Durbin algorithm find Reflex coefficient Γ_j and filter coefficients $a_p(k)$ from the given autocorrelation $r_x(k) = \{1, 0.5, 0.5, 0.25\}$. **[8]**

c) What are the advantages of lattice filter? **[2]**

P.T.O.

Q4) a) Explain the MYWE method for modeling an MA(q) Process. **[8]**

b) For N = 2 FIR Least Square Inverse system having a unit sample response $g(n) = \delta(n) - 0.64\delta(n-1)$ **[8]**

i) Find residual energy due to truncation ε_t.

ii) FIR Coefficients $h(n)$.

iii) Minimum Square error $\{\varepsilon\}_{min}$.

SECTION - II

Q5) a) Justify why Periodogram Method is asymptotically unbiased but not a consistent estimation. **[6]**

b) Write notes on All Pole Modeling Using Prony's Method. **[6]**

c) Explain how FIR Wiener Filter can be used for filtering and Prediction. **[6]**

Q6) a) Explain and derive the algorithm for Bartlett Method. **[8]**

b) Determine the frequency resolution and figure of merit of the Periodogram, Bartlett, Welch and Blackman Tukey Method for the quality factor of Q = 10. Assume that overlap In Welch's method is 50% and length of the sample sequence is N = 1000. **[8]**

Q7) a) Compare Periodogram, Modified Periodogram, Bartlett and Welch Method. **[6]**

b) Consider a signal $x(n) = d(n) + v(n)$; where $d(n)$ is a AR(1) Process that satisfies the difference equation. **[10]**

$$d(n) = 0.6d(n-1) + w(n)$$

Where $w(n)$ is a white noise sequence with variance $\sigma_w^2 = 0.64$ and $\sigma_v^2 = 1$.

i) Determine the auto correlation sequence $r_x(k)$ and $r_d(k)$.

ii) Design a wiener filter of length M = 3 to estimate $d(n)$.

iii) Determine the MMSE for M = 3.

Q8) a) For causal FIR Wiener Filter derive Wiener-Hope equation and Minimum error. **[8]**

b) Write a note on parametric and non parametric power spectrum estimation. **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1439

[3865]-651
M.E. (Production)
MATERIAL TECHNOLOGY
(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

SECTION - I

Q1) a) How plastic deformation occurs? Explain in detail. **[6]**

b) Distinguish between precipitation hardening and dispersion hardening. Give atleast one example of each category. **[5]**

c) Five grained materials possess good mechanical properties. Do you agree? Justify your choice. If a steel has a value of σ_i = 150 MPa K = 0.70 MPa $m^{½}$, what is the value of yield stress if grain size is ASTM no. 5. Given - ASTM no. 5 contains 248 grains/mm^2 & grain diameter is 0.065 mm. **[5]**

Q2) a) What is toughness? Explain the important micromechanisms of fracture. **[4]**

b) Show that the stress required to propagate a crack in a brittle material is related to the size of crack. Is Griffith equation for the fracture stress applicable to metals. **[4]**

c) Explain super plasticity & Homologous temperature. **[4]**

d) What are the different types of fractures observed in metals? Draw them schematically. **[4]**

P.T.O.

Q3) a) With a graph explaining relationship between fatigue crack growth rate & stress intensity factor, discuss various regions of fatigue crack growth. **[6]**

b) Distinguish between fatigue limit & endurance limit with suitable graph & appropriate example of each. **[6]**

c) A material is to be selected for high temperature application. Which factors you would take into account in the selection? **[4]**

Q4) a) Describe giving reasons the processing routes & materials you would use for the following applications (any 3) : **[12]**

i) A small car crank shaft.

ii) An electric light bulb fillament.

iii) A spanner.

iv) A screw to be used in constructing the hull of a wooden boat.

v) Cylinder block for a car engine.

b) What is meant by High cycle & low cycle fatigue? Suggest at least one component in each case which might be subjected to these types of fatigue. **[6]**

SECTION - II

Q5) a) Explain why Dual phase steel is used for car bumpers in detail. **[4]**

b) Maraging steels contain almost negligible carbon still why their strength is high? Give atleast 2 applications of maraging steels. **[6]**

c) What are factors to be considered for selection of a material which is to be used for human body part implant? **[4]**

d) Explain briefly metallic glass. **[2]**

Q6) Answer any 2 of the following :

a) What are ceramics? Where they find applications? Explain any one method of processing of ceramics. **[8]**

b) What are the different types of coatings given? Discuss in detail. **[8]**

c) What are shape memory alloys? Explain with suitable examples. **[8]**

Q7) a) What are the various factors that must be taken into account for material selection? **[6]**

b) What the major reasons for the great increase in the use of plastics in engineering designs over the past years? **[4]**

c) Explain the various recent developments in cemented carbide tools manufacturing, in order to enhance their life. **[6]**

Q8) a) How carbon fibers are produced? Why carbon fiber composites are used in some aero space applications? **[6]**

b) Calculate the modulus of elasticity for a composite material consisting of 60% by volume of E glass fiber & 40% epoxy resin for the matrix when stressed perpendicular to fibers & parallel to fibers. The modulus of elasticity of E glass is 10.5×10^6 psi & that of epoxy resin is 0.45×10^6 psi. **[6]**

c) Explain in brief : **[6]**

i) Al-clad.

ii) Ceramic-matrix composite.

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Total No. of Questions : 10] **[Total No. of Pages : 2**

P1446

[3865] - 664
M.E. (Computer)
PRINCIPLES & PRACTICES OF I.T. MANAGEMENT
(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Mention the functions of Management giving the importance of each one of these specifically for I.T. Management. **[16]**

Q2) a) How can the information technology help in imbibing the social responsibility in the country. Give your suggestions. **[8]**

b) Mention the important points to be considered as preliminary work in IT projects. **[8]**

Q3) a) Discuss the aspects to be considered while budgeting an IT project. What are the risks involved in these projects and how can these be taken care off? **[8]**

b) What are the problems faced in managing teams of professionals? How does this differ from managing teams of blue color workers? **[8]**

Q4) a) Discuss the importance of Project Network Diagram. What are the constraints in its preparation? Once prepared is it necessary to revise it? Justify. **[8]**

b) Discuss the importance of consideration of manpower flux in project planning. **[8]**

P.T.O.

Q5) Write short notes on any three of the following : **[18]**

a) Management and Strategic Management.

b) Business Ethics.

c) Resource management in IT projects.

d) Reasons for delays in project implementation.

SECTION - II

Q6) "Group management is the most crucial aspect in any project management and when it comes to IT projects its much more crucial". Justify the statement highlighting the important aspects to be considered. **[16]**

Q7) a) Discuss the importance of communication in conflict management.**[8]**

b) Do you feel that energy management has been given due consideration by the government or the IT industry in India. Justify your answer.**[8]**

Q8) a) Discuss the importance of Employee Welfare in IT project management. **[8]**

b) Discuss the importance of Technology Management and Supply Chain Management in IT project management. **[8]**

Q9) a) Discuss the importance of Cyber Laws with regards to the latest revelations in the global scenario. What sort of safety aspects can be implemented to avoid piracy of strategic information? **[8]**

b) How can IT help in improving the performance of Quality Control in industry. Explain in brief the steps involved. **[8]**

Q10)Write short notes on any three of the following : **[18]**

a) Stress Management.

b) Reasons and solution on employee conflicts.

c) Six Sigma.

d) Quality Management and Quality Systems.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1457

[3865]-686
M.E. (Computer Network)
OPERATING SYSTEM DESIGN
(2008 Course) (510308)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write the short note on : **[8]**

i) Multiprogrammed batch system.

ii) Time sharing system.

b) Explain the different modes of process execution. What is process switching? Discuss the different scenario of process switching. **[8]**

Q2) a) Discuss the load sharing and dedicated processor assignment approaches for multiprocessor thread scheduling. **[8]**

b) What is the need of address space transfer? Discuss the different mechanism for address space transfer. **[8]**

Q3) a) Discuss the failure handling in message passing. **[8]**

b) Explain sequential consistency model & release consistency model. Give their relative advantages and disadvantages. **[8]**

Q4) a) Explain the structure of monitor. Discuss the bounded buffer producer/ consumer problem using monitor and signal. **[10]**

b) What is the need of mutual exclusion using hardware support? Discuss the Hardware approaches to mutual exclusion for uniprocessor and multiprocessor system. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain the different issues in recovery from deadlock. **[6]**

b) Explain deadlock modeling using resource allocation graph. **[10]**

Q6) a) What is the need of cache validation? Discuss the client initiated and server initiated approach for cache validation. **[8]**

b) Why file sharing semantics adapted by file system? Discuss different file semantics. **[10]**

Q7) a) Write short notes on : **[8]**

i) Active attacks in message communication.

ii) Access Matrix.

b) What is confinement problem? Discuss the different types of channels that can be used by program to leak information. **[8]**

Q8) a) Write the pseudo code for client server application using pipes. Explain the functions of pipes in unix used for inter process communication.**[8]**

b) Write the pseudo code for producer/consumer problem using message queues. Explain the structure and functions of message queue in unix.**[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1460

[3865]-695

M.E. (Chemical)

ADVANCED SEPARATION PROCESSES

(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the theory behind cross flow filtration. What are the various resistances in CFF? **[6]**

b) Explain dual function filter. **[6]**

c) Briefly explain mass diffusion. Give the equations for separability and maximum theoretical separative capacity. **[6]**

Q2) a) What is electrodecantation? **[6]**

b) Give the theoretical analysis of surface based solid-liquid separations involving a second liquid. **[6]**

c) Explain the working of any one equipment for pressure diffusion. **[4]**

P.T.O.

Q3) a) The individual resistances to mass transfer in the fluid and in the solid during adsorption of water vapour from air by silica gel using a fixed-bed technique (for low moisture content) are given by

$k_y a_p = 31.6\ G^{10.55}$ kg $H_2O/m^3.s.\Delta Y$

& $k_s a_p = 0.965$ kg $H_2O/m^3.s.\Delta X$

Where G' is the mass velocity of the gas ($kg/m^2/s$). The apparent bed density is 671.2 kg/m^3 and average particle size 1.727 mm diameter and external surface of the particles 2.167 m^2/kg.

Estimate the height of countercurrent adsorption tower for drying air at 26.7°C, standard atmospheric pressure, from an initial humidity of 0.005 to a final humidity of 0.0001 kg H_2O/kg dry air. Entering gel will be dry. A gel rate of 0.68 $kg/m^2.s$. and air rate of 1.36 $kg/m^2.s$ will be used. Equilibrium equation $Y^* = 0.0185\ X$ **[12]**

b) What is break through curve? Explain. **[4]**

Q4) a) Explain the basic adsorption cycles. **[8]**

b) Discuss all the aspects of temperature swing regeneration. **[8]**

SECTION - II

Q5) a) Explain swelling in resins and its function. **[6]**

b) Derive the relevant equations for osmosis in membranes. **[6]**

c) Discuss about porous and glassy membranes. **[6]**

Q6) a) Discuss the kinetic effects in crystallization from melt. **[8]**

b) Explain rejection & the term cb/cm in membranes. **[8]**

Q7) a) What are models in fouling of membranes? Explain any one. **[8]**

b) What are the effects of concentration polarization? Derive relevant equations. **[8]**

Q8) a) What is coadsorption? **[6]**

b) What is the significance of LUB? **[4]**

c) What are the various reasons for fouling in membranes? **[6]**

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Total No. of Questions : 8] **[Total No. of Pages : 7**

P1463

[3865]-704
M.E. (Chemical)
PROCESS MODELING & SIMULATION
(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***All questions are compulsory.***

SECTION - I

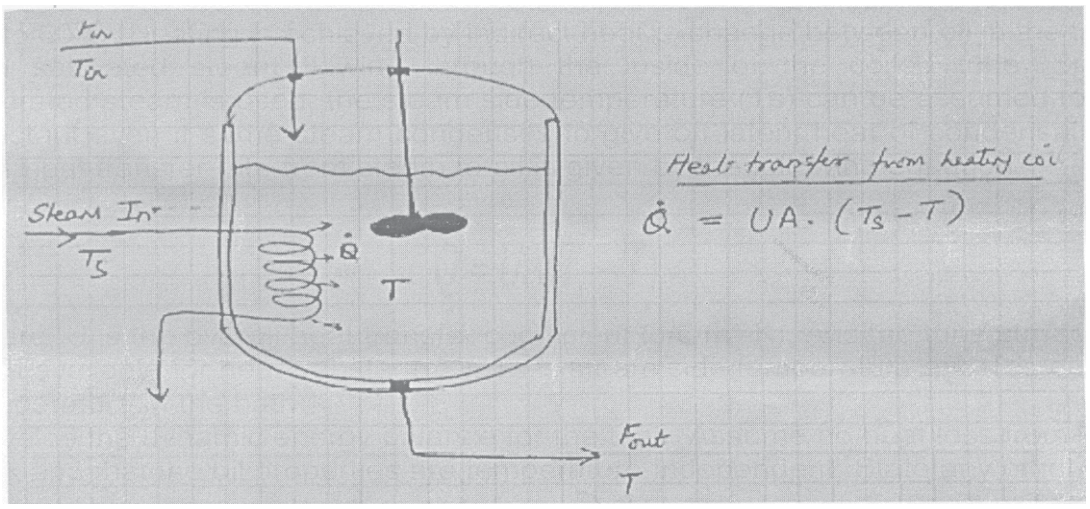
Q1) Consider the following continuously stirred tank heater shown below. The purpose of the tank heater is to raise the temperature of the process oil from ambient temperature in the feed stream to a temperature in the range of 50 to 60°C. Heating is achieved by indirect heat exchange between oil in the tank and saturated steam flowing through the inside of the coiled tube. Since saturated steam is used, the steam side temperature (Ts) can be assumed to be constant even if some steam condenses to give off latent heat of condensation. The heat transfer rate from steam to oil is given by the following equation :

$$\dot{Q} = UA(T_s - T)$$

Where, U is the overall heat transfer coefficient (J/s-m^2-K), A is the tube surface area available for heat transfer (m^2), Ts is steam side temperature and T is oil temperature in the bath.

Develop the dynamic energy balance for the tank. Assume no heat loss from the tank and that the oil properties are temperature-independent. State any other assumptions. **[18]**

P.T.O.

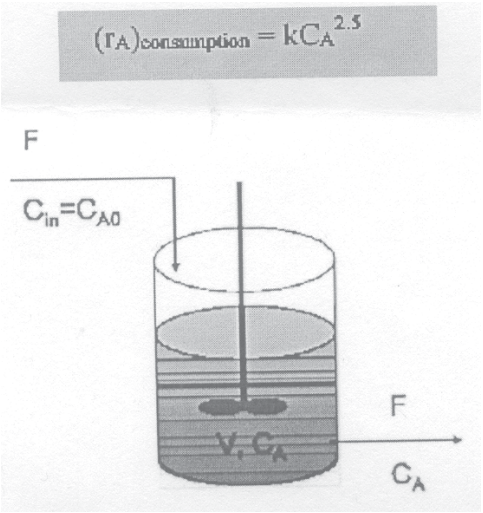


Q2) The following liquid-phase reaction is carried out in a continuously stirred tank reactor (CSTR) :

$$\mathbf{A \rightarrow B}$$

The rate of consumption of A (rA in mol/s-L) is described by the following rate law :

$$(r_A)_{consumption} = kC_A^{2.5}$$



It is also given that :

$F/V = 0.1\ min^{-1}$; $C_{A0}=1.0$ mol/L and $k=0.05$ $L^{1.5}/mol^{1.5}\cdot min$

a) Starting from first principles, derive the form of the component material balance.

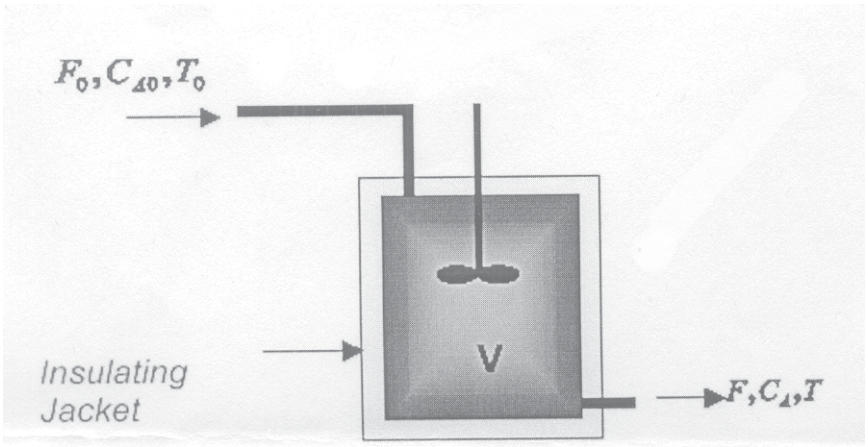
b) Identify whether the system is distributed parameter or lumped parameter system.

c) Identify the state variable. What is the state variable indicative of?

d) Use Newton's method to find the steady-state solution to the problem. What would be meaningful initial guess? **[16]**

Q3) Consider an adiabatic (insulated) CSTR shown in the figure below. The reacting mixture can be considered to be liquid of constant density and constant heat capacity. The reactor converts a species A into products. The reaction is exothermic with a heat of reaction equal to -ΔH. The rate of consumption is described by the following 2nd-order reaction kinetics. **[16]**

$$(r_A) = k\,C_A^2$$



a) Write down the dynamic mass, mole and energy balance for the adiabatic CSTR.

b) Consider the feed flow rate, concentration and temperature to be the inputs. Write down the differential equation in the **state-space** form - clearly identifying the elements of **A** and **B** matrix.

Q4) The average energy consumption by human body is approximately 100W. Under extreme conditions the body can afford to expend extra energy. You are required to estimate the ambient temperature (Ta) that a human body (unclothed) can be exposed to such that the energy lost by the body to maintain it at 37°C is 300 W.

Consider the heat loss by an unclothed body, treated as a lumped parameter system, to occur by two modes, convective and radiation, and given by the following equation : **[16]**

Convective heat loss: $Q_{conv} = 14.5\,A\,v^{0.5}(T_b - T_a)$ *in Watts*

Radiation heat loss: $Q_{rad} = \varepsilon\,\sigma\,A(T_b^4 - T_a^4)$ *in Watts*

Where,

A is the average area of a human body = 1 m^2

V is the velocity of air, m/s

ϵ is emissivity

σ is Stefan-Boltzmann constant $= 5.67 \times 10^{-8}\ W/(m^2\text{-}K^4)$

Assume the body is exposed to still air, which is equivalent to a velocity of 0.23 m/s. Also consider the human body to have an emissivity of 0.75

a) Apply Newton's method to find the ambient temperature. Use a relative tolerance of 0.01.

b) Justify your choice of initial guess for the ambient temperature.

SECTION - II

Q5) a) A continuous stirred tank reactor (CSTR) is operated at steady state. The reactor temperature is 473 K. The feed stream to the reactor is Pure A at 12.5 kg/min. The following reversible reaction occurs in the reactor.

$$A \leftrightarrow B$$

The equilibrium constant for the reaction is 2.35

Can you calculate the total mass flow rate exiting the reactor.

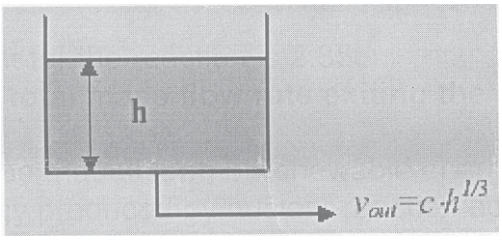
b) Some scientists argue that all form of renewable energy can be attributed to solar energy. The energy produced by nuclear reaction occurring within the core of the sun (at 15 Million °C) is finally released at the Sun's surface (at 5,000 °C) in the form of solar radiation. One of the researchers is using the following wellknown formula to calculate the energy released by the Sun

$$\text{Amount of heat radiated} = \text{constant} \times (T_s)^4$$

where, T_s is the surface temperature of the Sun.

What type of system does the above equation represent - Lumped Parameter or distributed parameter? And, Why? **[16]**

Q6) a) Consider the liquid-filled tank shown in the Figure given below.

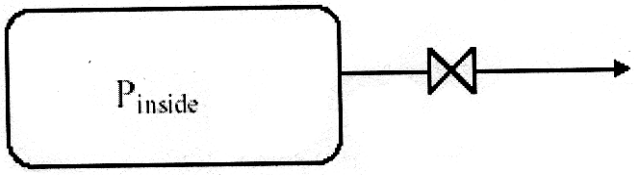


The dynamic mass balance around the tank is described by the following equation :

$$\frac{dh}{dt} = -\frac{c}{A} \times h^{1/3}$$

At steady-state, what is the numerical value of the state variable describing the system mass?

b) Consider the air-filled tank shown in the Figure below.



The dynamic mass balance around the air-filled, 10.0L, rigid pressurized tank at sea level is described by the following equation :

$$\frac{dm}{dt} = -\alpha \, P_{inside}$$

Where, m is the mass of air in the tank and P_{inside} is the gauge pressure of air in the tank. Gas behavior can be described by ideal gas law. The system and ambient temperature is 298 K. Initially, the gauge pressure records the air in the tank to be 2500 kPa. The valve is opened at some point in time. **What is the numerical value of system mass at steady state**?

c) The dynamic energy and mole balance equations on a CSTR has been linearized and expressed in the following state-space form.

$$\underline{\dot{x}} = \underline{\underline{A}}\,\underline{x} + \underline{\underline{B}}\,\underline{u}$$

Where x and u are deviation variables.

Can we determine the steady state values of the state variables? If you answer YES, provide the values. If you answer NO, explain why not. **[18]**

Q7) The dynamic behavior of a cylindrical tank with zero-input can be modeled by the following differential equation :

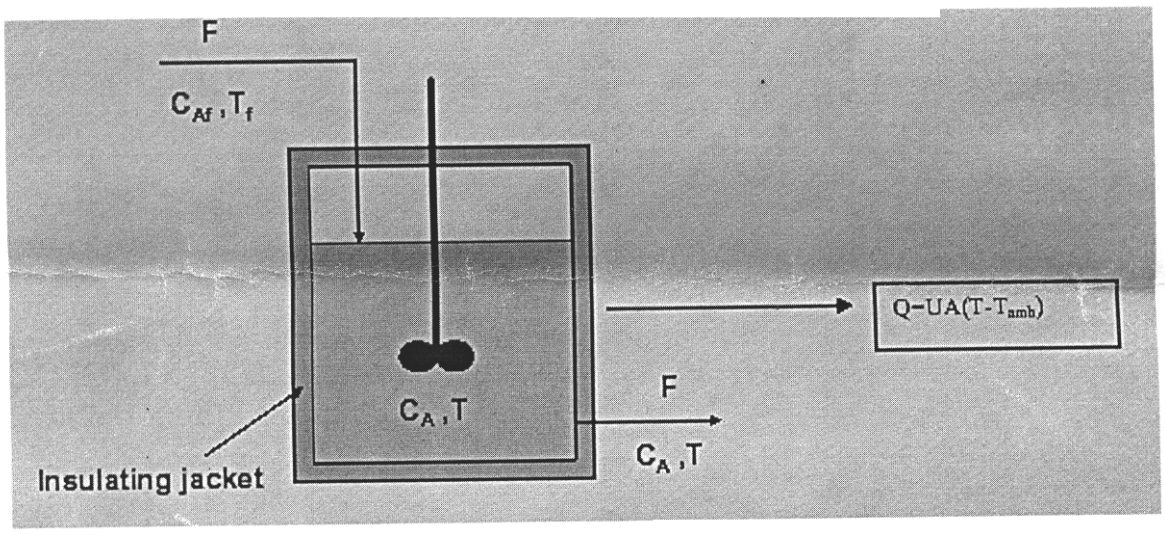
$$A\frac{dh}{dt} = -b \times h^{2/3}$$

where, A is 0.25 m^2 and b is 0.5 $m^{7/3}$/min. At t=0, h = 8 m.

a) **Use the 2nd-order Runge-Kutta method to estimate the tank height at t = 1, 2 and 3 minutes. Use an integration time-step of t = 1 minute.**

b) **Compute the analytical solution and compare the solution from part (a) at times t = 1 and t = 3 minutes.** **[16]**

Q8) Consider the CSTR shown in Figure below.



The dynamic mole and energy balance equations on the CSTR result in the following differential equations :

$$\frac{dC_A}{dt} = \frac{F}{V} \cdot (C_{Af} - C_A) - [A \exp(-\frac{E_a}{RT})] \cdot C_A \quad (1)$$

$$\frac{dT}{dt} = \frac{F}{V} \cdot (T_f - T) + (\frac{-\Delta H}{\rho c_p}) \cdot [A \exp(-\frac{E_a}{RT})] \cdot C_A - [\frac{UA}{V \rho c_p}] \cdot (T - T_{amb}) \quad (2)$$

Parameter	*Values*
F/V (hr^{-1})	1
A (hr^{-1})	9.703 × 3600
Ea (J/g-mol)	11,843 × 4.184
- ΔH (J/g-mol)	5960 × 4.184
T_f (K)	298
T_{amb}(K)	298
UA/V (J/L-K-hr)	150 × 4.184
C_{Af} (mol/L)	10
ρ C_p (J/L-K)	500 × 4.184
R (J/mol-K)	8.314

The steady-state values of concentration and temperature are 5.518 mol/L and 339.1 K, respectively.

a) Linearize the non-linear system of equations (1) and (2) around steady state. The only input variable is C_{Af}.

b) Assess the stability of the system at the steady-state. **[16]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1468

[3865]-714

M.E. (Chemical)

ENVIRONMENTAL CHEMISTRY

(Environmental Engineering)

(Revised 2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Explain the concept, scope and segments of environmental chemistry. Explain the various terms associated with environmental chemistry. **[16]**

Q2) Discuss the following in detail : **[16]**

a) Hydrogen Bonding in biological system.

b) Changes in water properties by addition of solute.

Q3) Discuss the formation, constituents and properties of soil and importance of soil chemistry. **[18]**

Q4) Write short notes on : **[16]**

a) Cyclic pathways in environment.

b) Carcinogenic compounds and their effects.

P.T.O.

SECTION - II

Q5) Draw a neat sketch and explain the construction, principle and working of :

a) HPLC. **[16]**

b) Classification and effect of pesticides.

Q6) Define adsorption and explain the design steps for designing a adsorption column. Discuss the various adsorption isotherms with neat diagrams and write all necessary equations. **[18]**

Q7) Define the following terms and explain the method of determination of:**[16]**

a) Viscosity.

b) pH.

c) BOD.

d) COD.

Q8) Write short notes on : **[16]**

a) Green House Effect and Global warming.

b) Polarography.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1472

[3865]-723
M.E. (Chemical)
WASTEWATER TREATMENT AND DESIGN
(2008 Pattern) (509138)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Which are the sources of water pollution? What is the effect on the environment of different water pollutants? **[6]**

b) Explain various factors which are essential for assigning quality of wastewater. **[6]**

c) Explain treatment scheme for wastewater with essential equipments. How the sequence of the equipment is presented on a flow sheet. **[6]**

Q2) a) Explain the importance of dissolved oxygen and factors which determines the quantity of oxygen in the treatment of the wastewater. **[6]**

b) Explain Henry's law for dissolved gases. What is the saturation of oxygen in water at 20°C in contact with dry air at 1 atms pressure having molar composition 21% oxygen? Henry's constant is (4.11×10^4). **[10]**

Q3) a) Explain the term BOD. What is the experimental procedure for its determination? **[6]**

b) How the rate of BOD oxidation is modeled. Derive equation for the BOD remaining. **[10]**

Q4) a) Discuss factors leading to non ideal flow in reactors. **[4]**

b) Explain important characteristic for a tracer. **[4]**

c) How tracer tests are conducted? **[4]**

d) Explain how tracer tests data is utilized for RTD of a reactor. **[4]**

P.T.O.

SECTION - II

Q5) a) Explain dispersion number (d) and Peclet number P_e. **[18]**

b) Explain the difference between space time (r) and RTD.

c) Qualities of adsorbent.

d) E curve and F curve.

e) Plug flow and mixed flow reactors.

f) Mass transfer operations in wastewater treatment.

Q6) In a CSTR operating at steady state a tracer is introduced in the feed stream. The tracer concentration in the effluent stream as a function of time is shown below **[16]**

T (sec)	0	100	200	300	460	500	670	735	840
Tracer concentration (g/m^3)	0	2.9	8.7	12.4	10	6.5	3.0	1.5	0.5

Calculate 1) Average residence time of the fluid and values for F(t) curve.

Q7) a) Explain the importance of mixing operation in wastewater treatment process. **[4]**

b) Why rapid mixing is essential in wastewater treatment process? Discuss principals of Flocculation. **[4]**

c) Power number. **[4]**

d) Turbine and Propeller mixers. **[4]**

Q8) a) Suspended growth process. **[4]**

b) Trickling filter. **[4]**

c) Bacterial growth pattern in a Batch reactor. **[4]**

d) Classification of bioprocess. **[4]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1473

[3865]-724
M.E. (Chemical)
SOLID WASTE MANAGEMENT
(Environmental Engineering)
(2008 Course) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) What are the Functional elements of solid waste management and discuss the Environmental impact of mismanagement. **[8]**

b) Explain the hierarchy of integrated solid waste management. **[8]**

Q2) a) Discuss the general considerations for waste storage at source of solid waste. **[8]**

b) What are the means and methods for transportation of solid waste? **[8]**

Q3) Discuss the following in details : **[18]**

a) Factors affecting the storage and collection.

b) Advantages & Disadvantage of various technological options.

Q4) Explain the principle, construction and working of the following with neat diagrams : **[16]**

a) Waste Heat Boilers.

b) Biomethanation.

P.T.O.

SECTION - II

Q5) a) Define the landfills? Explain the essentials components of landfilling. **[8]**

b) Discuss the energy recovery from solid waste. **[8]**

Q6) Discuss the various elements of financial management plan for solid waste system. **[16]**

Q7) For solid waste disposal site, the avg.-speed data obtained is : **[16]**

Distance X, km/trip	10	20	30	40	50	60
Avg. Haul speed, Y, km/hr	18	22	32	45	53	62
Total Time, hr.	0.55	0.9	0.93	0.89	0.94	0.96

Find the haul speed constants “a” and “b” and the total time for site located at 35 km away.

Q8) Write short notes on : **[18]**

a) Vermicomposting.

b) Waste heat recovery and co-generation.

c) Transfer Stations.

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Total No. of Questions : 10] **[Total No. of Pages : 2**

P1478

[3865] - 758
M.E. (Information Technology)
INFORMATION ASSURANCE AND SECURITY
(2008 Course) (514405A) (Elective - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is differential and linear cryptanalysis? Explain the differential cryptanalysis attack. Also compare differential and linear cryptanalysis. **[8]**

b) What three items are negotiated by Secure Socket Layer (SSL) before user data can be transferred? Explain SSL initialization communication flow between client and server. **[8]**

Q2) a) List five ways to mitigate threats from TCP attacks. What is one technique that can reduce attacks from IP, TCP and UDP? **[8]**

b) What was the original set of criteria used by NIST to evaluate candidate AES Cipher? Explain. **[8]**

Q3) a) Explain why data link layer tightly coupled with physical layer. Describe a physical layer medium that cannot be adequately managed by the IEEE 802.3 MAC? **[8]**

b) List and explain various primitive operations are used in Blowfish? **[8]**

Q4) a) Software, hardware, network, data, and peoples are the five important components of an information system. Which are the most directly affected by the study of computer security? Explain. **[8]**

b) Perform encryption and decryption using RSA algorithm. For the following P = 7, q = 11, e = 17 and M (plain text) = 8. **[8]**

P.T.O.

Q5) a) What metrics are useful for Profile Based Intrusion Detection? **[8]**

b) What is double DES and triple DES? What kind of attack on double DES makes it useless? **[10]**

SECTION - II

Q6) a) Draw a simple, Internet base consumer to business e-commerce system that has a one supplier server and many local customers. List and explain all the security risks you can think off. **[10]**

b) What is VPN? Why should user VPNs require strong authentication? Which authentication mechanisms are best for a user VPN? **[8]**

Q7) a) Buffer overflows are one type of programming flaw exploited by hackers. What portion of memory is a real target in buffer overflow attack? What type of variable is targeted in a buffer overflow attack? **[8]**

b) What is a malicious code? Name and explain different types of malicious code. **[8]**

Q8) a) IPSec and IPv6 include equivalent security features such as key exchange, encapsulation, tunneling and encryption. Discuss the tradeoff between IPSec and IPv6. **[8]**

b) What is PGP? Explain with example the reasons for using PGP? **[8]**

Q9) a) User A & B exchange the key using Diffie Hellman algorithm. Assume $a = 5$, $q = 11$, XA = 2, XB = 3. Find YA, YB, K. **[8]**

b) What do you mean by security association? Specify the parameters that identify the security association? **[8]**

Q10)a) Name the symmetrical and asymmetrical cryptographic algorithms? Cryptographic hash functions are commonly used for storing passwords. Examples include /etc/passwd (using crypt or MD5) and LDAP (using SHAl). Why encryption algorithms such as DES or AES not used for storing passwords? **[8]**

b) Define Biometrics and distinguish between two broad categories of the techniques. **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1487

[3865] - 798

M.E. (Instrumentation) (Process & Biomedical)

INDUSTRIAL AUTOMATION

(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Classify system elements of typical DCS. Enlist functions of each element. Elaborate anyone with suitable sketch. **[16]**

Q2) a) Develop Programmable Ladder diagram for mixing of two liquids as per given sequence :

When the start P.B. is pressed, the inlet valve A switches ON till the middle level sensor has not sensed the liquid. When middle level is sensed inlet valve B switches ON till the high level sensor has not sensed the liquid. Then the motor spins the stirrer for 10 seconds for mixing of both the liquids. After this drain valve switches ON and remains on till the low level is not reached. **[8]**

b) Explain with suitable block diagram, data flow and number conversions involved in analog I/O operation of PLC. **[8]**

Q3) What is the significance of SPC in Process Plants? Elaborate with the different type of charts used. **[16]**

P.T.O.

Q4) Design and develop Feedback PI control of Flow Loop using PID block of PLC. **[18]**

SECTION - II

Q5) What is OPC? Explain in brief OPC data model. Illustrate with suitable example OPC client server architecture. **[16]**

Q6) Explain in brief related to DCS system : **[16]**

a) Database organization.

b) Data communication links.

Q7) Describe in brief power plant process. Develop DCS based automation strategy for the power plant control. **[18]**

Q8) Write notes on : **[16]**

a) Fuzzy Logic Controller.

b) SCADA.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1492

[3865]-703

M.E. (Chemical Engineering)

FLUIDIZATION ENGINEERING

(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define fluidized state and regimizaton of fluidized state. Discuss the same . **[8]**

b) Discuss the operating model for fluidization system. **[8]**

Q2) a) What are the applications of fluidization system? **[8]**

b) Hydrodynamics of fluidization systems. **[10]**

Q3) What are the different flow models? Discuss the generalized wake model and Davidson model. **[16]**

Q4) Explain the following in details; **[16]**

a) Incipient fluidization.

b) Pressure fluidization.

P.T.O.

SECTION - II

Q5) a) Derive the equation for minimum fluidization velocity. **[9]**

b) A fluidized bed consisting spherical particles of diameter 1.2 mm and density 1100 kg/m^3 is fluidized by fluid. The density of fluid is 900 kg/m^3 and viscosity 1mN-s/m^2. The fractional voidage is 0.5. Determine the minimum fluidization velocity of fluid. **[9]**

Q6) Discuss the following in details and write all necessary equations : **[16]**

a) 2 phase & 3 phase inverse fluidized bed.

b) Immersed horizontal cylinder-to-bed heat transfer.

Q7) Derive the kinetic model for conversion of shrinking and growing particle in fluidization. **[16]**

Q8) Write short notes on : **[16]**

a) Modeling by bed collapsing.

b) Geldart's classification for power assessment.

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Total No. of Questions : 12] **[Total No. of Pages : 3**

P1499

[3865]-826
M.E. (Polymer)
POLYMER PHYSICS & CHARACTERISATION
(2008 Course) (509108)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn, wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare the properties of polymer solution and low molecular weight substances. **[8]**

b) Explain the concept of cohesive energy density (CED). What are the various assumptions in Hildebrand theory of solutions? **[5]**

c) What do understand by Solubility Parameter? Explain the method to measure solubility parameter. **[5]**

OR

Q2) a) Starting with Einstein's model for solution viscosity derive the relation between radius of macromolecule and the solution viscosity. **[10]**

b) Give brief account of statistical thermodynamics of polymer solutions. **[8]**

Q3) a) Explain the terms electrical resistivity and angle of loss tangent. **[4]**

b) What is the equilibrium contact angle? Correlate it with the printability on polymer. **[4]**

c) Explain the following properties and how they are measured. **[8]**

i) DMA, ii) Creep,

iii) Refractive index, iv) Transmittance.

P.T.O.

OR

Q4) a) Enlist various methods for detecting viscoelastic transitions in polymers. Explain the electrical method in detail. **[8]**

b) Explain the principle of pyrolysis gas chromatography. How it can be used to study of polymer degradation? **[8]**

Q5) a) A blend of PP and LDPE was subjected to DSC analysis. From the DSC scan of 10.5 mg of this sample following data was obtained **[8]**

Area under Endothermic Peak (mJ)	Transition temperature (°C)	Enthalpy of fusion, ΔH (J/g)
1660	170	100 for PP
125	110	7.0 for LDPE

Using above data calculate the percent composition of the blend.

b) Explain TGA and DTG techniques. How these are applied to polymer analysis? **[8]**

OR

Q6) a) What is kinetics of crystallization? Enlist three models used for understanding of polymer crystallization. How DSC technique can be employed for studying kinetics of crystallization for polymers? **[8]**

b) Explain the use of TGA and DTGA for the analysis of polymers. **[8]**

SECTION - II

Q7) a) Explain in brief GPC and HPLC techniques. What type of information can be obtained from them? **[8]**

b) Discuss any five methods of the following the for fractionation of polymer. **[10]**

i) Solubility
ii) Chromatography,
iii) Sedimentation,
iv) Diffusion,
v) Ultrafiltration,
vi) Zone melting.

OR

Q8) a) Discuss electron microscopy and optical microscopy techniques. **[5]**

b) What is the role of elemental analysis in the identification of polymers? **[5]**

c) Explain the electrical properties of polymers, that play critical role when the polymer is used in electrical applications. **[8]**

Q9) a) Describe various techniques using X-rays for the characterisation of polymeric materials. **[8]**

b) Explain the role of proton NMR spectroscopy in modern polymer research. **[8]**

OR

Q10) a) Is possible to quantify the number of end groups using instrumental techniques. Discuss. **[8]**

b) Explain the role FTIR spectroscopy in modern polymer research. **[5]**

c) How will you differentiate between PMMA and Poly vinyl alcohol using IR? **[3]**

Q11) a) Using Maxwell Model, obtain expression for dynamic stress relaxation. **[7]**

b) Discuss in short, creep response of Voigt-Kelvin model. **[5]**

c) Explain in short the term “Loss tangent”. **[4]**

OR

Q12) a) Explain the effect of temperature on storage and loss moduli and on the relaxation time. **[7]**

b) Explain in short the term “Linear viscoelasticity”. **[5]**

c) Discuss the effect of Polydispersity index on viscosity. **[4]**

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1503

[3865] - 837

M.E. (Printing Engineering & Graphic Communication)

MODERN TRENDS IN PRINTING

(New) (2008 Course) (508103)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain offset printability and printing defects. **[9]**

b) Explain principles of drying in offset printing. **[8]**

c) Explain difference between inks used for publication, packaging and product printing. **[8]**

Q2) a) Why flexo is more suitable for label printing? **[9]**

b) Explain construction and benefits of annilox roller. **[8]**

c) Explain conventional and digital flexo plate making. **[8]**

Q3) a) Explain the process of formulation of Gravure Inks. **[9]**

b) Explain use of Doctor blade, its purpose and various types. **[8]**

c) Explain printing defects in Gravure printing. **[8]**

P.T.O.

SECTION - II

Q4) a) Explain various types of elastomers used in printing for impression rollers. **[8]**

b) Explain the effect of NIP width on printing. **[8]**

c) Explain the concept of rubber hardness and its effect on quality of printing. **[9]**

Q5) a) Explain limitations of common shaft drive? **[10]**

b) Discuss electronic line shaft drive system used in Gravure. **[10]**

c) Explain pneumatic system used in printing. **[5]**

Q6) a) What are the deciding factors for material handling equipment used in printing shop? **[10]**

b) Explain the effect of climate control on printing. **[8]**

c) Explain preventive maintenance system used in printing press. **[7]**

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1508

[3865]-844

M.E.

(Printing Engineering & Graphic Communication)

PRINT MEDIA COMMUNICATION

(2008 Course) (508108)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections must be written in separate answer papers.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain advantages & disadvantages of PDF/x formats. **[15]**

b) What are the technical skills required for different substrates/surfaces. **[10]**

Q2) a) How designs are created by using personel skills? **[10]**

b) Explain difference in skills required for Paper, Textile, Ceramics and plastics. **[8]**

c) Explain advantages of human vision system. **[7]**

Q3) a) What are the problems of Creative Media? **[15]**

b) Explain CIE system in Graphic art Industry. **[10]**

P.T.O.

SECTION - II

Q4) a) Explain concept of book design for children. **[10]**

b) Explain consideration used for cover design. **[8]**

c) What types of instruments used for measurement of print quality? **[7]**

Q5) a) How new paper is designed by using I.C.C. colour management? **[10]**

b) What is I.S.O. work flow? **[8]**

c) How cymk/rgb profile is used to design single page? **[7]**

Q6) a) Explain different softwares used for designing news paper. **[10]**

b) What is digital proof concept? **[8]**

c) Explain colour image processing. **[7]**

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Total No. of Questions : 10] **[Total No. of Pages : 4**

P1525

[3865] - 495

M.E. (Mechanical)

(Design Engineering Common to Automotive Engineering)

MATHEMATICAL MODELLING AND ANALYSIS

(2008 Course) (502201) (Part - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn with pencil wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary. But mention it clearly.***
6) ***Use of scientific calculator is allowed.***

SECTION - I

Q1) a) Compare Signal Flow Graphs and Linear Graphs. Write three points of comparison and one example each. **[8]**

b) Apply Block Diagram algebra to deduce expression for c/r for the block diagram shown in Figure Q2 (a). **[10]**

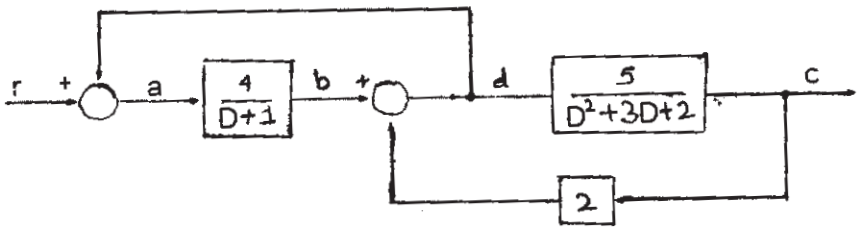


Figure Q 2 (a) Block Diagram

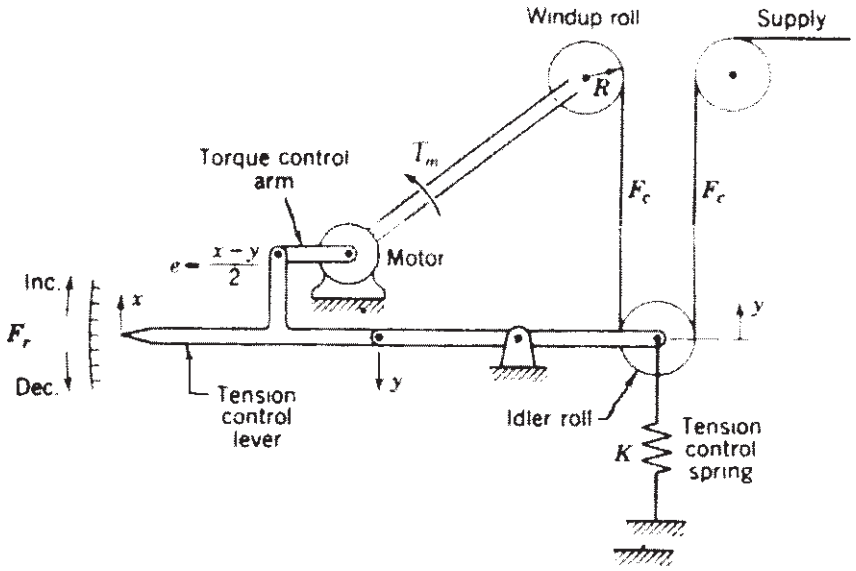
Q2) The state space representation for a system is $x = Ax + bf(t)$ expressed as

$$\begin{Bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{Bmatrix} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} \begin{Bmatrix} x_1 \\ x_2 \end{Bmatrix} + \begin{Bmatrix} 0 \\ 1 \end{Bmatrix} f(t)$$

Write matrix relationships (equations). Apply Laplace transforms to obtain $X_1(s)$ $X_2(s)$. Construct signal flow graphs. Using Mason's Gain formula to obtain $\phi(s) = [sI - A]^{-1}$ (i.e. e^{At}). **[16]**

P.T.O.

Q3) a) Figure Q3 (a) shows a tension regulating apparatus such as is used in the paper industry. To ensure uniform winding, it is necessary to maintain a constant tension F_c as the sheet is being wound on the windup roll. To increase the tension in the paper the tension control lever is raised. This raises the torque control arm of the motor, which increases the torque T_m applied by the motor to the windup roll. The change in torque provided by the motor is $T_m = K_m e/(1 + \tau D)$. For the windup roll, it follows that $F_c = T_m/R$ where R is the radius of the wheel. Determine the overall block diagram relating a variation. **[6]**



f_c to the reference or desired tension to a variation of the controlled tension f_c

Figure Q1 (b) Tension Control Apparatus.

b) For Series Programing used in State Space Methods it follows that for $(D^2 + a_1 D + a_2)y(t) = (b_1 D + b_2)f(t)$ **[10]**

The matrix relationships are

$$\begin{Bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{Bmatrix} = \begin{bmatrix} -a_1 & 1 \\ -a_2 & 0 \end{bmatrix} \begin{Bmatrix} x_1 \\ x_2 \end{Bmatrix} + \begin{Bmatrix} b_1 \\ b_2 \end{Bmatrix} f(t) \text{ and } y(t) = x_1$$

Apply to following equation to obtain matrix relationships. Draw block diagrams for these equations

$$y(t) = \frac{D+3}{(D+1)(D+2)} f(t)$$

Q4) a) The block diagram of some system is represented in Figure Q 4 (a). Construct signal flow graph and obtain $y(t)/f(t)$. **[8]**

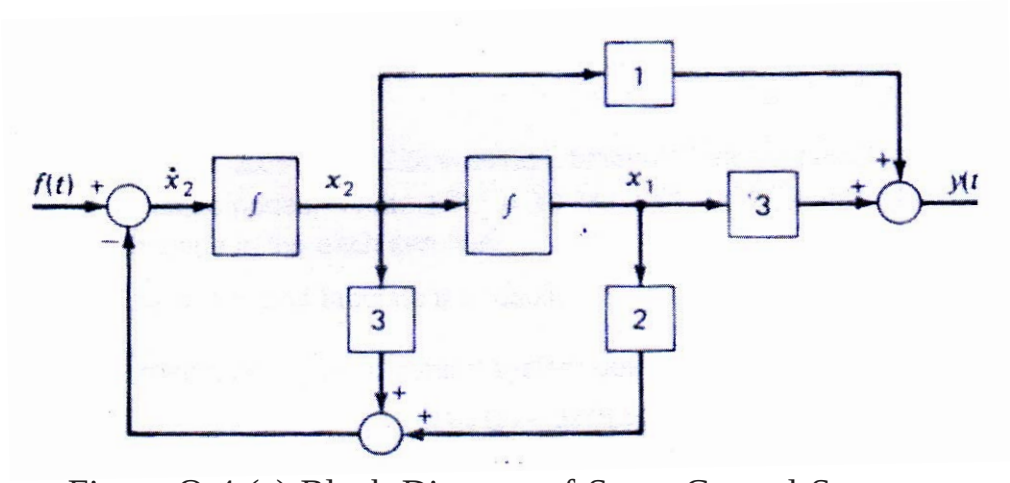


Figure Q 4 (a) Block Diagram of Some Control System

b) Describe cause variable and effect variables with two examples of each. **[8]**

Q5) a) Compare static and dynamic systems with three points of comparison and one illustration of each. **[6]**

b) For the MIMO system shown in Figure Q 5 (b) obtain. **[10]**

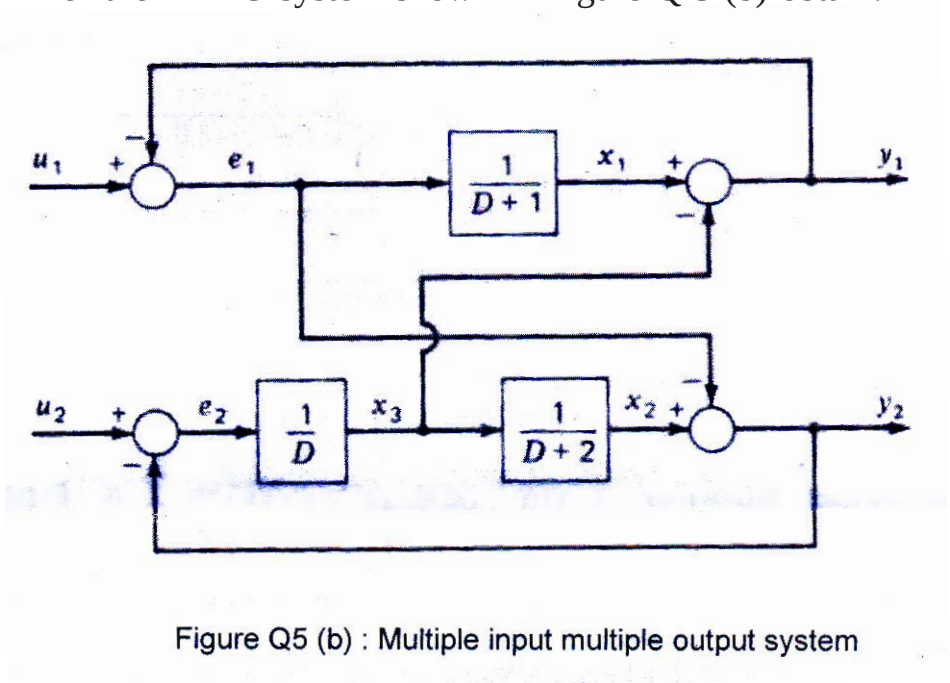


Figure Q5 (b) : Multiple input multiple output system

SECTION - II

Q6) Consider a thin plate with 10 cm length, 10 cm width. The left vertical edge (x = 0) is constrained at 100°C, top horizontal edge (y = 10) is constrained at 75°C, right vertical edge (x = 10) is constrained at 50°C and bottom horizontal (y = 0) is maintained at 125°C. **[18]**

To solve the governing differential equation

$$\frac{\delta^2 T}{\delta x^2} + \frac{\delta^2 T}{\delta y^2} = 0$$

Discritize with grid of $\Delta x = \Delta y = 2.5$ cm using Libmann's Method calculate the temperature of inside nodes. With $T^{New} = \lambda T^{New} + (1 - \lambda)T^{old}$ and $\lambda = 1.25$ over relax each value in the each iteration
Compute four iterations and tabulate the result.

Q7) a) Determine the response of speed control system described by **[8]**

$$N_0(s) = \frac{3N_{in}(s) - 3sU(s)}{s^2 + 4s + 3}$$

For $N_{in} = 1/s$ and $U(s) = 0$

b) Determine the inverse Laplace of **[8]**

$$Y(s) = \frac{75}{(s+6)(s^2 + 4s + 13)}$$

Q8) a) Determine z transform of $f(t) = t$. **[4]**

b) Determine inverse z transform of **[4]**

$$C(z) = z\left[\frac{(z-2)}{(z-0.5)^2(z-1)}\right]$$

c) Determine inverse z transform of **[8]**

$$C(z) = z\frac{z - 0.7}{(z^2 + 0.6z + 0.25)(z + 0.5)}$$

Q9) a) Write in brief the over relaxation method used in elliptic partial differential equations with significance and applications. **[8]**

b) Use of Fourier Transforms in Vibration Analysis. **[8]**

Q10)a) For $y = f(x) = 5x^2 + 12x + 1$ from $x = 0$ to 5, with $y(0) = 1$, employ R-K method to evaluate the integral with $h = 2.5$. **[8]**

b) Write a short note on Simulation techniques used in Design Engineering. **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1526

[3865]-475
M.E. (Mechanical Engineering) (Heat Power)
NUMERICAL METHODS IN THERMAL AND FLUIDS ENGINEERING
(2008 Course) (502101)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Consider the function

$f(x, y) = x^4y^2 + 2xy + y^2$

Evaluate the double integral (from 0 to 1 in x and y)

$$\int_0^1 \int_0^1 f(x,y)dxdy$$

using :

a) Using Trapezoidal rule with $\delta x = \delta y = 0.5$ **[5]**

b) Using Trapezoidal rule with $\delta x = \delta y = 0.25$. **[12]**

Q2) The volume V of liquid in a spherical tank of radius r is related to the depth h of the liquid by

$$V = \frac{1}{3}\pi h^2(3r - h)$$

a) Determine h given r = 1.0 m and V = 0.75 m^3. **[12]**

b) Repeat the same for r = 1.15 m. **[4]**

P.T.O.

Q3) The variable y is given as a function of x at the following points :

x	0	1	2
y	1.2	1.7	2.8

a) Fit a quadratic spline through these points. **[10]**

b) Form the equations for the cubic spline. The solution for the cubic spline constants is not required. **[6]**

Q4) Consider one dimensional transient conduction in a rod of 1m length, given by

$$\frac{\partial T}{\partial t} = \alpha \frac{\partial^2 T}{\partial x^2}$$

The boundary and initial conditions are

- T = 20 at t = 0 (initial condition).
- T = 0 at x = 0 (boundary condition)
- T = 70 at x = 1 (boundary condition)

Choose δx = 0.25 m and δt = 0.02s. Take α = 1 m^2/s.

a) Using the explicit method, advance by two time steps and determine the temperature field at t = 0.04s. **[12]**

b) Form the equations for the semi-implicit scheme for one time step. The solution is not required. **[5]**

SECTION - II

Q5) Consider the system Ax = b, where matrix A is given by $A = \begin{bmatrix} 2 & 1 & -1 \\ 2 & 4 & 1 \\ 1 & 2 & 3 \end{bmatrix}$

and the vector b is given as $b = \begin{bmatrix} 2 \\ 1 \\ 1 \end{bmatrix}$

and $x = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$

Solve for x using LU decomposition. **[16]**

Q6) Consider the matrix A given by

$$A = \begin{bmatrix} 2 & 1 & -1 \\ 2 & 4 & 1 \\ 1 & 2 & 3 \end{bmatrix}$$

a) Determine the maximum eigen value using the Power method. **[6]**

b) Determine the minimum eigen value using the Power method. The LU decomposition in Question 5 can be utilised, if required. **[11]**

Q7) Consider the equation

$$\frac{d^2x}{dt^2} + 5x\frac{dx}{dt} + (x + 7)\sin(\omega t) = 0$$

with initial conditions $\frac{dx}{dt} = 2$ and $x = 4$ at t = 0.

a) Decompose the equation into 2 first order equations. **[2]**

b) Integrate using Forward Euler with stepsize $\delta t = 0.2$ from $t = 0$ till $t = 1$. **[15]**

Q8) Consider steady state conduction given by the Laplace equation in a square of 1m length. The boundary conditions are as follows :

- T = 125 for $y = 0$, $0 \le x \le 1$
- T = 90 for $y = 1$, $0 \le x \le 1$
- T = 170 for $x = 0$, $0 \le y \le 1$
- T = 240 for $x = 1$, $0 \le y \le 1$

With $\delta x = \delta y = \frac{1}{3}$,

a) Form the equations at the interior nodes. **[8]**

b) Carry out 2 cycles of iteration, using the relaxation method. **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1550

[3865]-203
M.E. (Computer Engineering)
DISTRIBUTED OPERATING SYSTEMS
(Revised Course 2002) (510102)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Attempt any three questions from section - I and three questions from section -II.***
2) ***Answers to the both sections should be written in separate answer sheets.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable pocket calculator is allowed.***

SECTION - I

Q1) a) What is the role of distributed objects? Which objects are more suitable in a distributed system? Are the objects different from traffic agents. **[8]**

b) What are the types of RPC messages? How server management is achieved in RPC? **[8]**

Q2) a) Distributed systems are less secured as compared to centralized systems. Give the reasons to justify or nullify the statement. **[8]**

b) Describe the Bully and Ring algorithms and state the time complexity of both algorithms. **[8]**

Q3) a) Explain the following design issues for distributed operating system. **[8]**

i) Reliability.

ii) Flexibility.

b) What are the models for organizing the threads? What are the issues in designing the thread package? **[8]**

P.T.O.

Q4) a) Explain the distributed approach for mutual exclusion along with suitable cases. **[8]**

b) What is drifting of clocks? What is the difference between centralized and distributed algorithms for clock synchronization? **[10]**

SECTION - II

Q5) a) Describe the implementation of logical clocks using : **[8]**

i) Counters.

ii) Physical clocks.

b) Why message ordering is important in distributed system? Does it affect the response time of network. **[8]**

Q6) a) Discuss the relative advantages and disadvantages of using the NRNMB, NRMB, RMB and RNMB strategies in the design of a DSM system.**[8]**

b) Explain the hardware and software architecture of Amoeba OS. How is object management achieved in Amoeba OS? **[8]**

Q7) a) Prove that the existence of a cycle in a general resource allocation graph is a necessary but not a sufficient condition for the existence of a deadlock. **[8]**

b) Explain the following factors for the file accessing models : **[8]**

i) Remote file access.

ii) Unit of data transfer.

Q8) a) What is RMI? What is the difference between static and dynamic RMI? **[8]**

b) Explain the implementation of sequential consistency model. **[10]**

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Total No. of Questions : 9] **[Total No. of Pages : 3**

P1556

[3865] - 21
M.E. (Civil) (Hydraulics)
SEDIMENT TRANSPORT & RIVER MECHANICS
(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State the various approaches to the initiation of sediment motion. Explain in detail "shields' analysis" for the initiation of sediment motion. **[12]**

b) For a 2 mm diameter sediment particle, what is the critical shear stress at 20°C? **[4]**

Q2) a) Draw neat sketches indicating the various flow regimes with changing flow conditions and explain each of them briefly. **[10]**

b) How do form resistance and grain resistance vary in different regimes of flow? **[6]**

Q3) a) Briefly explain the various modes of sediment transport. **[8]**

b) Using Meyer-Peter and Müller method, estimate the bed load transport of sediment in an alluvial channel, 150 m wide and 3 m deep carrying a discharge of 375 m^3/s. The channel bed slope is 1 in 3600 and the mean size of the sediment is 0.3 mm. **[8]**

P.T.O.

Q4) a) What are the regime methods of design of stable channels in alluvial soil? **[6]**

b) Compare Kennedy's method and Lacey's method. **[4]**

c) Design a stable channel in alluvial soil to carry a discharge of 550 m^3/s by using Lacey's method. The mean size of sediment particles is 0.04 mm. **[8]**

Q5) Write short notes on the following : **[16]**

a) Garde-Ranga Raju's method of resistance analysis.

b) Assumptions in Einstein's bed load function.

c) Suspended load distribution.

d) Use of remote sensing in determining the sediment load.

SECTION - II

Q6) a) On the basis of hydraulic aspects, explain the phenomenon of aggradation and degradation. **[8]**

b) In a wide alluvial stream, a suspended load sample taken at a height of 0.33 m above the bed indicated a concentration of 1100 ppm of sediment by weight. The stream is 5.0 m deep and has a bed slope of 1/3600. The bed material can be assumed to be uniform size with a fall velocity of 2.2 cm/sec.

Estimate concentration of sediment at mid depth. Assume K = 0.4.**[8]**

Q7) a) What is bifurcation? What is confluences? Explain their practical significance. **[8]**

b) State causes and controlling measures of silting of reservoirs. **[8]**

Q8) a) Explain any four types of classifications of river training works. **[8]**

b) Define : **[8]**

i) Meander length. ii) Meander belt.

iii) Tortuosity. iv) Cut off ratio.

Q9) Write short notes (any three) : **[18]**

a) Groynes-concepts-applications-types.

b) Pitched island.

c) Bed load measurements.

d) River gauging by ultrasonic method.

e) Elements of river morphology.

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Total No. of Questions : 6] **[Total No. of Pages : 3**

P1560

[3865] - 34

M.E. (Civil) (Structures)

REINFORCED CONCRETE AND PRESTRESSED CONCRETE STRUCTURES

(2002 Course)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of IS 456, IS 1343, IS 3370 & non programmable calculator is allowed.***
5) ***Neat diagrams must be drawn wherever necessary.***
6) ***Assume any other data if necessary.***

SECTION - I

Q1) a) Design a slab using yield line theory for a hall of size 5.4 m × 5.5 m c/c fixed at all sides. Use M20 Fe500 take Live load = 5 kN/m^2 & floor finish load = 1 kN/m^2. Draw details of reinforcement. **[10]**

b) Design a grid slab for a floor of a hall 15m × 12m c/c having square grid of 1.5m. Use M20 Fe500 take Live load = 4.5 kN/m^2 & floor finish load = 0.80 kN/m^2. Apply the required check & draw reinforcement details. **[15]**

Q2) Design a bell type RCC shear wall for length 4m, thickness 230 mm for the following.

Axial forces of 1900 kN and 200 kN due to dead & live load and due to seismic load respectively.

Bending moment of 450 kNm and 4000 kNm due to dead & live load and due to seismic load.

Respectively Use M20 Fe 415, draw reinforcement details. **[25]**

P.T.O.

Q3) Design a Intze type ESR for 4.5 lakh liters with staging height 12m using M25, Fe500 Design must include Analysis and Design calculations of Top dome, top ring beam, cylindrical wall, Middle level ring beam, Conical & bottom dome of the tank. Draw details of reinforcement at salient points. **[25]**

SECTION - II

Q4) Design intermediate post tensioned prestressed concrete 'T' section roof beam of a hall for flexure and shear for the following.

Clear span = 13m, width of support = 400mm, spacing of beams 3.5m c/c, RCC slab thickness 130 mm, live load on slab 1.5 kN/m^2, water proofing load on slab = 1.0 kN/m^2, concrete grade M40 HT steel is Multi-strand cables S4 (having 4 strands of l50mm^2) with fy = 1900 N/mm^2, stressed up to 75% of 'fy' do not consider the composite action Design must include detail load, bending moment calculation, Check fiber stresses in concrete and deflection. Draw sketches showing cable profiles. **[25]**

Q5) a) Explain in detail with proper sketches, segmental construction of prestressed concrete fly over bridge box girder. **[10]**

b) The cross section a composite beam of a T section having a pre-tensioned rib of 250 mm wide and 500 mm depth with M45 and cast in situ slab (flange) 1500 mm wide and 120 mm thick with M20. The rib is prestressed with 20 wires of 7 mm dia. with ultimate tensile stress of 1500 N/mm^2.

Calculate the moment of resistance of the composite section assuming that there is sufficient vertical reinforcement at the junction to avoid the shear failure of the beam. **[15]**

Q6) a) Design post tensioned prestressed concrete slab for a floor of shopping mall for the following :

Isolated clear spans of 8m × 8m width of supporting beam on all sides 400 mm, live load on slab 5 kN/m^2, floor finish load on slab = 1.2 kN/m^2, concrete grade M45 HT steel is cables of cross sectional area 100 mm^2 with fy = 1900 N/mm^2.

Design must include check fiber stresses in concrete and deflection design of end block. Draw sketches showing cable profiles. **[18]**

b) Explain in detail with proper sketches, manufacturing process of prestressing of pre tensioned sleepers. **[7]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1564

[3865] - 49
M.E. (Mechanical-Heat Power)
ADVANCED THERMODYNAMICS
(2002 Course) (502103)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) In a rotary compressor, air enters at 1.0 bar, 21°C where it is compressed adiabatically to 6.6 bar & 250°C. Calculate the entropy production & irreversibility for 2kg per second of air flow. The atmosphere is at 1.03 bar and 20°C. Neglect K.E. changes. **[8]**

b) Write a note on availability & irreversibility. Explain availability function for closed & open system. **[8]**

Q2) a) Explain Helmholtz & Gibb's function. **[5]**

b) State the significance of first law efficiency & second law efficiency. **[5]**

c) Show that for an ideal gas, the slope of constant volume line on "T-s" plane is more than that of constt press line. **[6]**

Q3) a) State & explain law of corresponding states. Also explain generalized compressibility chart with suitable sketch. **[7]**

b) Derive clausius-clayperon equation. State any one application with suitable example. **[9]**

P.T.O.

Q4) Write short notes on (any three) : **[18]**

a) Joule-Thompson coeff.

b) Enthalpy departure.

c) Maxwell-Relations.

d) Vander Waal's Equation of state.

SECTION - II

Q5) a) A mixture of ideal gases consists of 3kg of nitrogen and 5 kg of carbondioxide at a pressure of 3 bar & 20°C temp. **[10]**

Find : - i) Mole fraction of N_2 and CO_2.

ii) Equivalent molecular weight of mixture.

iii) Partial pressures & partial volumes.

iv) volume & density of the mixture.

b) What is fugacity & activity? Explain. **[6]**

Q6) Explain in brief : **[16]**

a) Heat of reaction.

b) Adiabatic flame temperature.

c) Law of mass action.

Q7) a) Explain Maxwell Boltzmann statistics & Bose Einstein statistics. **[8]**

b) For a chemical reaction, $CO_2 + H_2 \rightleftharpoons CO + H_2O$, the equilibrium value of degree of reaction is 0.58.

Determine Equilibrium constant. **[8]**

Q8) Write short notes on (any three) : **[18]**

a) Fermi-Dirac statistics.

b) Amagat 'law & Kay's rule.

c) Gibb's phase rule.

d) Third law of thermodynamics.

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1566

[3865] - 58

M.E. (Mechanical) Heat Power

ADVANCED AIR CONDITIONING HEATING & VENTILATION

(New 2002 Course) (Elective - II) (502110)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, Psychrometric chart and tables electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the terms : Absolute humidity, Relative humidity, Specific humidity and Thermodynamic wet bulb temperature. **[8]**

b) Explain the Thermodynamics of human body and concept of effective temperature. **[10]**

Draw the comfort chart published by ASHRAE and discuss its use.

Q2) An air conditioning system is to be designed using the following data :**[16]**

Indoor Conditions : 24°C DB and 60% RH

Outdoor conditions : 38°C DB and 28°C WB

Infiltration air :1200 m^3/h and ADP 10°C.

Room sensible heat load = 46.4 kW and LH load = 11.6 kW

Recirculated air : 60%

Recirculated air is mixed with conditioned air after cooling coil, find the following :

a) Condition of air leaving the coil.

b) Condition of air entering the hall.

c) Mass of air entering the cooling coil and system.

d) Bypass factor.

e) Refrigeration load in TR.

P.T.O.

Q3) a) Discuss the different methods of duct design. **[8]**

b) A rectangular duct of 400 mm × 300 mm size carries 1.25 m^3/s of air having density of 1.15 kg/m^3. Determine the equivalent diameter of a circular duct if same quantity of air is carried with same pressure drop. Derive the expression you use. **[8]**

Q4) Write notes on : **[16]**

a) Sources of noise in Air conditioning plants.

b) Methods of noise prevention.

c) Types of grills, diffusers and registers.

SECTION - II

Q5) a) Explain different types of fans used in Air conditioning practice and their characteristics. **[8]**

b) Discuss the effect of change in speed on fan operation. **[4]**

c) Explain showing the characteristics the fan operation in series and parallel. **[6]**

Q6) Giving the requirements of air conditioning systems, explain the typical systems, showing layout for any two of the following : **[16]**

a) Automobiles.

b) Railway coach.

c) Air-Planes.

Q7) Write notes on any four : **[16]**

a) Air washers.

b) Cycling and sequence controls.

c) Humidistats.

d) Modern controls for purity and odour.

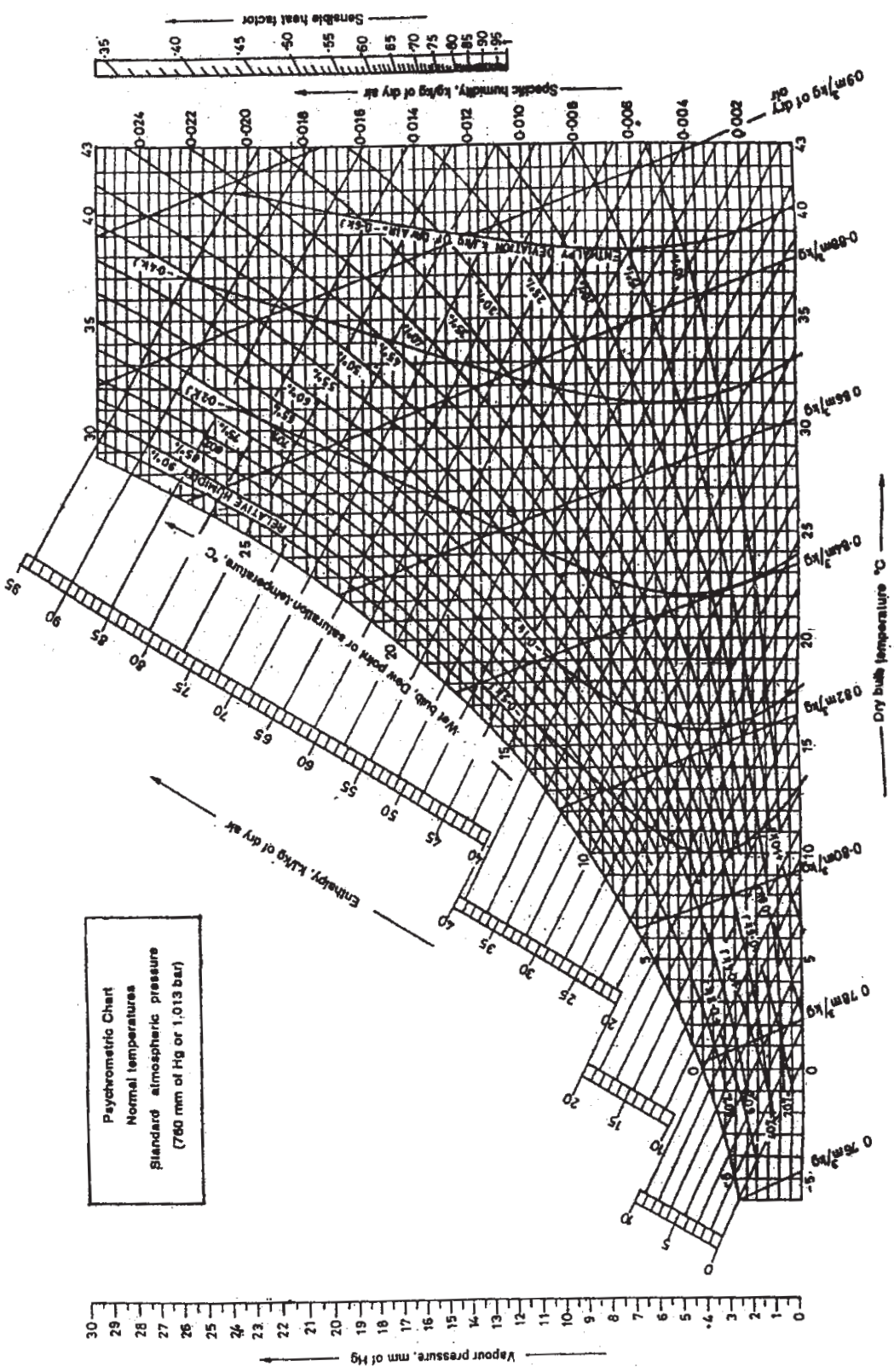
e) Various types of filters.

Q8) Explain : **[16]**

a) Basic Psychrometry of evaporating cooling.

b) Requirements of ventilation air.

c) Various sources of infiltration air.


Psychrometric Chart
Normal temperatures
Standard atmospheric pressure
(760 mm of Hg or 1,013 bar)
Enthalpy, kJ/kg of dry air
Wet bulb, Dew point or saturation temperature, °C
Dry bulb temperature °C
Specific humidity, kg/kg of dry air
Sensible heat factor
Vapour pressure, mm of Hg
RELATIVE HUMIDITY
ENTHALPY DEVIATION kJ/kg OF DRY AIR

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1579

[3865] - 143

M.E. (Elex-Digital Systems)

MULTIMEDIA TECHNIQUES

(Revised Course 2002)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) How does multimedia computing differ from any other computing? What are the hardware & software components of a multimedia platform? Using block diagram explain the functions of multimedia development system. **[10]**

b) Explain the terms hypertext, hypermedia & multimedia & comment on their interrelation. **[8]**

Q2) a) Explain the principle of ADPCM used for voice coding. What will be the performance improvement over plain PCM given by an ADPCM coder for a white Gaussian noise input? **[8]**

b) What are the different types of data blocks of VOC file format? Compare VOC with WAV. **[8]**

P.T.O.

Q3) a) What are the different types of pictures defined in MPEG - I standard for trade-off between coding efficiency & random access? Briefly explain the interdependance among these picture types in a typical video sequence. **[8]**

b) Justify : **[8]**

i) MPEG recommends to exploit spatial & temporal redundancies in a video sequence.

ii) Graphics primitives & their attributes are not represented by bitmaps.

Q4) a) Explain the header of JPEG file . **[8]**

b) Write short notes on : **[8]**

i) Two dimensional logarithmic search.

ii) Entropy based coding.

SECTION - II

Q5) a) Draw a neat block diagram of PAL encoder & explain function of each block. **[8]**

b) Compare NTSC, PAL & SECAM color TV systems. **[6]**

c) State the factors that affect the gap-width in magnetic head of a typical video cassette recorder. **[4]**

Q6) a) What are the block level elements in an HTML document? Using neat diagram explain attributes of a block level element. Which is the special tag available to create blocks for DHTML capable browsers? **[8]**

b) Differentiate between magnetic & optical storage media for multimedia data. State the selection criteria for storage media with typical application. **[8]**

Q7) a) Draw a neat block diagram of sound card & explain function of each block. State the different factors deciding quality of sound. **[8]**

b) What is 3D sound? How does a human being determine a position of a sound source? Does ITD's provide any information for locating a sound source directly in front or behind? Justify. **[8]**

Q8) a) With the help of generic block diagram of video compression explain how the compression is carried out? Discuss briefly the different compression techniques. **[8]**

b) Explain the concept of audio-visual objects in MPEG-4. How does it offer an interactive feature to the user of MPEG-4 decoder? **[8]**

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1586

[3865] - 175
M.E. (Electrical) (Power System)
POWER SYSTEM PROTECTION
(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain importance of fault analysis. **[5]**

b) Explain directional over current relay. **[10]**

c) Explain classification and components of static relays. **[10]**

Q2) a) Explain modelling and standards of CT^s and PT^s. **[10]**

b) Explain mixing transformer. **[5]**

c) Write a note on simulation of transients. Explain what is flux swing. **[10]**

Q3) a) Derive from fundamentals the generalised expression for radius of circle and co-ordinates of the centre of a dual input amplitude comparator. **[10]**

b) Explain following static distance relays : **[15]**

i) Impedance Relay.

ii) Reactance Relay.

iii) Mho relay.

P.T.O.

SECTION - II

Q4) a) Explain digital protection based on fundamental signal. **[5]**

b) Explain setting and synthesizing relay characteristics w.r.t. distance relays. **[8]**

c) Explain three stepped distance protection scheme of transmission line. **[12]**

Q5) a) Explain w.r.t. protection of power transformer : **[13]**

i) Magnetising inrush current.

ii) Overfluxing protection.

b) Explain schemes used in digital protection of transformer. **[12]**

Q6) Write notes on : **[25]**

a) Buchholz Relay.

b) Digital protection of synchronous generator based on second harmonic injection.

c) Static quadrilateral distance relay.

d) Modern bus bar protection.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1658

[3865] - 520
M.E. (Mechanical) (Mechatronics)
MICROCONTROLLER
(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer papers.***
2) ***Attempt any three questions from each section.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare microprocessor and microcontroller. **[6]**

b) With the help of block diagram explain the architecture of 8051. **[10]**

Q2) a) Explain 4 modes of timers of 8051. **[8]**

b) With memory map explain internal memory organization of 8051. **[8]**

Q3) a) What is function of linker, loader, simulator and emulator? **[8]**

b) Explain following instructions of 8051 : **[8]**

i) SWAPA.

ii) DJNZ, Rn, label.

iii) XCHD.

iv) PUSHA.

Q4) Write short notes on : **[18]**

a) Features of 8051 microcontroller.

b) Logic analyzer.

c) In-circuit emulator.

P.T.O.

SECTION - II

Q5) a) Draw interfacing diagram for DAC to 8051. **[8]**

b) Explain different addressing modes of 8051. **[8]**

Q6) a) Compare features of 89C51RD with 8051. State which microcontroller is better. **[8]**

b) Draw the interfacing diagram of stepper motor to 8051 and explain the algorithm for rotating the stepper motor by 10 steps in forward direction. **[8]**

Q7) a) Explain the need of power saving modes in 8051. State and explain steps in using power down and ideal modes. **[8]**

b) List the features of I2C bus protocol. Explain how peripherals are addressed in I2C. **[8]**

Q8) Write short notes on : **[18]**

a) SPI.

b) RS 485.

c) PSW register in 8051.

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1682

[3865] - 671
M.E. (Computer)
WEB SERVICES AND SOA
(2008 Course) (510105) (Elective) (Theory)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Here is a definition of SOA.
Contemporary SOA represents an open, extensible, federated, composable architecture that promotes service-orientation, and is comprised of autonomous, QOS capable, vendor diverse, interoperable, discoverable and potentially reusable services, implemented as web services. EXPLAIN what you understand by above statement about SOA and its characteristics. Give examples for following four of above characteristics of SOA : interoperable, composable, open, and autonomous. **[12]**

b) Draw a diagram to depict the phases of an SOA delivery lifecycle and in couple of lines each describe each phase (Hint : analysis. administration). **[4]**

Q2) a) Explain what do you understand by registry, UDDI. **[4]**

b) State how WSDL and SOAP are useful in SOA design phase. **[4]**

c) Give a WSDL description of any service of your choice. **[4]**

d) Explain terms in brief : service activity, orchestration. **[4]**

P.T.O.

Q3) Illustrate following concepts with examples (diagrams if relevant) : **[16]**

a) Reliable messaging.

b) WSDL four basic patterns for message exchange (Hint solicit-response etc).

c) Business value of SOA through Integration of applications.

d) What are the issues that arise in service testing.

Q4) Write short notes on any three : **[18]**

a) SOA governance.

b) SOAP, WS-ATTACHMENTS.

c) Components of an SOA (process, service, message, operation).

d) Traditional middleware : RPC, RMI, .NET, CORBA, EJB.

e) ESB : mediation and QOS based routing.

f) Web Services Framework.

SECTION - II

Q5) In the context of web based applications, write briefly on : **[16]**

a) User-friendly, interactive, dynamic web sites.

b) What is AJAX and Need for it.

c) The Way Ajax technology works (CSS, javascript, DOM, XML..etc).

d) http protocol.

Q6) In brief explain : **[16]**

a) Concepts of, a service, publishing a service, discovery of a service and invocation of a service.

b) Three of the Software development life cycle Phases (requirements analysis, design, and architecture) with examples to illustrate.

c) What are BLOGS, and How BLOGS can be used by student leaders, teachers, principal in education setup.

d) Concepts of service level agreement and Quality of service.

Q7) Illustrate the following concepts with examples of your own : **[16]**

a) Business value of SOA : reduced time to market using reusability.

b) XML data and schemas for "savings account" in a hypothetical bank.

c) Loose coupling as a design principal.

d) RSS feeds.

Q8) Write short notes on any three : **[18]**

a) Web2.0 and user participation, collaboration.

b) Components and advantages of components in software field.

c) Nonfunctional Software requirements (Hint : quality attributes like performance, modifiability.) and their relationship to design, architecture.

d) Advantages, need, examples of SOA.

e) Security threats in web based systems and how to provide security.

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1764

[3865] - 442

M.E. (Civil/Hydraulics)

SYSTEMS TECHNIQUES IN WATER RESOURCES ENGINEERING

(2008 Course) (Elective - I) (501304)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) a) What is a constraint surface in a 2D design space? Draw a schematic sketch of constraint surfaces in a hypothetical 2-D design space and show following types of points. **[8]**

i) Free and acceptable point.
ii) Free and unacceptable point.
iii) Bound & acceptable point.
iv) Bound & unacceptable point.

b) State five Water Resources applications of Optimization. **[5]**

c) What is graphical optimization and what are its limitations? **[5]**

Q2) a) Solve the following by Big M method **[8]**

Minimize $Z = X_1 + 2X_2 + 3X_3$ subject to

$X_1 - X_2 + X_3 \geq 4$

$X_1 + X_2 + 2X_3 \leq 8$

$X_2 - X_3 \geq 2$ and $X_1, X_2, X_3 \geq 0$

b) Explain what is dual problem. Write dual of the following primal. **[8]**

Maximize $f = 50X_1 + 100X_2$

Subject to

$2X_1 + X_2 \leq 1250$

$2X_1 + 5X_2 \leq 1000$

$2X_1 + 3X_2 \leq 900$

$X_2 \leq 150$ where $X_1 \geq 0$ & $X_2 \geq 0$

P.T.O.

Q3) a) What is sensitivity analysis? How is useful in post optimality process? **[4]**

b) Four villages A, B, C, D are to be supplied with treated water. Their demands are 7, 5, 3, 2 units respectively. There are three sources P, Q, R from which these demand are met. The sources can supply 6, 1, 10 units respectively. The transportation cost matrix is given below. Find minimum cost by Northeast corner & by VAM. **[12]**

	A	B	C	D	Supply
P	2	3	11	7	6
Q	1	0	6	1	1
R	5	8	15	9	10
Demand	7	5	3	2	

Q4) a) What is Annuity? What are the different types of Annuities? **[8]**

b) A company is interested in investing in any one of the following two projects. The relevant data pertaining to the two projects is given below. Rank the projects according to the B/C ratio and state which option would be the best? **[8]**

Particulars	Project A	Project B
Initial investment (lakh rupees)	37	45
Net annual benefits (lakh rupees)	5	7
Useful life (years)	15	10
Salvage value (lakh rupees)	1	2
Discount rate	10%	10%

SECTION - II

Q5) a) Use golden section method to minimize $Z = X^3 - 12X$ in the range of 0 to 10 carry out first five iterations. **[10]**

b) Explain the algorithm of Fibonacci method. **[6]**

Q6) a) Use Newton's method to minimize $f(x) = 8X_1^2 + 5X_2^2 - 10X_1X_2 - 18X_1$. Take the starting point as (0, 0). **[10]**

b) What is Hessian matrix? Explain what is the significance of Hessian matrix. **[6]**

Q7) a) Explain the assumption in a two person zero sum game. **[4]**

b) Define saddle point & fair game.

c) The payoff matrix in a game between A & B is as follows. Determine the strategies of each player and the value of the game. The payoffs are for player A.

	B1	B2	B3	B4
A1	6	–9	10	1
A2	7	8	9	2
A3	9	8	16	2
A4	4	5	0	4

[12]

Q8) a) The water resources project is ongoing and equipment for the same is to be transported from place 1 to place 11. The equipment can be transported along different routes. The travel distances along different routes from place i to place j are as follows. **[16]**

Place i-j	Distance in km.	Place i-j	Distance in km.
1-2	30	5-8	21
1-3	34	5-9	33
1-4	36	5-10	33
2-5	29	6-8	22
2-6	27	6-9	24
2-7	30	6-10	29
3-5	31	7-8	33
3-6	25	7-9	32
3-7	23	7-10	34
4-5	28	8-11	37
4-6	27	9-11	28
4-7	26	10-11	36

Use dynamic programming to determine the shortest route between place 1 and place 11.

b) Write recursive equation for each stage. **[2]**

❖ ❖ ❖ ❖

Total No. of Questions : 8] **[Total No. of Pages : 3**

P1765

[3865] - 483

M.E. (Mechanical) (Heat Power)

ADVANCED AIR CONDITIONING & HEATING & VENTILATION

(2008 Course) (Elective - II) (502105) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, Mollier charts, electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Give the typical layout of an auditorium of capacity 500 seats located in a city like Pune where summer outside conditions may be taken as DBT = 42°C and WBT = 28°C. Also calculate the heat load with appropriate assumptions, for air conditioning system to be used for the same. **[18]**

Q2) a) 1000 m^3/min of recirculated air at 24°C DBT and 10°C DPT is adiabatically mixed with 400 m^3/min of fresh air at 28°C DBT and 48% RH. Evaluate the enthalpy, specific volume, humidity ratio, final DBT and RH of the mixture. Draw the process on psychrometric chart. **[10]**

b) Desert air cooler is used to cool air from 40°C DBT, 25% RH to 28°C by evaporative cooling. Estimate the volume flow rate of air in m^3/hr. and the quantity of water required per hr. for cooling capacity of 2 TR. **[6]**

P.T.O.

Q3) a) Explain the VAV system concept. List the special characteristics of VAV systems. Discuss the different VAV systems. **[10]**

b) Explain the procedure of duct sizing by equal friction method. Give suitable examples. **[6]**

Q4) Write short notes on (any four) : **[16]**

a) Comfort chart.
b) Solar heat gain.
c) Infiltration load.
d) Thermal lag.
e) All air system.

SECTION - II

Q5) a) Differentiate clearly between direct and indirect evaporative cooling systems. Show the processes on chart. Explain the working of a two stage evaporative cooling system using cooling tower. **[8]**

b) Define adiabatic efficiency of evaporative coolers. Discuss the working of various types of evaporative coolers used in practice with neat sketches. **[10]**

Q6) Explain with neat sketches the working of the following equipments : **[16]**

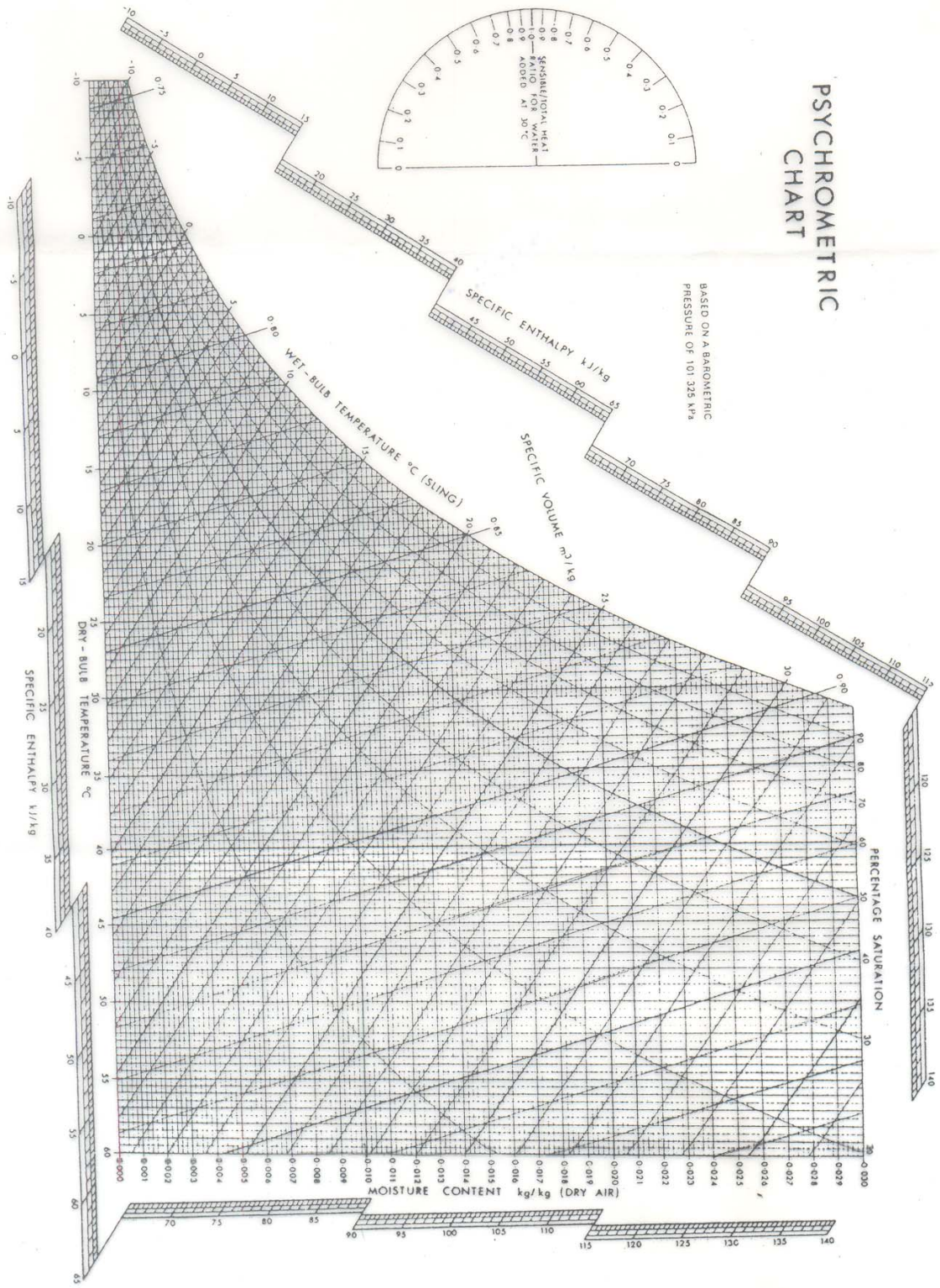
a) Chillers.
b) Condensing units.
c) De-humidifiers.

Q7) a) Give a typical layout and explain the design procedure for a 200 TR Central Air Conditioning plant. List the major equipments and their selection criteria. **[10]**

b) Discuss the various types of fans and their operating characteristics used in Air Conditioning. **[6]**

Q8) Write short notes on (any four) : **[16]**

a) Air locks, Air curtains and Air Showers.
b) Laminar flow clean rooms.
c) HEPA filters.
d) Modern Controls for odour and bacteria.
e) Static Regain method.


PSYCHROMETRIC CHART
BASED ON A BAROMETRIC PRESSURE OF 101 325 kPa
SENSIBLE/TOTAL HEAT RATIO FOR WATER ADDED AT 30°C
SPECIFIC ENTHALPY kJ/kg
WET-BULB TEMPERATURE °C (SLING)
SPECIFIC VOLUME m³/kg
DRY-BULB TEMPERATURE °C
SPECIFIC ENTHALPY kJ/kg
PERCENTAGE SATURATION
MOISTURE CONTENT kg/kg (DRY AIR)

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Total No. of Questions : 10] **[Total No. of Pages : 4**

P1766

[3865] - 501
M.E. (Mechanical) (Design Engineering)
PROCESS EQUIPMENT DESIGN
(Revised 2008 Course) (Theory) (Elective - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answer will be valued as a whole.***
6) ***Use of logarithmic tables, slide rules, Mollier chart, electronic steam table and electronic pocket calculator and steam table is allowed.***
7) ***Assume suitable data, if necessary giving reasons.***

SECTION - I

Q1) a) Explain with neat sketches classification of nozzles on the basis of forming, reinforcing pad limits for nozzle and design of reinforcement. **[8]**

b) Calculate thickness of a torispherical heads (100-6) and (80-6) elliptical head (2:1) and hemispherical head for a pressure vessel having design pressure 7 kg/cm^2, welded joint efficiency is 85%. **[8]**

Q2) a) Answer any one : **[2]**

i) What is “Hastelloy D’alloy and its advantages?

ii) What is duralumin? Give it’s application in process industries?

b) Explain with sketches types of gaskets. **[6]**

c) What is the relevance of following in design of flanged joints. **[6]**

i) Elastic, plastic, and springy reaction of gasket under action of tightening force.

ii) Gasket factor.

iii) Gasket seating stress.

d) What is the difference between knuckle radius and crown radius of torispherical head? **[2]**

P.T.O.

Q3) a) Explain role dead weight, wind load, seismic load in skirt support design. **[6]**

b) What is a bolting chair? Give design considerations for centered chair and anchor bolt design? **[6]**

c) A cylindrical pressure vessel 2m internal diameter is to operate at a pressure 5 kg/sq cm. The permissible stress of the material is 980 kg/sq cm. Welded joint efficiency is 80%. Calculate the thickness required for the vessel. If the vessel is fabricated in the spherical form, what maximum pressure will it be able to withstand? **[4]**

Q4) a) A Cylindrical storage tank has diameter 30m and the tank height is 15m. Liquid stored in the tank has a density 810 kg/m^3. Material of construction is carbon steel having permissible stress 1300 kg/sq cm. Density of material used for fabrication is 7700 kg/m^3.

The plate of size 3m × 1.2m in varying thickness is available for fabrication. Welded joint efficiency is 85% corrosion allowance is not necessary. Calculate the cylindrical shell thickness of the tank at different heights. Also estimate the total number of plates required. **[10]**

b) Explain design of pressure vessel subjected to external pressure. **[6]**

Q5) Write short notes on any three : **[18]**

a) Design of self supporting roof for storage vessels.

b) Inspection and testing of pressure vessels.

c) Design considerations for process equipment design.

d) Various types of roofs for storage vessels.

e) Linings for chemical plants and equipment.

SECTION - II

Q6) a) A high pressure vessel fabricated by shrink fit construction has three concentric shells. The ratio of outer to inner radius for all shells is1.2.The vessel is subjected to an internal pressure of 100 kg/sq cm. Pressure outside the vessel is atmospheric. **[8]**

Estimate :

i) Maximum combined stress at the interfaces of concentric shells

ii) Interface pressure resulting from internal pressure and shrinkage stresses

iii) Interface required modulus if rigidity of material = 2×10^6 kg/sq cm, inside diameter of the vessel is 300 mm.

b) Explain with neat sketch types of closures for high pressure vessels. **[8]**

Q7) a) How filters are classified? State their advantages and disadvantages. **[8]**

b) Explain the following aspects of design of shell and tube heat exchanger-shell diameter, shell thickness, nozzle thickness, baffles, flanged joint, thickness of tube, tube sheet thickness, channel and channel cover. **[8]**

Q8) a) Give examples of tall vessels and explain design considerations for tall vessels. **[8]**

b) Explain the contacting devices used in tray type columns or type of packings used in packed columns. **[5]**

c) Explain various safety measures considered in equipment design. **[3]**

Q9) a) Name the type of agitators and explain power requirements for agitation. **[6]**

b) A pressure vessel has inside diameter 1470 mm and q plate thickness of 5 mm. Inside diameter of flange is 1482 mm. A gasket is provided over the flange face. Gasket factor is 2.0 and the gasket seating stress is 120 kg/cm^2. Inside diameter of gasket is 1485 mm. pressure inside vessel is 2.5 kg/cm^2.

Permissible stress in bolts under atmospheric conditions is 600 kg/cm^2. Permissible stress in bolts at operating conditions is 550 kg/cm^2. Diameter of bolt is 20 mm.

Calculate :

i) Bolt load.

ii) Bolt area.

iii) Flange thickness. **[10]**

Q10) Write short note on any three of following : **[18]**

a) Vacuum Crystallizer.

b) Protective linings for process equipments.

c) Design of pipe lines.

d) Process flow and process block diagram.

e) Various theories of failure.

f) Optimization techniques.

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1767

[3865] - 517
M.E. (Mechatronics)
CONTROL SYSTEMS
(2008 Course) (502805)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, whenever necessary.***

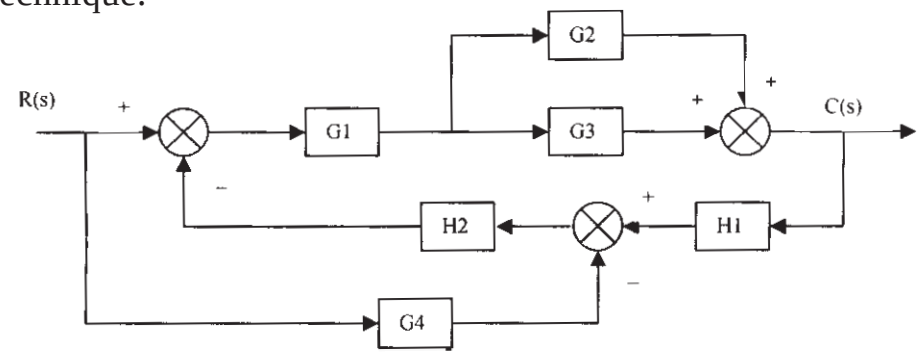
SECTION - I

Q1) a) Distinguish between the following : **[8]**

i) Linear and nonlinear control systems.

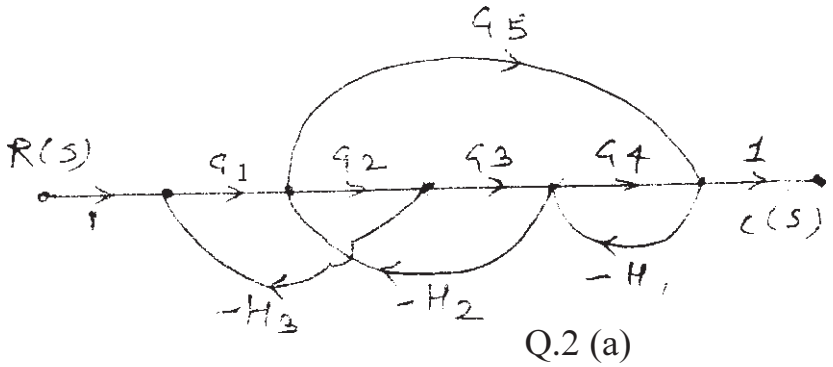
ii) Time varying and time invariant control systems.

b) Reduce the following block diagram of the system shown in following figure into a single equivalent block by block diagram reduction technique. **[8]**



Q2) a) Obtain the closed loop transfer function C(S)/R(S) using Mason's gain formula. **[8]**

P.T.O.



Q.2 (a)

b) What are static error coefficients? Derive the values of static error coefficient and steady state error for type 1 system for **[8]**
   i) Unit step input.
   ii) Unit ramp input.
   iii) Unit parabolic input.

Q3) a) Draw and explain different transient response specifications for second order control system. Write the expression for determining the same. If system has transfer function **[10]**

$$G(S)H(S) = \frac{64}{S^2 + 5S + 64}$$

For unit step input, find (i) ξ (ii) Wd (iii) Tp.

b) Examine the stability by Routh's criterion for the characteristics equation.
$S^5 + S^4 + 2S^3 + 2S^2 + 3S + 15 = 0$ **[8]**

Q4) a) Write short notes on : **[8]**
   i) Adaptive control.
   ii) Optimal control.

b) Write short note on self tuning controllers. State its application areas.**[8]**

SECTION - II

Q5) a) Write short note on comparison on time domain and frequency domain analysis. **[6]**

b) The loop transfer function of a unity feedback control system is **[10]**

$$G(S)H(S) = \frac{k}{S(S+2)(S+4)}$$

Sketch the root locus of the system. Determine the value K for marginal stability from the root locus.

Q6) a) A unity feedback control system has **[12]**

$$G(S)H(S) = \frac{80}{S(S+2)(S+20)}$$

Sketch bode plot. Determine from it

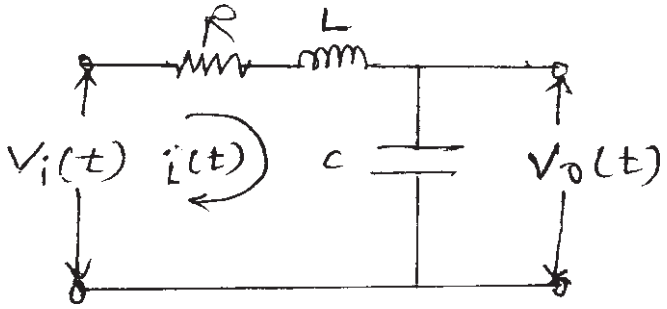
i) Gain crossover frequency.
ii) Phase crossover frequency.
iii) Gain margin.
iv) Phase margin.
v) Stability of system.

b) State advantages and disadvantages of state variable analysis over conventional control system. **[4]**

Q7) a) Explain the following terms : **[8]**

i) State ii) State variable.
iii) State space. iv) State vector.

b) Obtain the state model of the given electrical network in standard form. Given at $t = t_0$, $i(t) = i(t_0)$ and, $v_0(t) = v_0(t_0)$ **[8]**



Q.7 (b)

Q8) a) Give the classification of controllers and explain the characteristics of on-off, P, I, D, PID controllers. **[10]**

b) Sketch and comment on the outputs of P, PI, PD and PID controllers for a step input. **[8]**

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1768

[3865] - 544

M.E. (Electrical Engineering) (Control System)

SCADA SYSTEMS AND APPLICATIONS

(2008 Course) (Elective - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain with the help of block diagram SCADA system in detail. **[15]**

b) Explain the various communication technologies used in SCADA systems. **[10]**

Q2) a) With the help of block diagram explain Programmable Logic Controller (PLC). **[15]**

b) Explain with a block diagram Remote terminal unit and its use. **[10]**

Q3) a) Explain in detail various SCADA Protocols. **[15]**

b) Compare SCADA, DCS and PLC based systems. **[10]**

P.T.O.

SECTION - II

Q4) a) Explain wired and wireless industrial communication methods. **[15]**

b) Explain the 7 layers of OSI model and their functions. **[10]**

Q5) a) Explain in detail the use of SCADA in substation automation. **[15]**

b) Explain open standard communication protocols. **[10]**

Q6) a) Explain the use of SCADA in Energy management system for interconnected power system. **[15]**

b) Explain the use of SCADA in Oil and Gas industries. **[10]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1769

[3865] - 584
M.E. (Computer)
INFORMATION SECURITY AUDIT & MANAGEMENT
(2008 Course) (Elective - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Attempt any three questions from section - I and three questions from section - II.***
2) ***Answer of section - I and section - II should be written on separate answer sheets.***
3) ***Figures to the right indicate full marks.***
4) ***Draw neat diagram wherever necessary.***
5) ***Make suitable assumptions wherever necessary.***

SECTION - I

Q1) a) What is Security? Explain NSTISSC Security Model. **[8]**

b) What is Management? Explain the difference between Leadership and Management. **[8]**

Q2) a) Explain the following components of Organizational Planning with suitable examples. **[8]**

i) Mission. ii) Vision.

iii) Values. iv) Strategy.

b) Explain various types of Information Security Policies. **[8]**

Q3) Explain the information Security Roles for following titles. **[16]**

a) Chief Information Security Officer.

b) Security Managers.

c) Security Administrators and Analysts.

d) Security Technicians.

e) Security Staffers.

f) Security Consultants.

g) Security Officers and Investigators.

h) Help Desk Personnel.

P.T.O.

Q4) Write short notes on (any three) : **[18]**

a) Principles of Information Security Management.

b) SDLC and the SecSDLC.

c) Information Security Policy, Standards, and Practices.

d) Components of the Security Program.

SECTION - II

Q5) a) Explain the following Security Management Models. **[8]**

i) NIST Security Models.

ii) A Hybrid Security Management Model.

b) Explain the Emerging Trends in Certification and Accreditation. **[8]**

Q6) a) Explain the following Risk Control Strategies. **[8]**

i) Avoidance. ii) Transference.

iii) Mitigation. iv) Acceptance.

b) Explain Risk Control Strategy Selection by Evaluation, Assessment, and Maintenance of Risk Controls. **[8]**

Q7) a) Explain various types of Laws and Ethics in Information Security. **[8]**

b) Describe the Ethical Concepts in Information Security. Explain the differences in Ethical Concepts. **[8]**

Q8) Write short notes on (any three) : **[18]**

a) Security Management Practices.

b) Risk Management-Identifying and Assessing Risks.

c) Certifications and Professional Organizations.

d) Project Management Tools.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1772

[3865] - 675
M.E. (Computer Engineering)
NETWORK DESIGN, MODELING AND ANALYSIS
(2008 Course) (510110)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

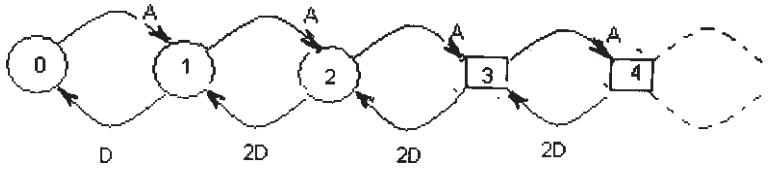
SECTION - I

Q1) a) Explain in Brief Gaussian Probability Density Function. **[8]**

b) Discuss in details the probability of failure in establishing a connection in a network. **[8]**

Q2) a) Explain in detail Relaxation Algorithm; Give example. **[8]**

b) In the system shown in the figure, if A = D = l; **[8]**



Compute i) P_0

ii) Probability of loss.

iii) Average queue length.

iv) Average waiting time.

Q3) a) Discuss in brief features of terminal concentrator in a Computer Network. **[8]**

P.T.O.

b) Messages arrive to a system at the rate of 10 per minute. Lengths of messages are exponentially distributed with average of 3600 characters on a transmission channel of 9600 bps. Compute. **[8]**

i) Average service time.
ii) Service rate.
iii) Utilization of server.
iv) Probability that there are two messages in the system.

Q4) Write short notes on (any three) : **[18]**

a) Network design tools.
b) M/G/1 queue with vacations.
c) PSN node.
d) Priority queuing.

SECTION - II

Q5) a) Suggest and discuss any algorithm which deals with nodes that are far from center, Don't get stranded. **[8]**

b) With the help of a neat diagram explain the architecture of a network node. **[8]**

Q6) a) Explain Kruskal's algorithm with an example. **[8]**

b) What do you understand by open queuing networks and closed queuing networks? Explain with examples. **[8]**

Q7) a) Explain the duties and responsibilities of network administrator. **[8]**

b) Ten laboratories with 20 computers each are set up in an institute. The farthest laboratories are at 200 meters away from each other. Internet connectivity is to be provided at all the laboratories. Suggest how to set up this network with high efficiency as well as sufficient isolation. **[8]**

Q8) Write short notes on (any three) : **[18]**

a) Network virtualization.
b) Bin packing.
c) Bandwidth management.
d) IP multicast in Internet.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1775

[3865] - 877
M.E. (CAD/CAM)
CONCURRENT PRODUCT DESIGN
(2008 Course) (Elective - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any three questions from section - I and three questions from section - II.***
2) ***Use separate answer books for each section.***
3) ***Use of calculator, std. data table is allowed.***
4) ***Assume suitable data if required.***

SECTION - I

Q1) a) What do you know about Benchmarking? Discuss different phases of benchmarking. **[8]**

b) What is concurrent design? State and explain the role of design team elements in concurrent design. What are benefits of concurrent design? **[8]**

Q2) a) Why process models are important? State and explain types of process models. **[8]**

b) State and explain various steps involved in the Product Design. **[8]**

Q3) a) State the factors which influence the selection of material while designing a product. **[8]**

b) What are the guidelines/considerations for Design for Environment? State the objectives of DFE. **[8]**

Q4) Write a short note on : **[18]**

a) Axiomatic Design.

b) Technology life cycle.

c) Design for aesthetic.

P.T.O.

SECTION - II

Q5) a) What are the Objectives of Design to Cost? State the elements which are to be considered in designing product cost. **[8]**

b) What is the Life Cycle Cost of product? Explain the steps of Life Cycle Costing Process. **[8]**

Q6) a) How collaborative approach helps in development of product? What are different tools & technologies used for it? **[8]**

b) What are the benefits of Modularity in product design? Discuss various types of modularity with the help of sketches. **[8]**

Q7) a) What is importance of VRML in concurrent product Design? **[8]**

b) How the concurrent engineering is used to enhance the manufacturability & other attributes of electronic products? **[8]**

Q8) Write a short note on : **[18]**

a) Cost capacity factor.

b) Mechanical considerations in product design.

c) Internet based design.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1776

[3865] - 879
M.E. (CAD/CAM)
RAPID PROTOTYPING
(Revised Course 2008) (Elective - II) (511205)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non-programmable electronic pocket calculator and statistical tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) How would you define prototype in the context of modern product development? **[8]**

b) What are the three phases of prototyping? Contrasting these with those of geometric modeling, what similarities can be drawn? **[8]**

Q2) a) Give the general classification of Rapid Prototyping (RP) systems. Explain any one Rapid Prototyping system in detail. **[8]**

b) Describe the advantages of Rapid Prototyping in-terms of its beneficiaries such as the product designer, tool designer, manufacturing engineer, marketers and consumers. **[8]**

Q3) a) Explain with suitable example the following properties of prototype : **[8]**

i) Material.
ii) Dimensional accuracy.
iii) Surface finish.
iv) Machinability.

b) Despite the increase in relative complexity of the shape and form of products, project times have been kept relatively shorter. Why? **[8]**

P.T.O.

Q4) Write short notes on (any three) : **[18]**

a) Comparison of STL and SLC file formats.

b) Fused Deposition Modeling (FDM).

c) Environmental resistance in RP.

d) Data acquisition in reverse engineering.

SECTION - II

Q5) a) Explain with a suitable example how the design concept of generation of models, form and fit checking, and functional testing is done in RP. **[8]**

b) Briefly describe the difference between : **[8]**

i) Conventional tooling.

ii) Rapid tooling.

Q6) a) Explain briefly the line spread function of scanned Gaussian Laser Beam. **[8]**

b) What is photomodulus model? Describe bilateral exposure of a thin sample. **[8]**

Q7) a) With a flow chart explain the economic analysis in using the Rapid Prototyping technology in the present context. **[8]**

b) Describe with a neat sketch the Laser Subtractive Laser Fabrication process. **[8]**

Q8) Write short notes on (any three) : **[18]**

a) CAD data verification in RP.

b) Application of RP in Biomedical.

c) Laser Additive Non Laser Fabrication.

d) Material characteristics in RP.

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1777

[3865] - 880
M.E. (Production) (CAD/CAM)
ENERGY MANAGEMENT
(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Comment on the current energy situation in India, highlighting the strengths and weaknesses of it. **[8]**

b) Write short notes on evaluation of power projects based on Return on Investment and Payback period methods. **[8]**

Q2) a) What are the different methods adopted in Load Management? **[6]**

b) Discuss in brief important areas where we can undertake energy conservation effectively. **[5]**

c) How energy audit can help in improving energy efficiency? Discuss with suitable examples. **[5]**

Q3) a) List the equipment which one can use for energy audit mentioning their applications. **[6]**

b) Discuss in brief the steps involved in energy audit. **[6]**

c) Prepare cost sheet mentioning the various heads to be considered for calculating cost of electricity generated by Thermal Power plant. **[6]**

P.T.O.

Q4) a) Select the answer : **[8]**

i) For industrial process heating, the best quality of steam is:

1) dry saturated steam 2) superheated steam
3) wet steam. 4) high pressure steam.

ii) What type of steam is generally used for power generation/ application.

1) high pressure steam with super heat.
2) dry saturated low pressure steam.
3) dry saturated steam with high pressure.
4) wet steam with very high pressure.

iii) In indirect steam heating,.....heat is utilised for heating application.

1) Sensible 2) Latent
3) Specific heat 4) None of the above

iv) The normal velocities encountered in pipes for superheated steam is

1) 50-70 m/sec 2) 30-40 m/sec
3) 20-25 m/sec 4) 15-20 m/sec

b) Answer the following in short: any four **[8]**

i) What do you understand by ‘water tube boilers’ and ‘fire tube boilers’?

ii) What do you mean by IBR steam boiler.

iii) What is the affect of sulphur in coal when used in boiler?

iv) Write a short note on IBR steam pipe.

v) What are the parameters required to estimate the boiler efficiency by ‘direct method’?

SECTION - II

Q5) Write short notes on any three of the following: **[18]**

a) Demand Side Management

b) Power Factor Improvement

c) Energy Conservation in Compressed Air Systems

d) Co-generation applications in India

Q6) a) What are the methods in improving energy efficiency of electric motors? **[8]**

b) How can one improve the efficiency of illumination? **[8]**

Q7) a) Mention the methods adopted in improving energy efficiency of compressed air systems as well as Refrigeration and Air-conditioning systems. **[8]**

b) How will you undertake energy conservation in educational institutions? **[8]**

Q8) Write short notes on any four : **[16]**

a) Co-generation,

b) Areas where co-generation can be undertaken,

c) Opportunities in Energy Conservation in Process Industry

d) Energy Efficient Motors,

e) Sanky Digram and its applications in Energy Management

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1778

[3865] - 805

M.E. (Instrumentation, Process & Biomedical)

ORGANISATIONAL BEHAVIOUR & MANAGEMENT

(2008 Pattern)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer three questions from section - I and three questions from section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Define Management. State and explain its functions. Critically analyze effective versus successful managerial activities in a changing global business environment. **[16]**

Q2) Define Organizational behavior. Explain various models of organizational behavior. Critically evaluate the challenges and opportunities for OB. **[16]**

Q3) Differentiate between personality, emotions and perception. Explain how perception is a key element in individual decision making. **[16]**

Q4) a) State and explain the concepts of motive, motivating and Motivation. How motivation helps in enhancing efficiency and Productivity in an organization. **[8]**

b) Critically describe Victor Vroom's Expectancy Theory of Motivation. **[10]**

P.T.O.

SECTION - II

Q5) State and explain various stages of Group development. Describe How Group Dynamic brings effectiveness in Group decision making process.**[18]**

Q6) State and Explain the concept of Leadership. Explain Fielders contingency theory of leadership and how it is helpful to an organization. **[16]**

Q7) State and explain the concept of organization system. What are its different components? How it brings balance in organization's policies & practices. **[16]**

Q8) What is Conflict management? How conflict resolution takes place in business? Explain contingency approach to conflict management. **[16]**

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Total No. of Questions : 8] **[Total No. of Pages : 4**

P1368

[3865]-402

M.E. (Civil) (Construction & Management)

MANAGEMENT AND PROJECT PLANNING IN CONSTRUCTION

(2008 Course & 2002 Course)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer three questions from section - I and three questions from section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) The following table gives the cost duration data for the activities of a small construction project. **[18]**

Activity Code i - j	Normal		Crash	
	Duration (Days)	Cost (Rs.)	Duration (Days)	Cost (Rs.)
1 - 2	8	7000	3	10000
1 - 3	4	6000	2	8000
2 - 3	0	0	0	0
2 - 5	6	9000	1	11500
3 - 4	7	2500	5	3000
4 - 6	12	10000	8	16000
5 - 6	15	12000	10	16000
5 - 7	7	12000	6	14000
6 - 8	5	10000	5	10000
7 - 8	14	6000	7	7400
7 - 9	8	6000	5	12000
8 - 9	6	6000	4	7800

The indirect costs are Rs. 1000/- per day.

P.T.O.

a) Draw the network, find the critical path and the normal project duration. Also find the corresponding total project cost.

b) Carry out stage by stage compression and find

i) The optimal duration and the corresponding minimum project cost.

ii) Find the all crash solution.

c) Plot a graph of costs verses time.

Q2) The following table gives the manpower requirement of a small project for various activities. **[16]**

Activity Code i - j	Duration Days	Manpower Required
1 - 2	9	7
1 - 3	10	3
3 - 4	4	6
2 - 4	9	6
2 - 5	10	5
2 - 6	5	7
4 - 7	7	7
5 - 7	8	5
6 - 7	7	6
7 - 8	8	8

a) Assuming that all activities start at EST, draw the squared network and manpower loading diagram and compute EFR for this schedule.

b) Schedule the activities to achieve maximum possible resource levelling without exceeding the project duration. Find EFR in this case.

Q3) a) Explain any one theory of management. **[4]**

b) Under what conditions is LOB technique used? Give suitable examples. **[6]**

c) Explain the work breakdown structure for the construction of a primary school building. **[6]**

Q4) a) What are the applications of MIS to construction Industry? **[6]**

b) What is the importance of coordinating and communicating in a construction Industry? **[6]**

c) Compare the precedence network with CPM network. **[4]**

SECTION - II

Q5) a) Explain project cost-influence diagram with an example. Explain life-cycle of a project and its importance in project planning. **[3+3]**

b) Explain advantages of a matrix organization over other types. **[4]**

c) Explain EIA and EMP in the context of Delhi Metro Project. **[8]**

Q6) You are a contracting firm in India with head office at Bombay. You have to submit a tender for executing the construction work of a multistoreyed commercial complex situated on a black cotton soil in a Gulf country. The project worth is 200 crores and duration is 12 months. The tender is with the contractor's design.

You are to submit your organizational structure for H.O as well as for executing the project in the Gulf ; for evaluation of the bid. Prepare a detailed structure inclusive of qualifications, experience, expertise, salaries offered etc. Also work out the total cost incurred on these resources. **[16]**

Q7) a) Explain the importance of method study and work measurement with an example. **[4]**

b) Explain role of the Project Management Consultants on a Highway project in pre-tender and post-tender activities with a case study. **[8]**

c) Design an incentive scheme for paying bonus to the watchman of your construction company. **[4]**

Q8) a) Explain the process and importance of job evaluation. With a case study, explain how the performance of project managers can be evaluated on a major construction job. **[2+6]**

b) A construction organization has targetted an annual business turnover of 20 crores. The normal profit expected from the business is 10% of the turnover. As a company policy 1% of this amount will be given as any annual bonus to its employees. For every 2 lakhs generated as an annual extra profit, 10% of the amount will be given to its employees. Any employee who gets the 10% incentive consecutively for 3 years will get 2 additional increments in a particular cadre, after 3 years. In a span of 7 years, an employee who gets 10 increments in all, will be automatically promoted to the next cadre.

On a mega construction project involving the following team members, an annual profit of 2 crores was generated on a turnover of Rs. 10crores. The members are :–

	HR	Salary
1	Project Controller	Rs. 60,000 per month.
3	Project Managers	Rs. 45,000 per month.
6	Senior Engineers	Rs. 30,000 per month.
6	Junior Engineers	Rs. 20,000 per month.
6	Supervisors	Rs. 12,000 per month.
3	Stores Keeper	Rs. 8,000 per month.
3	Watchman	Rs. 5,000 per month.

[The annual payments of the staff are given for individuals, based on a monthly amount]

The incentive is to be distributed in the proportion of the individual's salary w.r.t, the total salary on the human resources.
Work out the incentives to each human resource, based on the above data.
One of the senior engineer has got 9 increments in a period of 7 years. Will he be automatically promoted? Has he earned the annual extra profit of 10% from his contribution? Explain. **[8]**

Total No. of Questions : 8] **[Total No. of Pages : 3**

P1369

[3865]-414
M.E. (Civil) (Construction & Management)
OPERATIONS RESEARCH
(2008 & 2002 Course)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer three questions from section - I. and three questions from section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Minimize $Z = 5x_1 + 8x_2$ **[12]**

subject to

$3x_1 + 2x_2 \geq 3$

$x_1 + 4x_2 \geq 4$

$x_1 + x_2 \leq 5$

$x_1, x_2 \geq 0$

b) Explain the difference between Big M method and Two-phase method. **[4]**

Q2) a) The following table gives the unit cost of transporting construction material from three plants to four sites. The requirement at each site and the availability at each plant. **[14]**

Plants	Sites				Supply
	A	B	C	D	
1	50	60	100	50	200
2	80	40	70	50	380
3	90	70	30	50	160
Demand	100	180	220	240	

Determine the minimum cost transportation policy and the corresponding cost. Use VAM to find the initial feasible solution.

P.T.O.

b) How will you solve a transportation problem for **[4]**
   i) Maximization.
   ii) Unbalanced problem.

Q3) a) Four engineers are available to design four projects. Engineer 2 is not competent to design the project B. Given the following time estimates needed by each engineer to design a given project, find how should the engineers be assigned so as to minimize the total design time of four projects. **[10]**

Engineer	Projects			
	A	B	C	D
1	15	13	13	11
2	17	–	18	14
3	9	13	19	7
4	11	13	12	10

b) i) Explain local maxima and global maxima. **[6]**
   ii) What is a convex function?

Q4) a) Use golden section or Fibonacci method to maximize $z = 36x - 0.9x^2$ in the range 10 to 50 to an accuracy of 1%. Carry out computations for the first four stages only. **[8]**

b) Use steepest gradient technique to maximize $z = 6x_1 - 2x_1^2 + 4x_2 - 2x_2^2 - 2x_1x_2$. Take the starting point as (1,1) and carry out first two iterations only. **[8]**

SECTION - II

Q5) a) State Bellman's principle of optimality. What is a recursive equation? **[4]**

b) Twelve units of capital can be invested in three projects. The expected returns from the 3 projects for each level of investment is given below. Use dynamic programming to obtain the best allocation to maximize the overall returns. **[14]**

Investment Level	Return from project		
0	0	0	0
2	10	20	15
4	35	30	40
6	65	50	55
8	70	75	75
10	85	90	95
12	95	100	105

Q6) a) Explain the various components of a queueing system. What is Kendall-Lee Notation? **[6]**

b) Vehicles arrive at a service station in a Poisson distribution with average time between two consecutive arrivals being 60 minutes. The service time, which is distributed exponentially has a mean value of 45 minutes. Determine **[10]**

i) The average queue length and the number of vehicles in the system.

ii) The average waiting time of vehicles in the queue and in the system.

iii) The probability that there are two vehicles in the queue.

iv) The chance that the vehicle will straightaway be taken up for servicing.

Q7) a) What is a sequencing problem? **[6]**
Explain the method for solving 3 stations, n jobs and no passing.

b) Explain the various factors affecting the choice of a project from amongst various alternatives. **[6]**

c) Explain the difference between mutually compatible projects and mutually exclusive projects. **[4]**

Q8) a) What are the situations under which replacement of equipment becomes necessary? What are the different types of replacement problems? **[6]**

b) Explain the basic assumptions in a two-person, zero-sum game. **[6]**

c) Explain the concept of dominance in Games Theory. **[4]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1371

[3865]-438
M.E. (Civil - Hyd.)
WATER RESOURCE PLANNING AND MANAGEMENT
(2008 Course) (501302) (Elective - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer any three questions from section - I and three questions from section - II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of electronic pocket calculator is allowed.***
7) ***Assume suitable data, if necessary.***
8) ***Your answer will be valued as a whole.***

SECTION - I

Q1) a) "Water resource planning and Management is influenced by Good Governance, local ownership, networking of people and Knowledge." Justify this statement with valid logic. **[9]**

b) What is meant by water users' cooperative societies? What is the meaning of integrated approach in Water Resource Engineering? **[9]**

Q2) a) Discuss in detail about the gradual development of Water Resource Planning and Management in India dating back from 1970. **[8]**

b) Developing countries are facing a new threat "eco-colonialism" Do you think "eco-colonialism" is a hindrance in the path of Water Resource Management. Discuss it in detail. **[8]**

Q3) a) How do you correlate Water resource Management and decision making? **[8]**

b) Discuss about Cost-Benefit Analysis of multipurpose projects. **[8]**

Q4) Write Short Notes on (Any Four) **[16]**

a) Strategies in Water Resource Development.

b) Global Water Partnership.

c) Uniqueness of Water Resource Development.

d) Role of Good Governance in Water Resource Management.

e) Multi objective planning models.

P.T.O.

SECTION - II

Q5) a) What do you mean by Global Water Partnership? Discuss in detail. **[9]**

b) "Water Resource is unique and indivisible". Justify this statement with valid logic and discuss in detail. **[9]**

Q6) a) Discuss about the Macro Analysis of Water Resources Development Strategies in detail. **[8]**

b) Do you think that "Interlinking of various rivers of India" is a golden solution to Water Resource Planning? Explain with proper logic in support of your statements. **[8]**

Q7) a) What is the full form of ICOLD? Do you think INCOLD is an extension of ICOLD? What are the role of ICOLD in Water resource planning and Management? **[8]**

b) What do you mean by "Integrated Water Resources Development Plan?" Discuss in detail. **[8]**

Q8) Write Short Notes on (Any Four) **[16]**

a) Macro Analysis of Water Resources Development.

b) Integrated Water Resources Development Plan.

c) Inefficient irrigation system and Wastage of water.

d) Sustainable Agricultural Development.

e) Active Participation of Farmers in Water Resource Planning.

Total No. of Questions : 6] **[Total No. of Pages : 3**

P1375

[3865]-454
M.E. (Civil) (Structures)
ADVANCED SOLID MECHANICS
(2008 Course)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain with neat sketches different components of stresses and strains acting on 3D rectangular element of size dx,dy and dz. Assume X,Y,Z as body forces in x,y and z directions respectively. Also obtain differential equation of equilibrium. **[8]**

b) Write down the constitutive relations for strains in terms of stresses for elasticity problem. **[7]**

c) At a point in a stressed body, the cartesian components of stresses are $\sigma_{xx} = \sigma_{yy} = 75$MPa,

$\sigma_{zz} = -30$ MPa, τ_{xy} = zero MPa, $\tau_{yz} = 45$ MPa, $\tau_{zx} = 75$ MPa.

Determine normal and shear stresses whose outer normal has direction cosines cos (n,x) = 0.66, cos (n,y) = 0.66, cos (n,z) = 0.33. **[10]**

Q2) a) Discuss the state of pure shear and hydrostatic state of stress using the concept of stress invarient. **[7]**

b) What is plain stress and plain strain problem? Obtain compatibility equation in terms of stresses for 2D problem of elasticity. **[8]**

c) Find stress and strain component of cantilever beam loaded with the point load 'P' at the free end using Airy's stress function. **[10]**

Q3) a) Write the basic equations for equilibrium, strain-displacement and stress-strain relationship for a plane stress 2D problem in polar co-ordinates. **[7]**

b) Obtain differential equations of equilibrium in polar co-ordinates. **[8]**

P.T.O.

c) In a plane stress problem where weight is the only body force, the Airy's stress function is given by $\Phi = 6x^5 + A\,x^4\,y + B\,x\,y^4 - 3\,y^5$. Calculate the values of constants A and B. **[10]**

SECTION - II

Q4) a) Define an axi-symmetric problem in elasticity, giving two examples. **[5]**

Using the cylindrical co-ordinate system, obtain the stress equilibrium equations in an axi-symmetric problem.

b) A thick walled cylinder with open ends has internal and external radii *'a'* & '*b*' respectively. It is subjected to uniform internal & external pressures p_i & p_o respectively.

Treating this as an axially symmetric plane stress problem, obtain the relations for the radial & tangential stresses σ_r & σ_θ in terms of the radial co-ordinate 'r'. Hence obtain the relations for the circumferential & radial strains at the inner radius '*a*' in the cylinder. **[15]**

c) A thick walled open ended cylinder is made of an aluminium alloy with E = 72 GPa and Poisson's ratio $v = 0.33$. It has an inside diameter of 200mm and outside diameter of 800 mm. The cylinder is subjected to an internal pressure of 150 MPa. Compute.

i) The principal stresses at the inner radius.

ii) Increase in the inside diameter due to the internal pressure. **[5]**

Q5) A uniform bar of elliptic cross-section has semi-major and semi-minor axes of length '*a*' & '*b*' respectively. The bar carries an axial twisting moment 'M_t' applied at each end.Using the Prandtl's stress function ϕ in the form

$\phi = m\left(\frac{x^2}{a^2}+\frac{y^2}{b^2}-1\right)$, m being a constant, obtain the solution for the shear stresses in the cross-section, satisfying the boundary conditions. Hence obtain the maximum values of stresses and their positions. Obtain also the expression for the torsional rigidity 'C' of the cross-section in terms of *a,b* and the shear modulus G of the bar material. **[25]**

Q6) a) Explain briefly the classification of beams on elastic foundation. What is a 'Winkler Foundations' ? **[4]**

b) A semi-infinite beam of uniform flexural rigidity EI is resting on an elastic foundation and subjected to a clockwise moment M_o at one end. The foundation modulus is 'K' and the beam may be assumed to be attached to the foundation.Starting from the fundamentals, derive the equation for the deflection of the beam. **[15]**

c) A timber beam of length 4m and cross-section 80mm × 150mm (depth) is attached to a rubber foundation for which K = 32 MPa. A clockwise moment of 6kN-m is applied at one end of the beam. Obtain the maximum deflection and the maximum flexural stress in the beam indicating the location of each. Take E = 15GPa for timber. **[6]**

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1377

[3865]-456

M.E. (Civil) (Structures)

ADVANCED DESIGN OF CONCRETE STRUCTURES

(2008 Course)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of IS 456, IS 1343, IS 3370 & non programmable calculator is allowed.***
5) ***Neat diagrams must be drawn wherever necessary.***
6) ***Assume any other data if necessary.***

SECTION - I

Q1) a) Draw yield lines for the following : **[8]**

i) Equilateral triangular slab fixed at two adjacent sides and free at third side.

ii) Rectangular slab with fixed supports on two adjacent sides with remaining longer side simply supported and shorter side unsupported.

b) Explain upper and lower bound theorem. **[7]**

c) Design a RCC slab for a circular hall of diameter 5.6m using Yield Line Theory. Assume the peripheral support thickness 300mm, the slab is simply supported. Use M20 Fe500 take Live load = 5 kN/m^2 & floor finish load = 1.5 kN/m^2. Draw details of reinforcement. **[10]**

Q2) a) Design a grid slab for a floor of hall 15 × 18 m c/c having square grid of 1.5m. Use M20 Fe500 take Live load = 4 kN/m^2 & floor finish load = 1.2 kN/m^2. Apply the required check & draw reinforcement details. **[15]**

b) Design a intermediate panel of flat slab for a hall with column spacing 6m × 6m c/c. the size of the column diameter is 500 mm each. Use M25 Fe 500 take Live load = 5 kN/m^2 & floor finish load = 1.0 kN/m^2. Draw reinforcement details. **[10]**

P.T.O.

Q3) Design a staging for circular type ESR for 2 lakh liters with staging height 10m using M25, Fe500 in earthquake zone IV. Safe bearing capacity is 180 kN/m^2. Design of container is not required. Assume approx dimension of container, wall, top, bottom slab thickness, beams sizes & number of columns. Design must include calculations of vertical loads and horizontal force design the bracings, columns and foundations. Draw the reinforcement details. **[25]**

SECTION - II

Q4) a) Write detailed note on classification of shear wall. **[5]**

b) Design deep beam of a hall for flexure and shear for the following

Clear span = 4.5m, width of support = 450mm, working UDL on the beam 1300 kN/m. Take the total depth of beam = 3.2m Use M35 & Fe500. Show all Analysis and Design calculations & draw the reinforcement details. **[20]**

Q5) A two span prestressed concrete continuous beam ABC having cross section 200 × 800mm simply supported at A & C and continuous over B. The eccentricities at A & C = 0, at B = 240 mm upward and at midspan of AB & BC = 300mm downwards. Material used is M45 and multistrand cables 2 Nos 7T13 (having 7 strands of 100mm^2 with fy = 1950 N/mm^2), stressed to 75% of fy, each span is of 16m, superimposed load on both the spans 15 kN/m. Assume 18% loss of prestress. **[25]**

i) Determine primary, secondary moment at support at prestress and dead load.

ii) Draw the resultant line of thrust at working load.

iii) Calculate shift and stress in extreme fibers at working load.

Q6) Design post tensioned prestressed concrete slab for a floor for the following.

Flat interior panel of 6.3m × 8.3m, live load on slab 5 kN/m^2, floor finish load on slab = 1.5 kN/m^2, concrete grade M40, Multi-strand cables S3 (having 3 strands of 100mm^2 with fy = 1950 N/mm^2) stressed up to 75% of 'fy'. Design cables to serve as beams. Assume 3 panels in each direction. Width of the beam on periphery of floor 600mm and column size 600mm × 600mm. Design must include check fiber stresses in concrete and deflection. Draw sketches showing cable profiles. **[25]**

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Total No. of Questions : 6] **[Total No. of Pages : 3**

P1378

[3865]-457

M.E. (Civil) (Structures)

STRUCTURAL DESIGN OF CONCRETE BRIDGES

(2008 Course)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any Two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of IRC-5, 6, 18, 27, 45, 78 & 83 codes, IS 1343, IS 456-2000 is allowed.***
5) ***Mere reproduction of theory from IS or IRC codes as answer will not get full credit.***
6) ***Neat diagrams must be drawn wherever necessary.***
7) ***Assume any other data if necessary.***

SECTION - I

Q1) a) Write short note IRC standards for live load on different bridges. **[8]**

b) List the data parameters to be collected/investigated from a proposed bridge site stating their importance. **[8]**

c) Write detail note box girder bridge. **[9]**

Q2) a) What are the factors affecting the span of bridge? Derive the conditions for 'Economical span' of bridge stating the assumptions made. **[8]**

b) Design the culvert with the data :

Clear span of the culvert = 5 m

Clear carriage way width = 7.5 m

Size of kerb = 200 mm × 500 mm

Average thickness of wearing coat 100 mm

Use material M25, Fe500

Loading class A

Draw the cross section showing details of reinforcement at mid-span and at junction of the slab are kerb. **[17]**

P.T.O.

Q3) Design slab, cross girder and main girder of RCC T-beam and slab girder deck for the crossing of a national highway. The cross section is as shown in figure 1. Consider interior panel of the deck slab. Place the loads so as to produce critical SF and BM in the deck slab and girder. Draw neat sketches showing details of reinforcement in plan and elevation. Take the spacing of cross girders as 3 m C/C. Use M25 Fe500. **[25]**

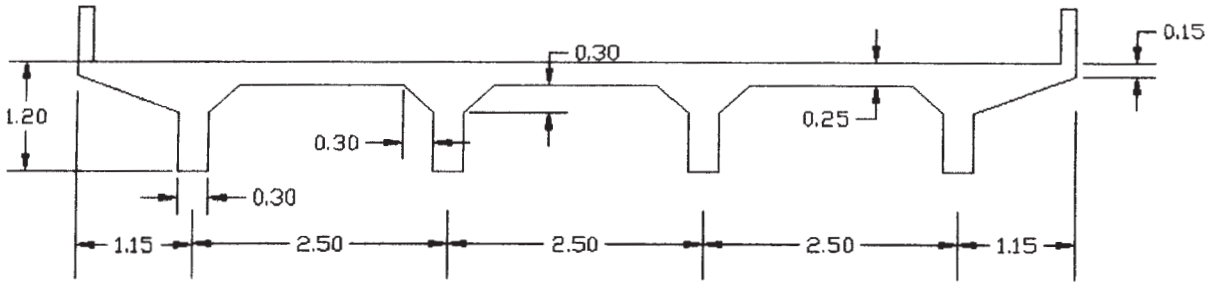

Fig1 **(All dimensions are in meters)**

SECTION - II

Q4) a) Describe different factor affecting the design of rigid frame bridge. **[9]**

b) Necessity and functions of expansion joint. **[8]**

c) Differentiate between rigid frame bridges are different from simply supported bridges with appropriate explanatory sketches. **[8]**

Q5) a) Write a short note on roller & rocker bearing. Draw sketches. Explain its merits and demerits. **[5]**

b) Design a reinforced elastomeric bearing at a pinned end of a plate girder of a bridge with following data : **[20]**

Maximum vertical load = 900 kN

Dynamic vertical load = 90 kN

Transverse lateral load = 40 kN

Longitudinal load = 50 kN

Longitudinal total translation = 12 mm

Rotation at support = 0.003°

Shear modulus of elastomeric bearing = 1.2 N/mm^2

Allowable comp. stress for concrete = 8 N/mm^2

Allowable comp. stress for elastomer = 10 N/mm^2

Q6) a) Design wall type RCC pier for the following : **[20]**

Top width of pier = 1 m with semicircular ends

Length of pier = 6 m excluding the semicircular part

Height of above footing = 10 m

HFL above the top of footing = 8 m

Total DL Reaction = 1800 kN

Total LL Reaction = 1200 kN

Tractive force = 120 kN

C/C distance of bearing on either side of centre line of pier = 1 m

BM in traffic direction due to unequal DL & LL = 600 kN-m

Material of pier and footing = M35 & Fe 500

Safe bearing capacity = 180 kN/m^2

Velocity of water current = 3 m/s consider the cross current also

Design the RCC footing and reinforcement in pier, check the stresses at the bottom of pier.

b) List merits and demerits well type foundation over pile type used for bridges. **[5]**

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1379

[3865]-465
M.E. (Civil) (Structures)
FINITE ELEMENT METHOD
(2008 Course)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain with examples different types of co-ordinates used in finite element method to define location of points in element. Hence obtain relation for natural co-ordinates for two noded element when range is –1 to +1. **[10]**

b) Prove that the natural co-ordinates are nothing but area co-ordinates for CST element of 2D problem. **[15]**

Q2) a) Define shape function. State and explain the convergence requirements of a polynomial shape function. Obtain and plot shape function for a three node bar element. **[10]**

b) Determine shape functions for a tetrahedron element used for 3D problems in natural co-ordinates. **[15]**

Q3) a) What is 'serendipity family element'? Using this concept find shape functions of quadratic serendipity family element. **[6]**

b) Derive general equation for determining the stiffness of an element using principle of minimum potential energy. **[6]**

c) Discuss various points to be considered while descretizing a structure for finite element analysis. **[6]**

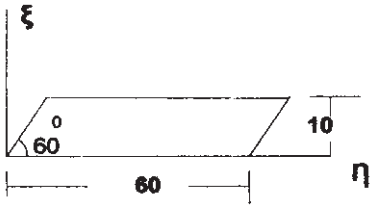
d) Derive elemental stiffness matrix for a plane truss element using variational approach. **[7]**

P.T.O.

SECTION - II

Q4) a) Explain the isoperimetric concept and types of isoperimetric elements in F.E.A. Discuss their advantages over other elements. **[5]**

b) What is Jacobian matrix? For the isoperimetric quadrilateral element shown in figure 4.1, assemble the Jacobian matrix for Gaussian point (0.57735, 0.57735). **[8]**



c) What is Lagrange shape function? Write shape functions for nine node rectangular elements with central node. **[12]**

Q5) a) What is displacement function for ACM plate bending element? Examine nodal as well as inter element compatibility of the element.**[7]**

b) Derive all matrices to formulate [K] of ACM plate bending element.**[8]**

c) Explain BFS plate bending element and its displacement function.**[10]**

Q6) a) Explain with neat sketches the various 3D elements used in analysis of shells. What are the factors to be considered in the development of shell elements? **[10]**

b) What is 'degenerated solid element'? Explain how a 3D brick element can be reduced to shell element. **[15]**

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1380

[3865]-466
M.E. (Civil) (Structures)
MANAGEMENT IN STRUCTURAL ENGINEERING
(2008 Course)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) Write a short note on: **[25]**

a) Human management in construction industry.

b) Standard costing methodology.

c) Time management in building construction.

d) Material management with flow diagram.

e) Logistic management.

Q2) a) Explain the causes of inadequate durability. **[7]**

b) Write a short-note on regular maintenance of structure. **[8]**

c) Explain in brief (any-two) **[10]**

i) Fire safety.

ii) Corrosion in structures.

iii) Quality control of materials of structures.

Q3) a) List out the information required to be collected after visual inspection of destressed structure. **[7]**

b) List the different methods of NDT for compressive strength of concrete and explain Penetration Resistant Test in details. **[8]**

c) Write a short note on: **[10]**

i) Limitations on investigation.

ii) Factors affecting health of the structure.

P.T.O.

SECTION - II

Q4) a) Answer the following : **[8]**

i) Why adhesives of material of lower elasticity are disirable in concrete work?

ii) What is the difference between restoration and retrofitting?

iii) Why acrylics are mostly used as protective coating?

iv) Enlist the properties of chemicals used during restoration.

b) Define : **[7]**

i) Adhesions. ii) Cross-linking agents.

iii) Latex. iv) Catalyst.

c) i) Write a short note on specification for RCC jacketing. **[5]**

ii) Draw a figure, showing details of improved jacketing for beam. Draw any two options. **[5]**

Q5) a) Write a short note on formwork material. **[7]**

b) Write a short note on: **[8]**

i) Safety precautions working at height.

ii) Material handling and stacking.

c) Explain the design of form work with following points. **[10]**

i) Load on form-work.

ii) Design criterion.

iii) Design procedure.

Q6) Write short notes on: **[25]**

a) Planning and excuting of demolition.

b) Role of structural drawing in demolition of structures.

c) Recycling of demolished material.

d) Demolition safety.

e) Saw technique of demolition wire.

Total No. of Questions : 6] **[Total No. of Pages : 3**

P1381

[3865]-467

M.E. (Civil) Structures

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

(2008 Course) (Elective - III)

Time : 4 Hours*]** **[*Max. Marks : 100

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***
7) ***Use of IS 1893-2002 (Part - 1) is permitted.***

SECTION - I

Q1) a) What is an earthquake? Discuss the causes of earthquake and its direct and indirect effects on the structures. **[6]**

b) What is Liquefaction of soil? Explain reasons for liquefaction and various measures taken to reduce it. **[7]**

c) Write notes on :- **[12]**

i) Body waves and Surface Waves.

ii) Philosophy behind ERD of Structures.

iii) Plate Tectonic Theory.

Q2) a) ''The structures located in earthquake prone area shall have regulatories of mass, stiffness and strength''. Justify the statement with neat sketches. **[10]**

b) Determine the design eccentricity and torsion moment at each floor in X-Direction for a three storey building subjected to seismic shear at various storey as shown in figure 2.1. The total seismic weight/floor = 450 kN, column size 400 mm × 600 mm. Assume grade of concrete M25. **[15]**

P.T.O.

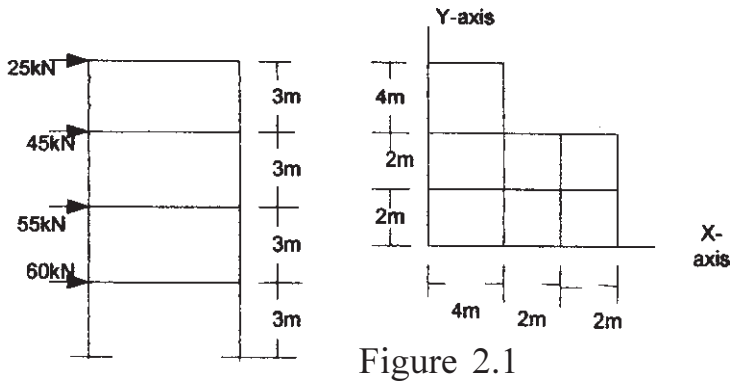

Figure 2.1

Q3) a) A Three storey OMRF Building has plan dimensions as shown in Fig.3.1. The storey height is 3 m. The live load is 3.5 kN/m^2 and it is to be constructed in Zone IV. Workout the seismic forces and shear on the structure. The size of columns are 400 mm × 400 mm. The beams are 230 mm × 230 mm and the roof and floor slab is 120 mm thick. The structure is resting on Type III soil and damping ratio 5%. Use Seismic Coefficient method. **[15]**

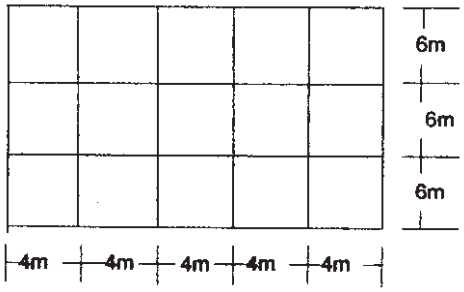

Figure 3.1

b) Write notes on (any two) :- **[10]**

i) Approaches to deal with non-structures in a building.

ii) Storey Drifts.

iii) Strong Ground Motion.

SECTION - II

Q4) a) What are the causes of instability in a steel building? Discuss types of steel frame in a building in seismic zone with their advantages and disadvantages. **[7]**

b) Explain with neat sketches the structural behavior of reinforced masonry walls and infill walls in seismic region. **[8]**

c) Explain Response Spectrum Method of Dynamic Analysis. **[10]**

Q5) a) Define shear wall and their classification? Describe structural behavior of long shear wall. **[10]**

b) A simple one storey building has shear walls as shown in figure 5.1. The shear walls are of M25 grade concrete and 200 mm thick. The storey height is 4 m. Design shear force on building is 300 kN in either directions. Compute design lateral forces in X-direction. **[15]**

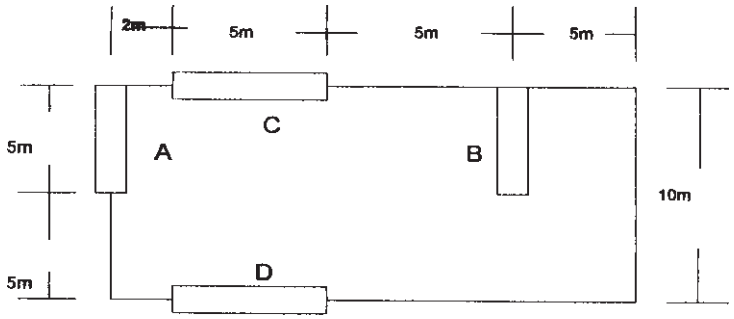

Figure 5.1

Q6) a) What is the necessity of Ductile Detailing? Describe the variables affecting ductility. **[10]**

b) What is Seismic Evaluation? What are different retrofitting techniques? Explain non conventional technique of retrofitting of RC building.**[15]**

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P1385

[3865]-499

M.E. (Mechanical - Design Engineering)

OPTIMIZATION TECHNIQUES

(502204-C) (Revised 2008 Course) (Elective - I)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each Section.***
2) ***Answer to each section should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of pocket calculator is allowed.***
6) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) a) What is the difference between linear and nonlinear programming problems? **[6]**

b) There are two different sites, each with four possible targets (or depths) to drill an oil well. The preparation cost for each site and the cost of drilling at site i to target j are given below.

Site i	Drilling cost to Target j				Preparation
	1	2	3	4	cost
1	4	1	9	7	11
2	7	9	5	2	13

Formulate the problem of determining the best site for each target so that the total cost is minimized. **[10]**

Q2) a) What is the difference between the simplex algorithm and the simplex method? **[6]**

b) Minimize the following function with simplex method.

$f = 2x_1+3x_2+2x_3-x_4+x_5$

Subject to the constraints,

$3x_1-3x_2+4x_3+2x_4-x_5=0$

$x_1+x_2+x_3+3x_4+x_5 = 2$

$x_i \geq 0$; $i = 1$ to 5 **[10]**

P.T.O.

Q3) a) State the necessary and sufficient conditions for the minimum of a function $f(x)$. **[6]**

b) Find the second-order Taylor's series approximation of the function.

$$f(x_1, x_2, x_3) = x_2^2 x_3 + x_1 e^{x3}$$

about the point $X^* = \begin{Bmatrix} 1 \\ 0 \\ -2 \end{Bmatrix}$. **[10]**

Q4) a) How do you identify the presence of multiple optima in the simplex method. **[6]**

b) Solve the following system of equation using Pivot operations.

$$6x_1 - 2x_2 + 3x_3 = 11$$

$$4x_1 + 7x_2 + x_3 = 21$$

$$5x_1 + 8x_2 + 9x_3 = 48$$ **[10]**

Q5) Write short note on any THREE. **[18]**

a) Pivotal reduction method.

b) Langrange Multipler Method.

c) Convex programming problems.

d) Equality constraint.

SECTION - II

Q6) a) What is difference between elimination and interpolation methods? **[6]**

b) Find the minimum of the function;

$$f(\lambda) = 0.65 - \frac{0.75}{1+\lambda^2} - 0.65\ \lambda \tan^{-1}\frac{1}{\lambda}$$

using quasi-Newton method with the starting point $\lambda_1 = 0.1$ and the step size $\Delta\lambda = 0.01$ in central difference formulas. Use $\in = 0.01$ for checking the convergence. **[10]**

Q7) a) What are the limitations of classical methods in solving a one-dimensional minimization problem? **[6]**

b) Minimize $f(x_1 x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ starting from the point $X_1 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$ by conjugate gradient method. **[10]**

Q8) Minimize $f(X) = 0.1x_1 + 0.05773x_2$.

Subject to,

$$g_1(X) = \frac{0.6}{x_1} + \frac{0.3464}{x_2} - 0.1 \leq 0$$

$$g_2(X) = 6 - x_1 \leq 0$$

$$g_3(X) = 7 - x_2 \leq 0$$

Using the sequential quadratic programming technique. **[16]**

Q9) a) What is the reason for possible divergence of Newton's method? **[6]**

b) Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$

from the starting point $X_1 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$ using Powell's method. **[10]**

Q10) Write short note on any 'THREE' **[18]**

a) Penalty function method.

b) Random Search Method.

c) Conjugate gradient method.

d) Half interval method.

Total No. of Questions : 10] **[Total No. of Pages :2**

P1386

[3865]-502
M.E. (Mech.) (Design Engineering)
ROBOTICS
(Elective - II) (2008 Course) (502205)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of non programmable calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define and explain the meaning of the following terms. **[10]**

i) Repeatability, ii) Resolution,
iii) Work volume and iv) Remote Compliance

b) In one degree of freedom robot, it has one sliding joint with full range of 1 meter. The robots control memory has a 12 bit storage capacity. Determine the control resolution for this axis of motion. **[6]**

Q2) a) Justify with suitable example the chaining operation of homogeneous displacement matrices is similar to chaining of orientation matrices for two transformations. **[8]**

b) Explain the steps to implement D-H convention for three axis articulated arm robot. **[8]**

Q3) a) A 2 DOF planar manipulator is as shown in figure 1 choose analytically whether end B can be located at (90, 50). If 'yes' state the angles, the link will have with positive X -Axis. If 'no' state the proper reason. **[8]**

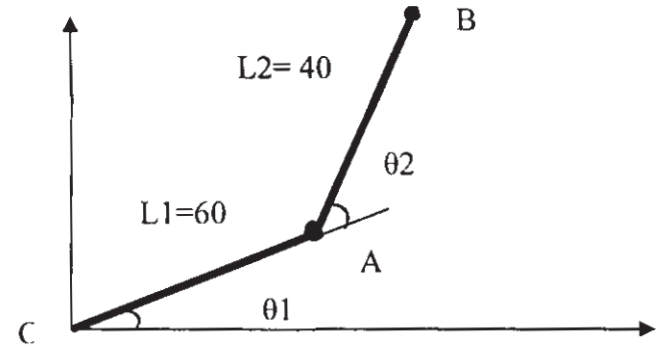

Figure 1

P.T.O.

b) Explain the possible solution methods to the multiple solutions of inverse kinematics. **[8]**

Q4) a) Explain the methods of providing the power to the end effectors. **[8]**

b) Explain the procedure used to establish the jacobian matrix for positioning and orienting. **[8]**

Q5) a) Differentiate between forward and inverse robot kinematics. **[6]**

b) Explain different types of mechanical grippers used to actuate the finger movements. **[6]**

c) Interfacing end effectors with the robot. Explain in brief. **[6]**

SECTION - II

Q6) a) Derive the joint angles for given end arm position of two degree of freedom arm in world space coordinates. **[8]**

b) Explain the joint accelerations as applied to the robot arm dynamic analysis. **[8]**

Q7) a) Discuss types of actuators used in robotics. **[8]**

b) Determine the time required to complete the move and the velocity of each joint for the three axis RRR manipulator to travel the following distance under joint interpolated motion: Joint 1, 30^{o}, Joint 2, 60^{o} and Joint 3, 90^{o}. All joints travel at a maximum rotational velocity of 30^{o} /s, neglecting the effect of acceleration and deceleration and no joint may travel at grater than 90% of maximum velocity. **[8]**

Q8) a) Explain the necessity of interpolators in trajectory planning of continuous path robots. **[8]**

b) Compare joint space scheme and Cartesian space scheme for trajectory planning. **[8]**

Q9) a) Enlist advantage and drawbacks of lead through programming methods of robot. **[8]**

b) Explain the following commands related to the robot programming MOVE, SPEED, OPEN and SIGNAL **[8]**

Q10) a) Explain the role of frame buffer and grabber in robotic vision system. **[6]**

b) Write notes on Artificial intelligence in robots. **[6]**

c) Explain robotic vision system with neat block diagram. **[6]**

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Total No. of Questions : 10] **[Total No. of Pages : 3**

[3865]-509

P1387

M.E. (Mechanical Engineering) (Design Engineering)

VEHICLE DYNAMICS

(2008 Course) (Elective - IV) (502212)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Square bracketed figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, and non-programmable, electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) The sprung parts of a passenger car weigh 11.12 kN and the unsprung parts weigh 890 N. The combined stiffness of the suspension springs is 45.53 kN/m and that of the tires is 525.35 kN/m. Determine the two natural frequencies of the bounce motions of the sprung and unsprung mass. Calculate the amplitudes of the sprung and unsprung parts if the car travels at a speed of 48 km/h over a road of a sinewave form with a wavelength of 9.15 m and an amplitude of 5 cm. **[18]**

OR

Q2) A tractor with a bounce natural frequency of 3.5Hz and a damping ratio of 0.1 travels at a speed of 5 km/h over a plowed field described by $S_g(\Omega) = 6.5\times10^{-4}\Omega^{-1.6}$ $m^2/cycles/m$ Determine the root-mean-square value of vertical acceleration of the tractor at a frequency of 1 Hz. Evaluate whether the vibration of the vehicle is acceptable from a fatigue or decreased proficiency viewpoint for an 8 h duration based on the International standard ISO 2631 (refer figure 1 on last page). **[18]**

Q3) A sports car weighs 9.919 kN and has a wheelbase of 2.26 m. The center of gravity is 1.22 m behind the front axle. The cornering stiffness of each front tire is 58.62 kN/rad and that of each rear tire is 71.36 kN/rad. The steering gear ratio is 20:1. Determine the steady-state yaw velocity gain and lateral acceleration gain of the vehicle in the forward speed range of 10 to 160 km/h with step of 40. **[16]**

OR

P.T.O.

Q4) a) Derive an expression for the steer angle δ_f required to negotiate a given turn with usual notations. **[8]**

b) Explain steady state response to steering input. **[8]**

Q5) Write short notes on following terms used in vibration measurement: **[16]**

a) r.m.s.

b) peak acceleration

c) crest factor and

d) vibration dose value (VDV).

SECTION - II

Q6) a) Explain transient response characteristic of vehicle in yaw to the steering input. **[8]**

b) Explain braking characteristic of two - axle vehicle. **[8]**

OR

Q7) A passenger car weighs 21.24 kN and has a wheelbase of 2.87 m. The center of gravity is 1.27 m behind the front axle and 0.508 m above ground level. The braking effort distribution on the front axle is 60%. The coefficient of rolling resistance is 0.02. Determine which set of the tires will lock first on two road surfaces: one with a coefficient of road adhesion μ=0.8 and the other with μ = 0.2. **[16]**

Q8) A tracked vehicle weighs 155.68 kN and has a contact length of 304.8 cm and a tread of 203.2 cm. The vehicle has a uniform contact pressure and is equipped with a clutch/brake steering system. On a sandy terrain, the value of the coefficient of motion resistance is 0.15, and that of the coefficient of lateral resistance is 0.5. The angle of internal shearing resistance of the terrain φ is 30°. **[16]**

a) Determine the thrusts of the outside and inside tracks required to execute a steady state turn.

b) If, during the turn, the sprocket of the outside track, with a radius of 0.305 m, is rotating at 10 rad/s, and the inside track is disconnected from the driveline by declutching and the brake is applied, determine the turning radius and yaw velocity of the vehicle during the turn. The slip of the running gear during the turn may be neglected in the calculations.

OR

Q9) A tracked vehicle is equipped with a controlled differential steering system having a gear ratio of 3:1. The vehicle weighs 155.68 kN, and has a tread of 203.2 cm and a contact length of 304.8 cm. The contact pressure of the track is assumed to be uniform. On a particular terrain, the value of the coefficient of motion resistance is 0.15, and that of the coefficient of lateral resistance is 0.5. Determine the minimum turning radius of the vehicle. Also calculate the power required to maintain a steady-state turn at the minimum turning radius when the speed of the center of gravity of the vehicle is 10 km/h. **[16]**

Q10) Write short notes; **[18]**

a) Moment of turning resistance.

b) Steering of vehicles with more than two axles.

c) Rolling resistance.

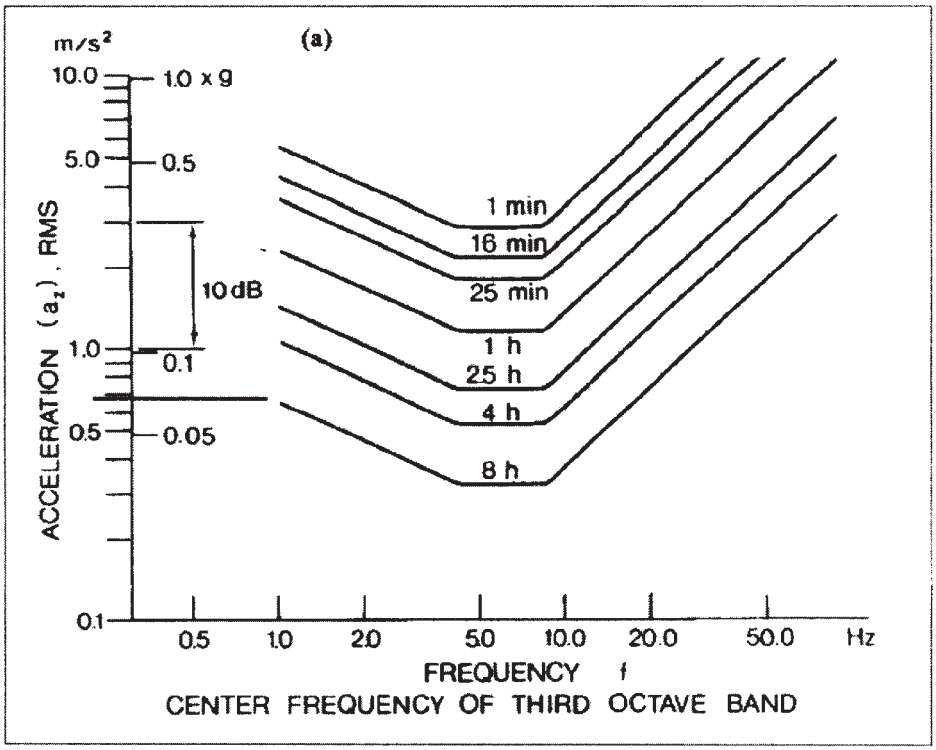


Figure 1. Limits of whole body vibration for fatigue or decreased proficiency as per ISO

Total No. of Questions : 10] **[Total No. of Pages : 3**

P1388

[3865]-515

M.E. (Mechanical) (Mechatronics)

DIGITAL SIGNAL PROCESSING

(2008 Course) (Elective - I)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any Three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if required.***

SECTION - I

Q1) a) Consider the analog signal

$x_a(t) = 10 \cos 400 \pi t$

i) Determine the minimum sampling rate required to avoid aliasing.

ii) Suppose that the signal is sampled at the rate $F_s = 800$ Hz. What is the discrete time signal obtained after sampling?

iii) Suppose that the signal is sampled at the rate $F_s = 200$ Hz. What is the discrete-time signal obtained after sampling. **[8]**

b) Considering digital filter as a system explain when this system can be considered as time invariant, causal, linear and dynamic **[8]**

i) $y(n) = x(n) \cos \omega n$

ii) $y(n) = n^2 x(n-5)$

Q2) a) The impulse response of LTI system is $h(n) = \{1, 2, 3, 4\}$. Determine
$\uparrow$

the response of the system to the input signal $x(n) = \{5, 6, 7, 8\}$. **[10]**
$\uparrow$

b) State and explain sampling theorem for bandlimited signal. What is aliasing effect? **[6]**

P.T.O.

Q3) a) Determine the Z transform of the following discrete time signals and ROC for each. **[8]**

i) $x(n) = u(n)$ ii) $x(n) = u(n-1)$

iii) $x(n) = u(n+1)$ iv) $x(n) = \delta(n)$.

b) State and explain any four properties of 'Z' transform. **[8]**

Q4) a) Determine the 4 point DFT of the following sequence

$x(n) = \{2, -1, 1, 1\}$.
$\uparrow$ **[8]**

b) State and explain any four properties of DFT. **[8]**

Q5) Write short notes on (Any three): **[18]**

a) Comparison of Harvard and modified Harvard architecture.

b) Block diagram of DSP and brief explaination.

c) DTMF.

d) Vibration Analysis.

e) Energy and power signals.

SECTION - II

Q6) a) Perform the circular convolution of the following two sequences. **[8]**

$x_1(n) = \{2, 2, 2, 2\}$, $x_2(n) = \{1, 2, 3, 4\}$
$\uparrow$ $\uparrow$

b) Explain in details the classification of filters with the help of frequency response. **[8]**

Q7) a) Give the comparison between IIR and FIR filters. **[8]**

b) Explain the following in brief. **[8]**

i) Data Address Generator (DAG).

ii) Multiplier - Accumulator Unit (MAC).

Q8) a) Explain the following windows for the design of FIR filters. **[8]**

i) Rectangular window.

ii) Hamming window.

b) Establish the system transfer function for the system defined by

$$y(n) + \frac{2}{3}y(n-1) + \frac{1}{3}y(n-2) = x(n) + \frac{1}{4}x(n-1) + \frac{2}{5}x(n-2).$$

Also realize the same using DF - I and DF - II methods. **[10]**

Q9) a) Determine the 4 point DFT of the following sequence

$$x(n) = \sin\left(\frac{\pi n}{2}\right) \; 0 \le n \le 3.$$ **[8]**

b) Explain any one application of DSP in mechatronics. **[8]**

Q10) Write short notes on (any four). **[16]**

a) Power spectral density.

b) IIR filter design techniques.

c) Comparison between analog and digital filters.

d) Auto/cross correlation.

e) Merits and demerits of DSP.

Total No. of Questions : 8] **[Total No. of Pages : 4**

P1389

[3865]-518
M.E. (Mechanical - Mechatronics)
THEORY OF MACHINES AND MECHANISMS
(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rules and electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the following terms with suitable examples: **[6]**

i) Completely constrained motion.

ii) Incompletely constrained motion.

iii) Successfully constrained motion.

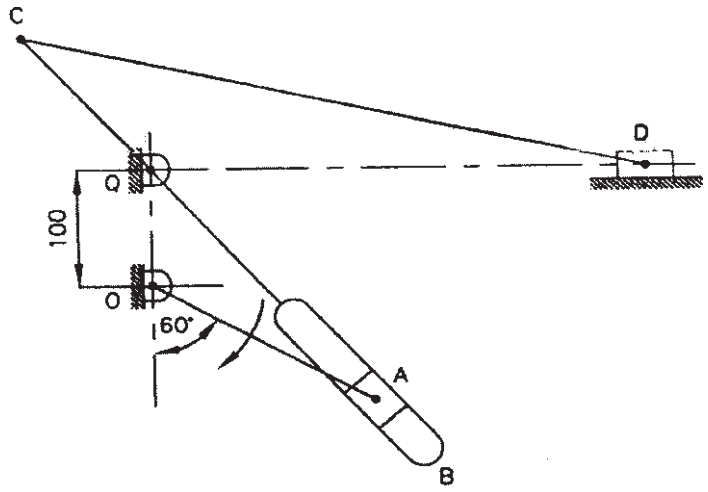
b) Write short note on elliptical trammel. State and explain the condition for which it will trace a circle. **[6]**

c) State and explain Kutzbach criterion with suitable example. **[4]**

Q2) a) What is instantaneous centre of rotation? Explain various types of instantaneous centre of rotation with suitable example. **[4]**

b) Following fig. shows a quick return mechanism in which the driving crank OA rotates at 150 rpm in clockwise direction. For the position shown, determine the magnitude and direction of (i) The velocity of block D, (ii) The angular velocity of the slotted bar QB using relative velocity method. Link lengths are CD = 500 mm, QC = 150 mm and OA = 200 mm. **[12]**

P.T.O.

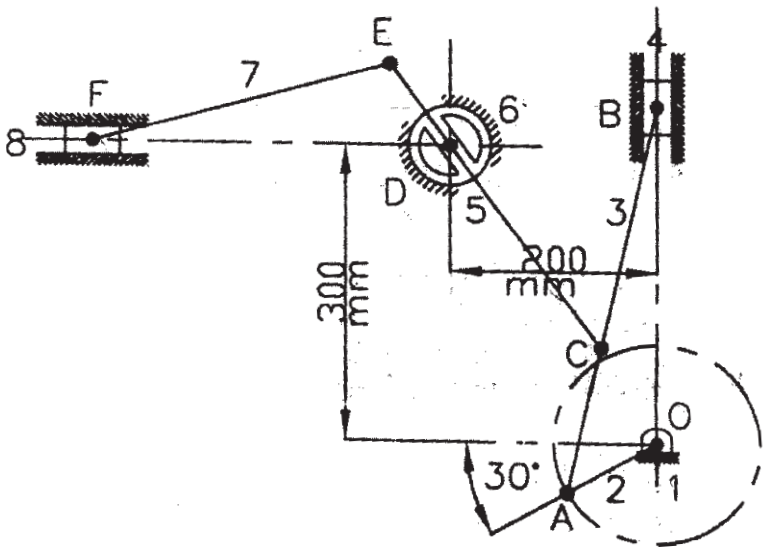


Q3) a) In a slider crank mechanism, lengths of crank and connecting rod are 90 mm and 360 mm respectively. The crank rotates uniformly at 500 rpm clockwise. When the crank has turned through 45° from the inner dead centre. Find by analytical method:–

i) Velocity and acceleration of the piston.

ii) Angular velocity and angular acceleration of the connecting rod. **[6]**

b) Following fig. shows a crank OA, 100 mm long, rotating clockwise about O at 200 rpm. AB is connecting rod 400 mm long. At point C on AB, 150 mm from A, the rod CE, 350 mm long is attached. This rod CE slides in a slot in a trunnion at D. The end E is connected by a link EF, 300 mm long to the horizontal moving slider F. For the mechanism in the position shown, determine the acceleration of F, using relative acceleration method. **[12]**



Q4) a) In a slider crank mechanism, the crank radius is 60 mm and the connecting rod length is 250 mm, rotates at 150 rpm in anticlockwise direction and has angular acceleration of 90 rad/sec^2. Write the loop closure equation and find the velocity and acceleration of the piston by chase solution, when crank angle of 50^o from I.D.C. **[8]**

b) The slider crank mechanism having stroke length 160 mm and obliquity ratio 5. The crank is rotating with anticlockwise direction with an angular velocity of 150 rad/sec. and retardation of 100 rad/sec^2. Find acceleration of slider when the crank is at 35^o from I.D.C. using complex algebra method. **[8]**

SECTION - II

Q5) a) Explain three position synthesis for single slider crank mechanism. **[6]**

b) Synthesis a four bar mechanism with input link 'a', coupler link 'b', output link 'c', and grounded link 'd'. Angle θ and Φ for the three successive positions are given in the table below:

	1	2	3
θ	20^o	35^o	50^o
Φ	35^o	45^o	60^o

If the length of the grounded link is 50 mm, using Freudenstein's equation find out other link lengths to satisfy the given positional conditions. Draw the synthesized mechanism in its position. **[10]**

Q6) a) Explain the terms under damping, critical damping and over damping.**[6]**

b) A coil of spring stiffness 4 N/mm supports vertically a mass of 25 kg at the free end. The motion is resisted by the oil dashpot. It is found that the amplitude at the beginning of the fourth cycle is 0.8 times the amplitude of the previous vibration. Determine the damping force per unit velocity. Also find the ratio of the frequency of damped and undamped vibrations. **[10]**

Q7) a) Explain the Phenomenon of cam jump. **[4]**

b) Draw a profile of a cam operating roller reciprocating follower having a lift of 40 mm. The minimum radius of cam is 30 mm. The cam raises the follower with S.H.M. for 110^{o} of its rotation followed by a period of dwell for 80^{o}. The follower descends for next 120^{o} of rotation of the cam with uniform acceleration and deceleration followed by dwell period. If the cam rotates at a uniform speed of 120 rpm, calculate the maximum velocity and maximum acceleration of the follower during the ascent period and descent period. **[12]**

Q8) a) Write short note on coupler curve synthesis. **[6]**

b) Discuss the effect of inertia on the shaft in longitudinal and transverse vibration. **[6]**

c) Derive equations for displacement velocity and acceleration for a tangent cam operating a radial translating roller follower when the contact is on the straight flank. **[6]**

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Total No. of Questions : 12] **[Total No. of Pages : 3**

P1393

[3865]-540

M.E. (Electrical) (Control System)

AUTOMATION & ROBOTICS

(2008 Course) (Elective)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Give the Basic concept of Automation and Hence define automation. **[5]**

b) Draw and Explain Arm design based human anatomy and hence explain prosthesis. **[5]**

c) Enlist type of Automation and Explain all the types of Automation. **[6]**

OR

Q2) a) Give the Historical development of Robotics. **[8]**

b) Define Robots for the following **[8]**

i) JIRA

ii) BRA

iii) RIA

iv) ISO

Q3) a) Give the Robot specifications and hence explain DOF, work envelop and reach with examples. **[8]**

b) What is spatial resolution in case of robot and hence explain it's significance relatively with accuracy. **[8]**

OR

Q4) a) Explain Robot anatomy with the help of links and joints. **[8]**

b) Explain the following with neat sketches. **[8]**

i) Arm configuration.

ii) Wrist configuration.

iii) End effector configuration.

P.T.O.

Q5) Give the complete Robot classification diagram and hence explain. **[18]**

a) SCARA Robot.

b) Servo Control Robot.

c) Pneumatic Robot.

OR

Q6) a) Give the comparison between cartesian, cylindrical and spherical robot as per their selection criteria. **[6]**

b) What are commercial or industrial manipulator capabilities. **[6]**

c) What are different drives used in manipulators. Explain with their characteristics. **[6]**

SECTION - II

Q7) a) Write in short Robot Control Sequencing for the robot programming. **[8]**

b) Discuss the following Robot languages. **[8]**

i) VAL

ii) RPL

iii) AML

iv) RAIL

OR

Q8) a) Explain Fixed instruction sequence control of robot and hence define 'Teach Pendent'. **[8]**

b) Find commercial examples of robotic extension to computer languages. Comment on the similarities of the extensions in terms of functionality. **[8]**

Q9) a) Two points $a = (4, 3, 2)^T$ and $b = (6, 2, 4)^T$ are to be translated a distance +5 units along X axis and –3 units along the Z axis. Using the appropriate Homogeneous transformation matrix, determine the new point a_{xyz} & b_{xyz}. **[6]**

b) Derive the rotation in y - z plane and z - x plane using the geometric approach and hence derive the rotation formula using vector technique. **[10]**

OR

Q10)a) Using graphical technique prove that it is always possible to make two reference frame co-incidence by performing at most two rotations and one translations. Discuss the implications of the order of the operations. **[6]**

b) Let a point $P=(0.5\ -0.5\ 1)^T$ is rotated along x, y, z axis simultaneously by an angle 30º, 45º, 60º resp. find the co-ordinates of final point P after rotation. **[10]**

Q11) Write short note on the following **[18]**

a) Joint Position Control.

b) Resolved Motion Position Control.

c) Resolved Motion Rate Control.

OR

Q12) a) Explain the Denavite-Hartenberg matrix & hence explain how to determine the parameters a_i, α_i, d_i, and θ_i. **[9]**

b) For a planner 2R manipulator with $l_1 = l_2 = 1$m. More the end-effector from rest at the initial position to rest at the final position in 1 sec. The co-ordinates of the end-effectors in the initial and final positions are

$XB_i = 1.366$m $\quad YB_i = 1.366$ m

$XB_f = -1.366$m $\quad YB_f = 1.366$m

Find the trajectory equations and angles made by links. **[9]**

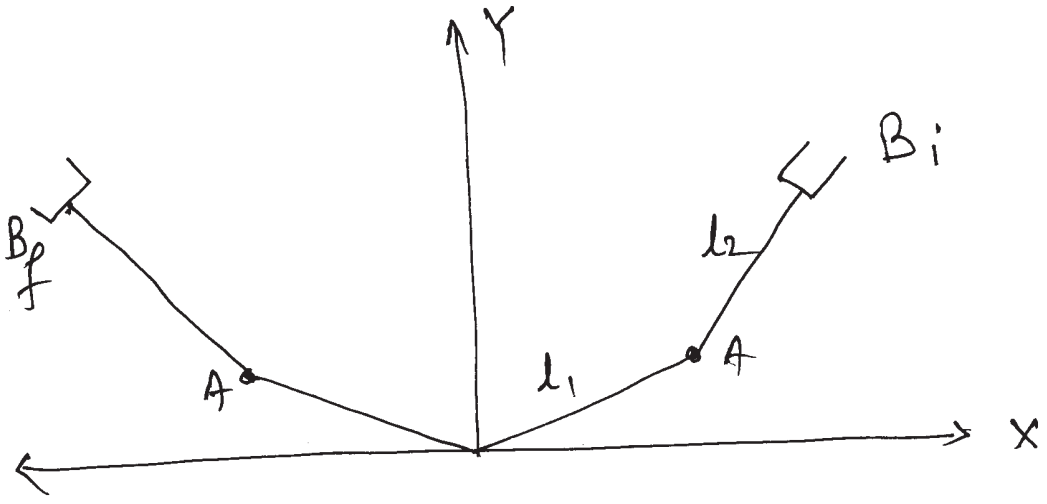

fig: 2R Manipulator.

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1395

[3865]-550
M.E. (Electrical) (Control System)
LARGE SCALE SYSTEM
(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***All questions carry equal marks.***

SECTION - I

Q1) a) Discuss improved Davison's technique for modal order reduction. Does it take care of the accuracy in the steady state error? **[13]**

b) Explain by suitable derivation, how Chidambara technique could be emphasized to get reduced order model, also giving an approval to central law reduction. **[12]**

Q2) a) For a third order system. **[12]**

$$\dot{x}=\begin{bmatrix} 0.5 & 0.5 & 0 \\ 0 & 1 & 0 \\ 0.833 & -2.1167 & -0.333 \end{bmatrix} x+\begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix} u$$

Find a reduced order model by modal aggregation.

b) What is the aggregation of control systems and hence give the properties of aggregated system matrix. **[13]**

Q3) Consider a third order assymptotically stable system with transfer function.

$$G(s)=\frac{s^2+13s+40}{s^3+13s^2+32s+20}=\frac{2+0.65s+0.05s^2}{1+1.6s+0.65s^2+0.05s^3}$$

and hence find the second order reduced model. Also explain moment matching. **[25]**

P.T.O.

SECTION - II

Q4) a) Explain the role of generalized Routh-algorithm in the process of model order reduction using the first, the second, the third couer form. **[20]**

b) Give the justification for the statement. "In case of the second cauer form, the first 2_r terms of the power series expansion about S = 0 for of G_r (s) agree with those of G (s) and in case of the first cauer form, the coefficients of expansion about S = ∞ agree with one another where as the third couer form is able to match both parameters". **[5]**

Q5) Consider the third order system $G(s)=\frac{b_0+b_1 s+b_2 s^2}{a_0+a_1 s+a_2 s^2+s^3}$ what are the first or second order Routh approximations of the system using γ - δ expansion. **[25]**

Q6) a) What are the conditions for the existence of periodic output feedback gain? **[10]**

b) Derive the expression for the lifted output in terms of state and input in the context of fast output sampling feedback technique. **[15]**

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1396

[3865]-554

M.E. (Electrical) (Power Systems)

COMPUTER APPLICATIONS IN POWER SYSTEMS

(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State the criteria on which classification of optimization problem is based. Explain any one in details. **[10]**

b) Explain multivariable optimization with inequality constraints. **[10]**

c) Find the solution of following problem by constrained variation method: **[5]**

Minimize $f(x, y) = 2x^2 + 3y - 4$

Subject to $g(x , y) = 3x - y + 5 = 0$

Q2) a) Explain random walk method for unconstrained minimization. Draw flowchart. **[12]**

b) Explain Unimodal function. Describe algorithm for unrestricted search elimination method with a limited step size. **[13]**

Q3) a) Explain the Newton Raphson method of load flow analysis. (Polar form) **[12]**

b) What are the methods of load flow under contingency conditions? Explain any one in details. **[13]**

P.T.O.

SECTION - II

Q4) a) Explain economic dispatch using Newton Raphson method. Draw flow chart. **[12]**

b) Explain optimal power flow based on Gradient method. **[13]**

Q5) a) Derive transmission loss formula in terms of transmission loss coefficients. **[12]**

b) Explain A.C.-D.C. load flow problem formulation along with D.C. system model, converter variables and derivation of equations. **[13]**

Q6) Explain the following :

a) Three phase load flow method. **[12]**

b) Formulation of sequence impedance matrix in terms of self and mutual impedances using transformation matrix. **[13]**

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1398

[3865]-557

M.E. (Electrical) (Power System)

DIGITAL SIGNAL PROCESSING & ITS APPLICATIONS

(2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 2 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the process of analog to digital conversion and quantization concept. **[6]**

b) Explain how discrete systems are classified as **[9]**

i) Static and dynamic systems.

ii) Linear and non-linear systems.

iii) causal and non-causal systems.

c) Explain the concept of convolution sum as applied to discrete linear time invariant system. Hence obtain convolution of the two sequences.

$x(n) = 1 \quad 0 \leq n \leq 2$

$= 0 \quad$ elsewhere

$h(n) = \{-2, -1, 0, 3\}$ **[10]**

$\uparrow$

P.T.O.

Q2) a) Explain frequency analysis of discrete time signals **[6]**

b) Find the circular convolution of two finite duration sequences

$x_1(n) = \{1, -1, -2, 3, -1\}$;

$x_2(n) = \{1, 2, 3\}$ **[6]**

c) Explain radix 2 (DIT) FFT algorithm in details. **[13]**

Q3) a) Explain design of FIR filters using windows. **[10]**

b) Compare FIR filters with IIR filters explaining their area of application. **[10]**

c) Obtain direct form realization of system function

$H(z) = 1+2z^{-1}-3z^{-2}-4z^{-3}+5z^{-4}$ **[5]**

SECTION - II

Q4) a) Explain different steps involved in designing low pass type I chebyshev analog filter. Hence also explain the procedure to obtain IIR filter using method of impulse invariance from the analog filter. **[15]**

b) Apply bilinear transformation to

$$H(s) = \frac{2}{(s+1)(s+2)}$$ with T = 1 sec and find H(z). **[6]**

c) Explain parallel form realization of FIR filters. **[4]**

Q5) a) Write a note on different architectures of DSP processors. **[13]**

b) Write a note on (any two) **[12]**

i) Special addressing modes in DSP

ii) Effect of finite word length.

iii) Pipelining.

Q6) a) With the help of a functional block diagram explain the features of TMS 320C50 DSP processor. **[15]**

b) Write a detailed note (with block diagram, hardware and software) on any one DSP based power system application **[10]**

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1399

[3865]-559

M.E. (Electrical) (Power Systems)

ARTIFICIAL INTELLIGENCE AND ITS APPLICATIONS IN POWER SYSTEMS

(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) What is fuzzy logic? Explain with examples operations on fuzzy sets. **[10]**

b) Explain with examples, following numbers associated with a fuzzy set. **[5]**

i) Height of a fuzzy set.
ii) Normalization of a fuzzy set.

c) Using following propositions, write well formed formula-WFF. **[10]**

p : Frequency is 50 Hz.

q : The system is unstable.

r : Generation-load balance is present.

Write following statements in symbolic form.

i) If generation-load balance is not present, then the system is unstable.
ii) The system is not unstable and frequency is 50 Hz.
iii) The system is unstable only if frequency is not 50 Hz and generation-load balance is not present.
iv) If frequency is 50 Hz, generation load balance is present.

Q2) Define Logic. Explain propositional logic in context with following points. **[25]**

a) Syntax of PL (1).

b) Symantics of PL (1).

c) Inference rules.

d) Derivation.

e) Resolution.

Explain each point with appropriate example.

P.T.O.

Q3) a) Explain different power system problems where fuzzy logic is useful. **[8]**

b) Explain application of artificial neural network in the area of power system planning, operation and protection. **[9]**

c) Explain three functional properties of neural network. **[8]**

SECTION - II

Q4) a) Define following terms : **[12]**

i) Artificial Intelligence (A.I).
ii) Artificial Neural Network (A.N.N).
iii) Learning of Neural Network.
iv) Generalization of Neural Network.
v) Learning rate.
vi) Momentum coefficient.

b) With neat diagram, explain the deterministic model of artificial neuron. Also explain with mathematical formula and graphical representation, the activation functions. **[13]**

Q5) Compare single layer perceptron with multilayer perceptron. Draw the structure of multilayer perceptron. Explain in detail 'Error back Propagation algorithm'. **[25]**

Q6) a) Explain the concept of learning with teacher and learning without teacher. **[10]**

b) Solve following neumerical for two iterations and use competitive learning algorithm. There are three source nodes as follows; i_1 = (1.1, 1.7, 1.8); i_2 = (0, 0, 0); i_3 = (0, 0.5, 1.5). The connection weights are W_1 = (0.2, 0.7, 0.3) W_2 = (0.1, 0.1, 0.9); W_3 = (1, 1, 1). The learning rate is 0.5. Conclude result about winner node. **[15]**

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1400

[3865]-562

M.E. (Electrical) (Power Systems)

POWER SYSTEM PLANNING AND RELIABILITY

(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain Extrapolation and Correlation techniques of load forecasting. **[8]**

b) Explain energy forecasting in context with residential, commercial and industrial sales forecasts. **[9]**

c) Explain peak demand forecasting. Also explain weather load model. **[8]**

Q2) a) Describe strategies for short term, Medium term and Long term planning. **[9]**

b) Explain the role of power system engineer in Long term planning. **[9]**

c) Explain the importance of reactive power planning in the power system. **[7]**

Q3) a) Explain the concept of probability in context with reliability. Also explain continuous Markov process. **[13]**

b) Explain two state model of reliability and show that MTTF is reciprocal of failure rate. **[12]**

P.T.O.

SECTION - II

Q4) a) What are the factors affecting Generation planning? Describe environmental considerations with reference to Generation planning. **[8]**

b) Explain Integrated Resource Planning. **[9]**

c) Explain factors affecting interconnection under emergency assistance. **[8]**

Q5) a) What is Loss of Load Probability (LOLP)? How it is used in the power system planning? **[10]**

b) Explain Transmission planning. Explain transmission line constraints. **[15]**

Q6) Explain the following in context with distribution system planning and reliability : **[25]**

a) Network reconfiguration.

b) Interruption indices.

c) Effects of lateral distribution protection.

d) Reliability indices.

e) Weather effects.

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1401

[3865]-564
M.E. (Electrical) (Power System)
DIGITAL POWER SYSTEM PROTECTION
(2008 Course) (Elective - III)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Using a flowchart explain in detail numerical overcurrent protection. **[9]**

b) Using block diagrams, explain in brief following digital filtering techniques. **[12]**

i) FIR filter.
ii) IIR filter.
iii) High pass filter.

c) State any four consequences if a power system is not protected. **[4]**

Q2) a) Explain digital protection of EHV/UHV transmission line based on travelling wave phenomenon. **[12]**

b) Explain software design of digital protection of transmission line. **[13]**

Q3) a) Explain digital protection based on injection of subsynchronous component in case of synchronous generator. **[10]**

b) Explain the causes of failure of a synchronous generator. **[5]**

c) Explain digital protection of synchronous generator based upon second harmonic current injection. **[10]**

P.T.O.

SECTION - II

Q4) a) With a neat diagram explain working of relay which is used to protect power transformer against incipient faults. **[10]**

b) In a differential scheme of power transformer explain principal of operation and reasons for taking high bias factor. Derive relay characteristics in complex β -plane. **[15]**

Q5) a) Explain the necessity and problems involved in "Relay setting and co-ordination". **[6]**

b) Explain three-stepped distance protection scheme of transmission line. **[13]**

c) Explain over-current relay setting. **[6]**

Q6) a) Develop fundamental algorithm for the short circuit studies. **[6]**

b) With ref. to (a) above, explain and derive equations for transformation to symmetrical components. **[7]**

c) Develop algorithms to calculate bus voltages, fault currents and fault levels at the buses for following faults : **[12]**

i) 3-Ph to ground fault.
ii) L-L fault.
iii) L-G fault.
iv) L-L-G fault.

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1402

[3865]-567

M.E. Electrical (Power System)

PARTIAL DISCHARGES IN ELECTRICAL POWER APPARATUS

(2008 Course) (Semester - II) (Elective - IV) (503212)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Define the following terms. **[16]**

i) Partial discharge.
ii) Internal discharge.
iii) Surface discharge.
iv) Corona discharge.
v) Permissible discharge level.
vi) Partial Discharge Inception Voltage.
vii) Partial Discharge Extinction Voltage.
viii) Repetition rate.

b) Draw equivalent circuit (a-b-c diagram) of partial discharges occurring in electrical insulation system and discuss effect of partial discharges on deterioration of electrical insulation system. **[9]**

Q2) a) Discuss procedure followed for calibration of PD measuring set up. **[12]**

b) Explain the concept of selectively wide band system used for PD measurement. **[13]**

Q3) Write short notes on :

a) Design of screens used for PD measurement. **[8]**

b) Effect of corners. **[8]**

c) Design of filters used for PD measurement. **[9]**

P.T.O.

SECTION - II

Q4) a) Explain the effects of PD on gaseous insulating materials. **[12]**

b) Explain effects of PD on mixed dielectric insulating materials. **[13]**

Q5) With reference to evaluation of partial discharges in electrical insulation system discuss.

a) Relation between measured and actual charge. **[9]**

b) Relation between the time dependent occurrence of PD and the extent of damage due to it. **[16]**

Q6) a) Discuss PD measurement technique in cables and also explain problems during PD measurement on long cables. **[10]**

b) Discuss PD location technique according to pulse spacing method. **[15]**

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Total No. of Questions :8] **[Total No. of Pages 2**

P1403

[3865]-570
M.E. (E&TC / Electronics)
Microwave / VLSI Embeded Systems / Communication Network / Signal Processing / Digital Systems
PRINCIPALS AND PRACTICES FOR IT MANAGEMENT
(504182) (2008)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any Three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Define management. Explain role of IT project in today's business management. **[8]**

b) Explain the importance of planning as beginning of process of management. **[8]**

Q2) a) Discuss the basic elements of strategic management process. **[8]**

b) Explain the need for project revision with reference to project delays. **[8]**

Q3) a) Enlist various types of conflicts. Identify techniques used for conflict management. **[8]**

b) Give the applications of IT in store and purchase management. **[8]**

Q4) Write short notes on any three : **[18]**

a) Business Ethics.

b) CMMI.

c) Six sigma.

d) Intellectual property rights & cyber laws.

P.T.O.

SECTION - II

Q5) a) Discuss the applications of IT in Agriculture sector. **[8]**

b) Elaborate the concept of knowledge management as modern approach to management. **[8]**

Q6) a) Explain the process of tracking project progress. **[8]**

b) Discuss the various techniques of network diagram creations and analysis. **[8]**

Q7) a) Explain the process of creating a work break down structures. **[8]**

b) Give the tools and techniques of strategic management. **[8]**

Q8) Write short notes on <u>any three</u> : **[18]**

a) Formal and Informal groups.

b) Stress management.

c) Energy management and energy audit.

d) Quality control and customer relationship.

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Total No. of Questions : 06] **[Total No. of Pages : 2**

P1405

[3865]-572

M.E. E & TC (Microwave)

APPLICATIONS OF MICROWAVE TO RADAR AND SATELLITE

(2008 Course) (Elective - I) (504224)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Solve any TWO questions from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data whenever necessary.***

SECTION - I

Q1) a) What are the losses in RADAR system? Derive an expression for Maximum RADAR range equation. **[15]**

b) A RADAR has the parameters: PRF of 1 kHz, Pulse width 2 μS, average power 100 W, Transmitting frequency of 6 GHz, target moving with a radial velocity of 200 km/Hr. Find peak power output, duty cycle and Doppler frequency. **[10]**

Q2) a) Explain the concept of RCS in detail with a characteristics for perfectly conducting sphere and square plate. **[10]**

b) What are the techniques for RCS prediction? Explain one of the technique. A RADAR operating at $\lambda = 0.03$ m has $R_{max.} = 50$ km. Its antenna gain is 2000 and transmitted power is 250 kw. Minimum detectable signal is 10 Pw. Find RCS of target. **[15]**

Q3) a) Explain Ambiguity function related to Synthetic Aperture Radar in detail. **[12]**

b) Elaborate application of S.A. Radar for ship monitoring. **[13]**

P.T.O.

SECTION - II

Q4) a) State and explain Kepler's law of planetary motion. **[10]**

b) Determine the look angles and the range for geostationary satellite at 30º for the earth station at latitude - 20º, longitude -30º. The earth station is situated at 1000 m above mean sea level. **[15]**

Q5) a) Explain in detail the TT and C systems in satellite communication. **[15]**

b) A receiving system consists of an antenna having a noise temperature of 60 k feeding directly into a LNA. The amplifier has a noise temperature of 120 k and gain of 45 dB. The coaxial feeder between the LNA and the main receiver has a loss of 2 dB, and the main receiver has noise figure of 9dB. Calculate the system noise temperature referred to input. **[10]**

Q6) a) Given that the IF bandwidth for a 252-channel FM/FDM telephony carrier is 7.52 MHz and that the required [C/N] ratio at the earth station receiver is 13dB, calculate **[10]**

i) The [C/T] ratio

ii) Satellite [EIRP] required if the total loss amount to 200 dB,

and the earth station ratio [G/T] is 37.5 dB/K.

b) What are different satellite access techniques? Explain each one of it.**[15]**

Total No. of Questions : 08] **[Total No. of Pages : 2**

P1406

[3865]-573

M.E. (E & TC) (Microwave)

DIGITAL IMAGE PROCESSING AND ANALYSIS

(2008 Course) (504224)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Assume suitable data, if necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of calculator is allowed.***

SECTION - I

Q1) a) With the help of a neat block diagram, explain a typical image processing system. **[8]**

b) Explain the following terms: **[8]**

i) Pixel

ii) 4- connectivity

iii) Spatial resolution

iv) Euclidean distance

Q2) a) Discuss any two point processing techniques in detail with their typical application. **[8]**

b) Write an algorithm for histogram equalization. **[8]**

Q3) a) Explain image restoration in the presence of noise using any two spatial filtering techniques. **[8]**

b) What is a color model? Explain HSI color model in detail with its application. **[8]**

Q4) a) Explain any one technique for lossless image compression. **[8]**

b) Explain DCT. Write expressions for forward and inverse 2D DCT of a signal f(m, n). **[10]**

P.T.O.

SECTION - II

Q5) a) Explain technique of image dilation and erosion. State their applications. **[8]**

b) Suggest any one technique for detecting edges in an image. **[8]**

Q6) a) Explain how Hough transform is helpful in detecting circles in an image. **[8]**

b) Explain any one technique for region based segmentation of an image. **[8]**

Q7) a) With the help of a suitable example, generate a chain code for an image. Use both 4 connectivity and 8 connectivity. **[8]**

b) Explain any 2 boundary descriptors. **[8]**

Q8) a) Write a note on Baye's classifier for object recognition. **[8]**

b) Explain object recognition using neural networks. **[10]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1409

[3865]-579

M.E. (E & T/C) (Microwave)

SIGNAL PROCESSING FOR WIRELESS COMMUNICATION

(504229) (2008 Revised Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) With the help of expressions statistical parameters, sketches etc compare among any four probability distribution models. Suggest suitable applications of each with reference to statistical signal processing. **[12]**

b) Explain the significance of complementary error function in digital communication. **[4]**

Q2) a) Define maximum likelihood estimator and MAP estimator. Can you use MLE to estimate random parameters? Justify your answer. **[6]**

b) Explain Gauss Markov Model. **[6]**

c) Explain what is hypothesis testing. **[4]**

Q3) a) Explain what are adaptive filters. **[4]**

b) Explain LMS algorithm starting from basics of Wiener filter theory. **[8]**

c) Explain any one application of adaptive filters. **[4]**

P.T.O.

Q4) Write short notes on (any three) : **[18]**

a) Spread spectrum communication.

b) Kalman filter.

c) RLS algorithm.

d) Base band digital communication.

SECTION - II

Q5) a) Explain what do you mean by spectral estimation. **[4]**

b) Explain the principles of spectral estimation. **[6]**

c) Explain Welch method of power spectrum estimation. **[6]**

Q6) a) Explain the term noise and discuss the various types of noise. **[6]**

b) Derive the expression for detection of known signals in colored noise. **[10]**

Q7) a) Explain the term target detection. **[6]**

b) Explain steady point target in detail. **[6]**

c) Explain dynamic target tracking. **[4]**

Q8) Write short notes on (any three) : **[18]**

a) Correlation receiver for binary decision problem.

b) Intersymbol interference in digital communication.

c) Probability distribution function and its properties.

d) ISI channel model for Kalman equalizer.

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1411

[3865]-581
M.E. (E & TC) (Microwave)
FIBER OPTIC COMMUNICATION
(2008 Course) (Elective - III) (504231)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any two questions from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data whenever necessary.***

SECTION - I

Q1) a) Explain the concept of electromagnetic modes in relation to planar optical waveguide. Discuss the modification that may be made to EM mode theory in a planar waveguide in order to describe optical propagation in cylindrical fiber. **[15]**

b) A step index fiber in air has N.A. of 0.16, a core R.I. of 1.45 and core diameter of 60 μm. Determine the normalize frequency for the fiber when light at wavelength 0.9 μm is transmitted. Further, estimate the number of guided modes propagating in fiber. **[10]**

Q2) a) Explain fiber cable design and manufacturing technique. **[10]**

b) A single mode SI fiber has zero dispersion wavelength of 1.29 μm and exhibits total first order dispersion of 3.5 ps nm^{-1} km^{-1} at wavelength of 1.32 μm. Determine the total first order dispersion at a wavelength of 1.54 μm. **[15]**

Q3) a) What is OTDR? Explain it. Explain also fiber fault location by using OTDR. **[12]**

b) Describe the basic detection process in photoconductive detector. The maximum 3 dB bandwidth allowed by an InGaAs photoconductive detector is 380 MHz when the electron transit time through the device is 7.6 ps. Calculate the photocurrent obtained from the device when 10 μw of optical power at wavelength of 1.32 μm is incident upon it, and the device quantum efficiency is 75%. **[13]**

P.T.O.

SECTION - II

Q4) a) Explain in detail the concept of WDM. **[15]**

b) The APD operates at $\lambda = 1\,\mu m$. Assuming a zero disparity binary code, estimate the incident optical power required at the receiver to register a binary one with BER of 10^{-9} at bit rates of 10 Mbits s^{-1} and 140 Mbits s^{-1}. The APD has following parameters :

Quantum efficiency = 80%, ratio of carrier ionization rate = 0.02 and operated with multiplication factor of 100. **[10]**

Q5) a) Explain in detail EDF Amplifier. **[13]**

b) For EDFA with a gain of 26 dB and maximum output of 10 dBm. **[12]**

i) Compare the output signal level per channel for 1, 2, 4 and 8 wavelength channel, when the input power is 1mW for each signal.

ii) What are the output signal levels per channel in each case if a pumped power is doubled.

Q6) a) For fiber optic link design explain what are system design considerations. **[10]**

b) An analog optical fiber system employs and LED which emits 3 dBm mean power into air. A coupling loss of 17.5 dB is encountered when launching into a fiber cable. The fiber cable which extends for 6km without repeater exhibits a loss of 5 dB/km. It is spliced every 1.5km with an average loss of 1.1 dB/splice. The connector loss at receiver is 0.8 dB. The PIN-FET receiver has a sensitivity of –54 dBm at the operating bandwidth of system. Assuming there is no dispersion equalization penalty, perform the optical power budget and establish safety margin.**[15]**

Total No. of Questions : 10] **[Total No. of Pages : 2**

P1412

[3865]-595

M.E. (E & TC/VLSI and Embedded Systems)

MEMORY TECHNOLOGY

(504185) (Elective - II) (2008 Course) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the different parameters which should be taken into account while designing SRAMs? **[7]**

b) Draw the various SRAM cell structures. Explain then for various operations. **[10]**

Q2) a) Draw the DRAM 3T cell structure and explain its operation. **[7]**

b) Explain the various stages of soft-error creation by an alpha-particle hit in a DRAM with necessary sketches. **[10]**

Q3) a) Discuss Stuck at fault model and explain it's pro and con of it. **[6]**

b) Explain data retention fault of memory in case of SRAM and DRAM. **[10]**

Q4) a) Write algorithm forMAT+. What types of faults it covers? **[8]**

b) What are the typical SRAM dc electrical characteristics? **[8]**

P.T.O.

Q5) Write short note on : **[16]**

a) Necessity of Testing of semiconductor memory.

b) Radiation effect on semiconductor memory.

c) Reliability issues of semiconductor memory.

SECTION - II

Q6) a) What is FRAMs? Explain working principals of same. **[10]**

b) How FRAMs are better than existing SRAMs and DRAMs? **[6]**

Q7) a) Explain basic principle of Analog Memory. **[8]**

b) What are applications of Analog Memories? **[8]**

Q8) a) Explain the principle operation of MRAMs with necessary sketches. **[10]**

b) What are the advantages and disadvantages of MRAMs? **[7]**

Q9) a) What are the different memory cards are available in the market? What care should be taken while handling such cards? **[7]**

b) What are the hardware and software requirements the tablet PC? **[10]**

Q10) a) Explain the basic working principle of LCD with suitable sketch. **[8]**

b) Explain the principle working of DVD with suitable sketch. **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1413

[3865]-598

M.E. (E & T/C) (VLSI & Embedded Systems)

EMBEDDED SIGNAL PROCESSING

(504189) (2008 Course) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any 3 questions from each section.***
2) ***Answer 3 questions from Section I and 3 questions from Section II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Find out the output $y(n)$ of a filter whose impulse response is $h(n) = \{1, 1, 1\}$ and input signal $x(n) = \{3, -1, 0, 1, 3, 2, 0, 1, 2, 1\}$ using (i) overlap-save method (ii) overlap-add method. **[8]**

b) What is a STFT? Explain with example how STFT can be used for time frequency analysis. **[8]**

Q2) a) Describe in detail "Divide & Conquer method" of computation of DFT. Describe in detail column wise mapping & row wise mapping. **[8]**

b) What is a discrete wavelet transform? How DWT is better than DFT? Explain. **[8]**

Q3) a) Explain the design of FIR filter using rectangular window. State its advantages and disadvantages. **[9]**

b) Explain DTMF application with importance of Goertzel Algorithm in it. **[9]**

P.T.O.

Q4) a) Justify the necessity of MAC & barrel shifter in DSP processor. **[4]**

b) With a simple schematic justify the speed enhancement in modified Harward architecture. **[4]**

c) List the sources of errors in digital signal processing. How product round off errors are reduced? **[4]**

d) What are desirable features of DSP processor? **[4]**

SECTION - II

Q5) a) Explain the concept of pipeling using timing diagram & explain how the performance of DSP processor can be improved with the help of same. **[8]**

b) Discuss in detail the finite wordlength effects in fixed point DSP system. **[8]**

Q6) a) Explain the VLIW architecture used in DSP processors with neat diagram. **[8]**

b) Describe in detail the different representation methods of DSP systems. **[8]**

Q7) a) Consider the DFG shown in fig. The number of parenthesis are computation times of the nodes. **[8]**

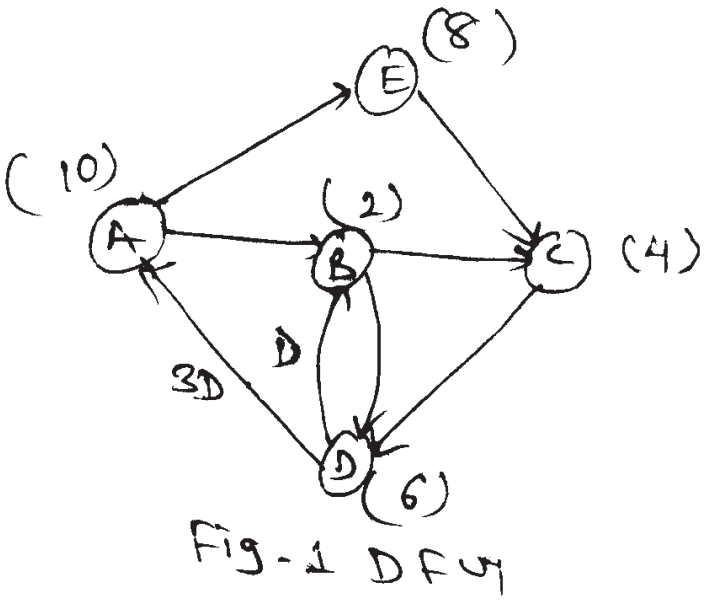

Fig-1 DFG

i) What is the iteration bound of this DFG? What is the actual iteration period?

ii) Retime this DFG to minimize the iteration period.

b) Compare TMS 320C 67XX & TMS 320C 54XX with respect to architectures, MIPS/FLOPS, accumulators, memories, onchip peripherals & addressing modes. **[8]**

Q8) Write short notes on (any 3) : **[18]**

a) Linear convolution & circular convolution.

b) Adaptive noise canceling with LMS adaptation algorithm.

c) Radix 2 DIT FFT algorithm.

d) FIR vs IIR filters.

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Total No. of Questions : 6] **[Total No. of Pages : 3**

P1416

[3865]-474

M.E. (Civil) (Structural)

OPTIMIZATION TECHNIQUES

(2008 Course)

Time : 4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two Sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State the necessary and sufficient conditions for the maximum of a multivariable function $f(x)$ **[7]**

b) A beam column of rectangular section is required to carry an axial load of 100 N and a transverse load of 40 N acting as shown in the figure. It is to be designed to avoid possibility of yielding and buckling and for minimum weight.

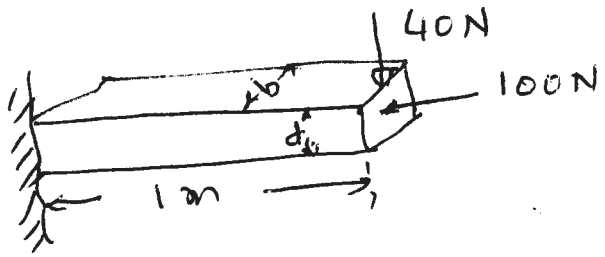
Formulate the optimization problem by assuming that the beam column can bend only in vertical plane. The material is of steel with specific weight of 80 kN/m^3, elastic modulus of 2x10^{7}kN per square meter and yield stress of 2 x10^4 kN/m^2.

The width of the beam is required to be at least 1.5 cm and not greater than twice the depth. **[11]**

c) Determine the maximum and minimum values of the function. **[7]**

f(x) = 12 x^5– 45x^4 + 40x^3 + 5

Figure for Q 1(b)



P.T.O.

Q2) a) How to identify the optimum solution in the simplex method? **[6]**

b) Minimize the following function with linear programming.

$f(x_1, x_2) = 3x_1 - 5x_2$

Subject to

$$x_1 + x_2 \leq -2$$
$$4x_1 + x_2 \geq -5$$
$$x_1 \geq 0, x_2 \text{ –un restricted in sign.}$$ **[10]**

c) Maximize

$$F = 2x_1 + x_2 + 3x_3$$

Subject to

$$x_1 + x_2 + 2x_3 \leq 5$$
$$2x_1 + 3x_2 + 4x_3 = 12$$
$$x_1, x_2, x_3 \geq 0$$ **[9]**

Q3) a) Write down the difference between elimination and interpolation methods. **[6]**

b) Minimize the function

$f_x = 0.65 - [0.75/(1+x^2]-$

$0.65x \tan^{-1} 1/x$

using Golden Section Method with x=6. **[10]**

c) State characteristics of direct search method.

Find the minimum of

$f = x^2 - 5x^3 - 20x + 5$

by quadratic interpolation method. **[9]**

SECTION - II

Q4) a) Minimize $f=2(x_2-x_1^2)^2+(1-x_1)^2$ **[13]**

If a base simplex is defined by the Vertices

$$X_1 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}, X_2 = \begin{Bmatrix} 1 \\ 0 \end{Bmatrix}, X_3 = \begin{Bmatrix} 0 \\ 1 \end{Bmatrix}$$

Find a sequence of four improved vectors using reflection, expansion and/or contraction.

b) Carry out first three iterations for minimization of the following problem using steepest descent method. Assume $X_0 = 0$. **[12]**

$f(X) = x_1 - x_2 + x_1^2 - x_1 x_2.$

Q5) a) Minimize $f = 3x_1^2 + 4x_2^2$ subject to $x_1 + 2x_2 = 8$ using an exterior penalty function method with the calculus method of unconstrained minimization. **[13]**

b) Minimize $f(X) = x_1^3 + x_2^3 + 3x_1x_2$, Subject to **[12]**

$3x_1 + x_2 \leq 3$

$5x_1 - 3x_2 \leq 5$

$x_1, x_2 \geq 0$

Using GRG method.

Q6) a) Illustrate the difference between Genetic Algorithms and traditional methods of optimization. Explain the way of representation of design variables in GA's. **[13]**

b) What is a neural network? How is a neuron modeled in neural network based models? **[12]**

Total No. of Questions : 9] **[Total No. of Pages : 3**

P1418

[3865]-532

M.E. (Mechanical) (Automotive Engineering)

FINITE ELEMENT METHOD

(2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

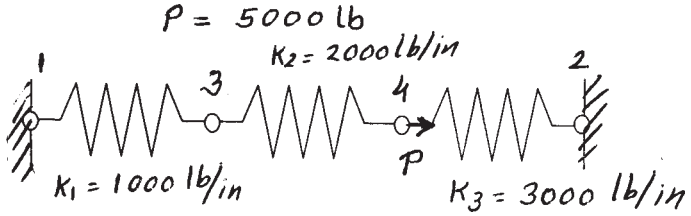
Q1) a) Explain shape function of CST element. Also explain the physical representation by area coordinates. **[6]**

b) Name three commonly used methods for deriving the element stiffness matrix and element equations. Briefly describe each method. **[6]**

c) Briefly explain the three typical areas of engineering where the finite element method is used. **[6]**

Q2) a) Derive a relation to determine the Jacobian function for CST element. **[6]**

b) For the spring assemblage with arbitrarily numbered nodes as shown in figure below, obtain global stiffness matrix, displacement of nodes and reaction at support. **[10]**



Q3) a) What is Local and Global Coordinate system? For 1-D spar element derive the relationship between local and global coordinate system. **[8]**

b) Discuss the Problem Modeling and Boundary Conditions for the following cases:

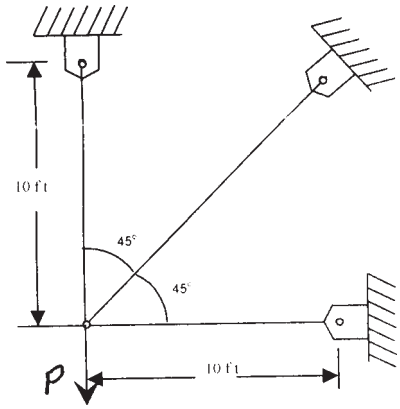
i) A cylinder of infinite length subjected to external pressure. **[8]**

ii) Belleville spring.

P.T.O.

Q4) a) Sketch and explain the frame element. **[6]**

b) For the plane truss composed of the three elements shown in the fig, subjected to a downward force of P = 10,000 1b applied at node. Determine the x and y displacement of the node and the stresses in each element. Let E = 30 x 10^6 psi and A = 2 in^2 for all elements. **[10]**



SECTION - II

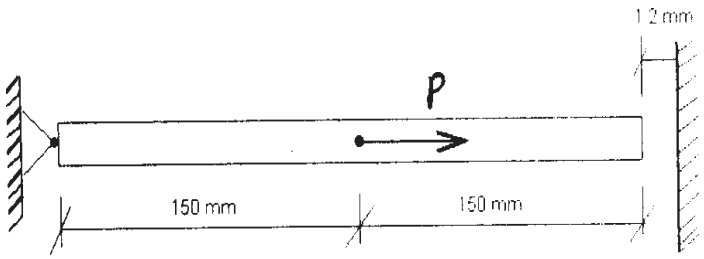
Q5) a) What is an isoparametric element? Explain with suitable example. **[4]**

b) Explain how symmetry is used in FEA with applications. **[6]**

c) Obtain the stress-nodal displacement relationship for the one dimensional element. **[6]**

Q6) a) Explain semiautomatic and fully automatic method of mesh generation with suitable example. **[8]**

b) In the figure below, a load P = 60 kN is applied as shown. Determine the displacement field, stress and support reaction in the body. Take A = 250 mm^2 and E = 20 kN/mm^2. **[8]**



Q7) a) Derive an expression for stiffness matrix of a Truss element. **[8]**

b) A CST element is defined by nodes at I(24, 30), J(60, 20), and K(90, 50) and the stress at these nodes are 90, 120 and 160 MPa respectively. Determine the stress at point P(60, 30). **[8]**

Q8) a) Consider a thin tapered plate with 6 inches width at top and 3 inches width at bottom having a length of 24 inches and uniform thickness of 1 inch. The material of the plate is steel having Young's modulus E = 30 x 10^6 psi and weight density 0.28 lb/in^3. In addition to its self weight, the plate is subjected to point load P = 100 lb at its midpoint. **[10]**

i) Model the plate with two finite elements.

ii) Using elimination approach, solve for the global displacement vector.

iii) Evaluate stress in each element.

Determine the reaction force at support.

b) Discuss the Post processing and Solution in FEA. **[6]**

Q9) Write a short note on any three. **[18]**

a) Plane stress and plane strain condition.

b) Significance of shape functions.

c) Interfacing of CAD and 3D analysis.

d) Different loading conditions in Beam Elements.

Total No. of Questions : 10] **[Total No. of Pages : 2**

P1419

[3865]-605

M.E. (Electronics / E & TC) (VLSI and Embedded Systems)

SOFTWARE DEFINED RADIO

(2008 Course) (Elective - IV) (504192)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Figures to the right indicates full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the concept of Software Defined Radio (SDR) with necessary block diagram. **[8]**

b) Write parameters for antenna selection for SDR. **[8]**

Q2) a) What are the typical component requirements of SDR with necessary specifications? **[8]**

b) For SDR developments explain different development tools that are available? **[8]**

Q3) a) Write typical characteristics of SDR and explain them in detail. **[8]**

b) What are the various processing steps required in Transmitter and Receiver of RF front end w.r.t. SDR? **[10]**

Q4) a) What are the various factors which should be considered while designing dynamic range of SDR receiver design? **[8]**

b) Why SDR Forum is formed? Explain the how to become member of this form. **[8]**

Q5) a) Describe aim and requirements of SCA. **[8]**

b) Justify ADC and DAC plays important role in SDR? **[8]**

P.T.O.

SECTION - II

Q6) a) Explain the role of DSP in SDR? **[8]**

b) Write Selection criteria for selection of processor for SDR? **[8]**

Q7) W.r.t. JTRS write short note on: **[18]**

a) Functional view.

b) Network overview.

c) Core frame work.

Q8) What are the factors which should be taken in account while selecting RTOS? Explain any one from following in detail. **[16]**

a) VxWorks.

b) LINUX & RT LINUX.

c) DSP/BIOS.

Q9) a) Write typical selection criteria for selecting the antenna for SDR? **[8]**

b) Describe typical low cost experimental Software Radio Platform. **[8]**

Q10)a) Write utility of EDA tools in software design development? **[8]**

b) Explain "SPEAKeasy" project. **[8]**

Total No. of Questions : 8] **[Total No. of Pages : 4**

P1420

[3865]-606

M.E. (E & TC - Signal Processing)

LINEAR ALGEBRA AND RANDOM PROCESSES

(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Prove that 'A triangular matrix is normal if and only if it is diagonal'. **[6]**

b) Show that matrix $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ satisfies Caley Hamilton theorem. Also determine the characteristic roots and corresponding characteristic vectors of matrix A. **[8]**

c) Determine whether each of following system is linear. (any two) **[4]**

i) $5x + 7y - 8yz = 16$

ii) $x + \pi y + ez = \log 5$

iii) $3x + ky - 8z = 16$

Q2) a) Express determinant Δ as product of two determinants and find its value.

$$\Delta = \begin{bmatrix} (a-x)^2 & (b-x)^2 & (c-x)^2 \\ (a-y)^2 & (b-y)^2 & (c-y)^2 \\ (a-z)^2 & (b-z)^2 & (c-z)^2 \end{bmatrix}$$ **[6]**

P.T.O.

b) Show that matrix A is involutory. **[4]**

$$A = \begin{bmatrix} -5 & -8 & 0 \\ 3 & 5 & 0 \\ 1 & 2 & -1 \end{bmatrix}$$

c) For the given Toeplitz matrix prove that inverse of a Toeplitz matrix is not in general Toeplitz. **[6]**

$$A = \begin{bmatrix} 1 & 3 & 5 \\ 2 & 1 & 3 \\ 4 & 2 & 1 \end{bmatrix}_{3\times 3}$$

Q3) a) Apply the test of rank to examine if following equations are consistent.

$2x - y + 3z = 8$

$-x + 2y + z = 4$

$3x + y - 4z = 0$

If consistent find the complete solution and if not make them consistent and find solution. **[8]**

b) Show that if A is an orthogonal matrix, then A^1 and A^{-1} are also orthogonal. **[4]**

c) Find the characteristics roots of the 2-rowed orthogonal matrix $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ and verify that they are of unit modulus. **[4]**

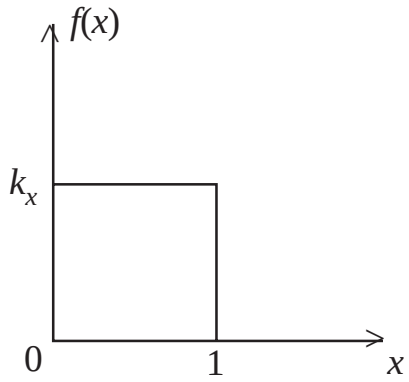
Q4) a) Show that the vectors $X_1 = [1, 2, 3]$, $X_2 = [-3, -2, -1]$, $X_3 = [1, -6, -5]$, form a linearly independent system. **[6]**

b) If matrix A is given by, $A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$. Find matrix B such that, it will state that A is non-singular matrix. **[6]**

c) Prove that Every orthonormal set of vectors is linearly independent. **[4]**

SECTION - II

Q5) a) Consider a probability density function shown below : **[8]**



Find :

i) Value of k ii) Mean

iii) Mean square value iv) Variance

v) 4^{th} moment vi) 4^{th} central moment.

b) A box contains 10 red pens, 8 blue pens and 6 green pens. What is the minimum number of draws, so that at least one pair of pens of the same colour is drawn. One pen is removed out for every draw. **[4]**

c) X and Y are two Random variables which represent 4 data points each. Calculate E(X), E(Y) and covariance of XY. Given,

X = {1, 3, 3, 5}, Y = {12, 12, 11, 7} **[4]**

Q6) a) Explain Binominal and Poissions distribution function. Give an example for each. **[8]**

b) Two Random variables X and Y are related by the relation $Y = ax + b$ where, a and b are any real constants. Show that their covariance is $C_{xy} = a\sigma_x^2$. **[8]**

Q7) a) Distinguish between Ensemble, Ensemble average and time average. What is an Ergodic process? **[8]**

b) Consider a resistor carrousel containing six bins. Each bin contains an assortment of resistors as shown in table. If one of the bins is selected at random and a single resistor drawn from that bin at random, what is the probability that the resistor chossen will be 10Ω? Refer to table 1 shown. **[10]**

Ohms	Bin Numbers						
	1	2	3	4	5	6	Total
10Ω	500	0	200	800	1200	1000	3700
100Ω	300	400	600	200	800	0	2300
1000Ω	200	600	200	600	0	1000	2600
Total	1000	1000	1000	1600	2000	2000	8600

Table : 1

Q8) a) Derive an equation for mean of a Random Process which is passed through an LTI filter. **[8]**

b) Draw the power spectral density probability distribution function and auto correlation of white Gaussian noise. What is noise Bandwidth. What is its valve for RC-Low pass filter. **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1422

[3865]-608

M.E. (E & TC - Signal Processing)

DIGITAL IMAGE PROCESSING

(2008 Pattern)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the Two Sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Assume suitable data, if required.***

SECTION - I

Q1) a) What is histogram specification? Explain with suitable example. **[8]**

b) Explain how the Laplacian of Gaussian can be used for image enhancement. **[8]**

Q2) a) Define chrominance, luminance and brightness. Explain the need of separating chrominance and luminance in color image processing. **[8]**

b) Explain Mach band effect. **[8]**

Q3) a) During acquisition an image undergoes uniform linear motion in the vertical direction for a time T1. The direction of motion then switches to the horizontal direction for time interval T2. Assuming that time it takes to change the direction is negligible and shutter opening and closing times are also negligible, give an expression for the blurring function H (u,v).**[8]**

b) Explain image restoration using Weiner filter. **[8]**

Q4) Write short notes on **[18]**

a) Homomorphic filter.

b) Orthogonal transform.

c) Additive and subtractive color models.

P.T.O.

SECTION - II

Q5) a) For given 2 x 2 image find DCT and show that DCT preserves signal energy. **[8]**

2	2
1	2

b) Explain the application of KL transform for principal component analysis. **[8]**

Q6) a) Explain any two region segmentation techniques. **[8]**

b) Explain use of motion in image segmentation. **[8]**

Q7) a) Explain any two descriptor used for boundary description. **[8]**

b) Find an expression for the signature of each of the following boundaries and plot the signatures. **[8]**

i) Square.

ii) Rectangle.

Q8) a) With suitable example explain arithmetic coding. **[6]**

b) With neat block diagram explain working of two dimensional transform coding for image compression. **[6]**

c) Explain the application of image processing for finger print recognition. **[6]**

Total No. of Questions : 8] **[Total No. of Pages : 3**

P1423

[3865]-612
M.E. (E & TC)
(Signal Processing)
WIRELESS AND MOBILE COMMUNICATION
(2008 Course) (Elective - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write a short note on "Ball Park Estimates". **[4]**

b) For a multipath channel σ is given as 1.37ms. Find out 50% coherence BW for the channel. Explain its importance and comment on the suitability for AMPS and GSM channel. **[8]**

c) State the condition for fast fading in terms of symbol period and signal BW. Why fast fading occurs only for very low data rates? **[4]**

Q2) a) A cellular service provider decides to use a digital scheme which can tolerate a S/N ratio of 15dB in worst case. Find the optimal value of N for

i) Omnidirectional antennas.
ii) 120° sectoring.
iii) 60° sectoring which sectoring scheme is better?

(Assume path loss component $n = 4$). **[8]**

b) If a subscriber is located at a distance of 1000m from the base station and adjacent channel interference is 100m from the base station, find S/I ratio due to adjacent channel interference (Take $n = 3$). **[4]**

c) Write a short note on channel assignment strategies. **[4]**

P.T.O.

Q3) a) Explain various techniques used to improve coverage and capacity in a cellular system. **[6]**

b) Consider a system with 100 cells and number of channels per cell = 20. If the average calling rate is 2 call's/hr and average duration of each call is 3 min, how many number of users can be supported if blocking probability is 2%.

(Total carried traffic is 13 Earlangs). **[6]**

c) Explain the various channels involved in a mobile oriented outgoing call. **[4]**

Q4) a) Write a short note on Okumura model. **[6]**

b) Explain the concept of inverse square law of proportion and the significance of loss exponent. **[4]**

c) Write a short note on ping-pong effect. **[4]**

d) How much of increase in capacity can occur if we use Microcell zoning of 3 zones per cell? **[4]**

(Assume S/I = 18 dB).

SECTION - II

Q5) a) Write a short note on RAKE receiver. **[4]**

b) What is the need of equalization? Explain linear transversal equalizer. **[6]**

c) Prove that no doppler shift will occur when the vehicle is moving perpendicular to the angle of arrival of the transmitted signal. Also find the time seperation required in samples of the received signal, in order that they are approximately independent for a doppler spread of 40 Hz. **[6]**

Q6) a) Draw and explain the architecture of IS-95 system. **[8]**

b) Differentiate between dimension limited system and interference limited system. **[4]**

c) Prove that the given codes are orthogonal to each other. **[4]**

C_1 = [0 0 11 00 11]

C_2 = [00 00 11 11]

Q7) a) Prove that the system capacity (number of mobile users) for a CDMA system is equal to 1.45 GP where GP is the processing gain. **[8]**

b) Differentiate between CDMA 2000 and W-CDMA. **[4]**

c) Explain various CDMA call processing states. **[4]**

Q8) a) Explain the need of short code and long code in CDMA. **[4]**

b) With the help of field equations for Hertzian dipole, show that the near field exist only in terms of $\overline{E}$. Also show that as the operational frequency increases, for field becomes dominant. **[7]**

c) Write a short note on Smart Antenna. **[5]**

d) What do you mean by reuse factor of 1 ? **[2]**

Total No. of Questions : 8] **[Total No. of Pages : 3**

P1425

[3865]-615

M.E. (E & TC) Signal Processing

ADVANCED DIGITAL SIGNAL PROCESSING

(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) For the system :

$$H(z) = \frac{1}{1 - 9z^{-1}}$$

Determine $P_0(z)$ and $P_1(z)$ for the two component decomposition. **[6]**

b) What is need for anti-imaging filter after upsampling a signal? **[5]**

c) Design linear phase FIR filter that satisfies the following specification based on single stage. **[7]**

Q2) a) Explain different addressing modes of TMS 320C 54XX. **[4]**

b) Let H(z) be a causal FIR transfer function of degree N – 1 with N even.

$$H(z) = \sum_{n=0}^{N-1} h(n) z^{-n}$$

Show that H(z) can be expressed in the form

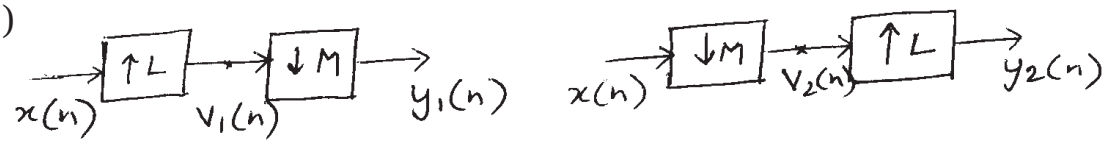
$$H(z) = (1 + z^{-1}) H_0\left(z_0^2\right) + (1 - z^{-1}) H_1(z^2) .$$ **[8]**

c) Explain pipe line operation of TMS 320C 54XX. **[4]**

P.T.O.

Q3) a) Draw generic diagram of host port interface HPI for TMS 320C 54XX. **[8]**

b)



Show that the two possible cascade configuration of factor of L up sampler and factor of M down sampler shown in the figure are equivalent only if L and M are mutually prime. **[8]**

Q4) a) Compare forward and backward linear predictions. **[7]**

b) Explain Levinson – Durbin algorithm. **[9]**

SECTION - II

Q5) a) The ARMA process is generated by the difference equation.

$x(n) = 1.6x(n-1) - 0.63x(n-2) + w(n) + 0.9w(n-1)$

i) Determine system function of whitening filter and its poles and zeros. **[5]**

ii) Determine power density spectrum of $x(n)$. **[4]**

b) Compare AR Lattice and ARMA Lattice ladder filter. **[7]**

Q6) a) A 3 stage decimator is used to reduce the sampling rate from 96 kHz to 1 kHz. Assume decimation factor of 8, 6 and 2 respectively for 3 stages.

i) Indicate sampling rate at the output of each 3 stages.

ii) Assume that decimator above satisfies following overall specifications. **[12]**

I/P sampling frequency F_s = 96 kHz

Decimation factor M = 96

Passband ripple = 0.1 db

Stop band ripple = 60 db

Frequency band of interest = 0 to 450 Hz.

Determine band edge frequencies for the decimating filter at each stage.

b) Draw functional block diagram of CPU of TMS 320C 54XX. **[6]**

Q7) a) Highlight use of multirate filtering in sub-band coding of speech signal. **[8]**

b) Draw functional diagram of ADSP21XX. **[8]**

Q8) a) Derive Widrow Hoof LMS algorithm for adaptive noise cancellation stating any reasonable assumption made. **[10]**

b) Bring out limitations of basic LMS and RLS algorithm. **[6]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1426

[3865]-619
M.E. (E & TC) (Signal Processing)
MULTIMEDIA TECHNIQUES
(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Enlist the additional features that must be present in PC that supports multimedia processing. Give broad specifications of PC that has multimedia capabilities. **[8]**

b) Compare different standards used by different countries for colour TV transmission and reception. **[8]**

Q2) a) What is the MIDI standard? Explain in brief the two components of MIDI interface which must be satisfied by the musical instrument to call it as MIDI device. **[8]**

b) Explain in detail, the MIDI messages. **[8]**

Q3) a) With the help of block diagram, explain the MPEG-I audio encoder. Comment on bit rates of compressed audio. **[8]**

b) What is GOP? Explain in detail encoding of various pictures in a GOP in MPEG-I. **[8]**

Q4) Write short notes on : **[18]**

a) Text compression.

b) PAL Encoder.

c) Multimedia Applications.

P.T.O.

SECTION - II

Q5) a) Discuss the terms hypertext, hypermedia and multimedia in detail. **[8]**

b) Which are the salient features of typical audio editing software. **[8]**

Q6) a) Explain all the types of animation. **[8]**

b) Explain the steps in creating 3D animation. **[8]**

Q7) a) Explain in detail the digital video standards. **[6]**

b) An NTSC encoded video clip has frame size of 720 × 480 pixels and is digitized using a bit-depth of 8 bit for each of y, cb and cr and a chroma sub sampling scheme of 4 : 2 : 2. Calculate the file size of a video clip of 30 sec and also the total time taken for it to be transmitted over 2Mbps transmission line. **[10]**

Q8) Write short notes on : **[18]**

a) The building blocks of multimedia.

b) WAVE file format.

c) Compression Techniques.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1427

[3865]-622

M.E. (E & TC) (Signal Processing)

COMPUTER VISION

(2008 Patterm)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain working of CMOS camera sensor. Compare CCD and CMOS camera sensors. **[8]**

b) What is Foveon X3 layered sensor? Explain. **[8]**

Q2) a) Explain image formation using pinhole camera. Can we find distance of the object from camera using image coordinates? **[6]**

b) What are external and internal camera parameters? Explain. **[10]**

Q3) a) If A = [1 2 3; 4 5 6; 7 8 9; 2 2 3], find pseudo-inverse of A **[8]**

b) What is perspective transform. Explain properties of perspective projection. **[8]**

Q4) Write short notes **[18]**

a) Essential matrix

b) Camera calibration

P.T.O.

SECTION - II

Q5) a) Explain optical flow estimation for large motion using Image pyramid. **[8]**

b) What is brightness consistency assumption for optical estimation. **[8]**

Q6) a) What is image rectification? Why it is required. **[8]**

b) How dynamic programming can be used to find matching between stereo images incase of occlusion. **[8]**

Q7) a) Explain the term disparity. Derive relation between disparity and distance of the object. **[8]**

b) Explain feature based correspondence search. **[8]**

Q8) Write short notes **[18]**

a) Applications of Computer Vision.

b) Kalaman filter.

Total No. of Questions : 08] **[Total No. of Pages : 2**

P1428

[3865]-626

M.E. (Electronics) (Digital Systems)

ADVANCED DIGITAL SYSTEM DESIGN

(2008 Course) (504197)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two Sections must be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if required.***
5) ***Use of scientific calculator is allowed.***

SECTION - I

Q1) a) Design a sequential circuit that computes the product of two four bit numbers. **[10]**

b) What is the clock skew? What are the possible problems caused by clocks skew? What is the remedy? **[8]**

Q2) a) Design a sequence generator in which output 'Y' is '1' only if input sequence of 1001 occurs at consecutive clock pulses, otherwise 'Y' is '0'. **[10]**

b) Describe the design issues of RICS and CISC processors. **[6]**

Q3) a) What is digital signature? What is the use of signature analysis? Explain with a suitable example. **[8]**

b) How to design a circuit to eliminate the de-bouncing of a switch. **[8]**

Q4) Write short notes on (any four) **[16]**

a) System integrity.

b) ATM packet generator.

c) Static and Dynamic Hazards.

d) Address and data path architecture of CPU.

e) ASM and FSM.

P.T.O.

SECTION - II

Q5) a) Explain the following terms in context to large digital system design. **[10]**

i) Reliability estimation.

ii) Reliability function.

iii) Failure rate.

iv) Bathtub curve.

v) MTBF.

b) What is SRAM cell? Design 2x2 array of SRAM cell and explain its operation. **[8]**

Q6) a) Explain BIST scheme with the help of block schematic. **[8]**

b) What is a boundary scan circuit? Explain with a neat diagram. **[8]**

Q7) a) What is transmission line? Find a reflection coefficient if transmission line of characteristic impedance 100 Ω is terminated with a load of 150Ω. **[8]**

b) What is PRBS generator? Draw and explain a scheme to generate PRBS. **[8]**

Q8) Write short notes on (any four) **[16]**

a) Design issues for large PCB.

b) Network design tools.

c) IEEE 486 bus.

d) Asynchronous serial data transfer.

e) Methods of elimination of cross talk.

Total No. of Questions : 10] **[Total No. of Pages : 2**

P1429

[3865]-627

M.E. (Electronics) (Digital Systems)

WIRELESS & MOBILE TECHNOLOGIES

(504197) (2008 Course) (Elective - I)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer Three questions from Section I and Three questions from Section II.***
3) ***Answers to the two Sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Name the main elements of the GSM system architecture and describe their functions. What are the advantages of specifying not only the radio interface but also internal interfaces of the GSM system. **[16]**

Q2) a) Compare the number of omnidirectional cells required to cover a 1000 sq.km area using DCS - 1900 and IS - 95. Assume equal transmitter powers and antenna gains. **[8]**

b) Why is the international availability of the same ISM bands important? **[8]**

Q3) a) What is the principal difference between connectionless communication and connection - oriented Communication? **[8]**

b) What is the purpose of IEEE 802 Standard Committee? What are the steps taken to make its recommendations and International Standards? **[9]**

Q4) a) How is mobility restricted using WLANs? Explain. **[8]**

b) Which type of different services does GSM offer? Give some examples and reasons why these services have been separated. **[9]**

Q5) Compare IEEE 802.11 and HIPER LAN - 2 with regard to their ad-hoc capabilities. Where is the focus of these technologies? How are fairness problems regarding channel access solved in IEEE 802.11 and HIPER LAN - 2 respectively? How is the waiting time of a packet ready to transmit reflected? **[17]**

P.T.O.

SECTION - II

Q6) a) How does GSM convert 456 bits of the speech, data or control signal into a normal busrt of 156.25 bits. **[8]**

b) What are the basic differences between wireless WANs and WLANs, and what are the common features? Consider mode of operation, administration, frequencies, capabilities of nodes, services, national/ international regulations. **[8]**

Q7) a) Why is routing in multi-hop ad-hoc networks complicated, what are the special challenges? **[8]**

b) Compare wireless and wired solutions for home access and in-home distributions. **[8]**

Q8) a) Differentiate between remote and self-positioning systems? **[8]**

b) Show the intraction of mobile IP with standard TCP. Draw the packet flow from a fixed host to a mobile host via a foreign agent. **[9]**

Q9) What is the difference between WAP service indication and service loading? What applications could use these services? What is push good for anyway? **[17]**

Q10) Discuss in detail about the request-to-send/clear-to-send (RTS/CTS) mechanism. **[17]**

Total No. of Questions : 10] **[Total No. of Pages : 2**

P1430

[3865]-630

M.E. (Electronics) (Digital Systems)

MEMORY TECHNOLOGY

(504198) (2008 Course) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the parameters which should be taken into account while designing SRAMs? **[5]**

b) Draw the various SRAM cell structures. Explain then for various operations. **[12]**

Q2) a) Draw the DRAM 3T cell structure and explain its operation. **[5]**

b) Write short note on **[12]**

i) Trench capacitor.

ii) Stack capacitor.

Q3) a) Draw masked ROM cell and explain its operation, advantages and disadvantages. **[6]**

b) Explain the operation of UVPROM with necessary sketch. How it is better and inferior than EEPROM? **[10]**

Q4) a) Compare SRAM and DRAM. **[8]**

b) Write short note on FLOTOX. **[8]**

P.T.O.

Q5) a) Discuss Stuck at fault model and explain it's pro and con of it. **[8]**

b) What is data retention fault of memory in case of SRAM and DRAM? Explain it with suitable diagram. **[8]**

SECTION - II

Q6) a) Write algorithm for MAT+. What faults it covers? **[8]**

b) What are the typical SRAM dc electrical characteristics? **[8]**

Q7) a) What is FRAMs? Explain working principals of same. **[10]**

b) How FRAMs are better than existing SRAMs and DRAMs? **[7]**

Q8) a) Explain the principle operation of MRAMs with necessary sketches. **[10]**

b) What are the advantages and disadvantages of MRAMs? **[7]**

Q9) a) Explain the basic working principle of LCD. **[7]**

b) What are the hardware and software requirements the tablet PC? **[9]**

Q10) Write short note on : **[16]**

a) Reliability issues of semiconductor memory.

b) Radiation effect on semiconductor memory.

c) Testing of semiconductor memory.

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P1432

[3865]-639

M.E. (Electronics) (Digital System)

DIGITAL SIGNAL COMPRESSION

(2008 Revised Course) (Elective - IV)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Figures to the right indicate full marks.***
3) ***Answer any three questions from each section.***
4) ***Assume suitable data, if required.***
5) ***Use of scientific calculator is allowed.***

SECTION - I

Q1) a) Define self information associated with the event. What is a prefix code? Explain how to check if a code is a prefix code using a root tree. **[8]**

b) Consider a source emitting 3 symbols a_1, a_2 and a_3 with probabilities 0.8, 0.02, and 0.18 respectively. Generate Huffman code for extended source by looking at a source sequence two at a time ie. a_1 a_2, a_2 a_3 etc. Find the average length of the code. **[10]**

Q2) a) Compare Huffman coding with arithmatic coding. **[8]**

b) Consider a source emitting symbols a_1 a_2 a_3 and a_4 with probabilities $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}$ and $\frac{1}{8}$ respectively. Generate a binary code for a source. **[8]**

Q3) a) Explain the operation of backward adaptive quantizer can we adjust the step size based on a single output? Explain. Draw block diagram for such a quantizer. **[8]**

b) Explain pdf optimized quantizer. What are mismatch effects? **[8]**

Q4) a) Explain ADPCM coding for speech with the help of block schematic. What is the advantage of using differential coding? **[8]**

b) Explain speech compression using LPC. Is it a lossy compression? Explain. Explain any one method to isolate voiced and unvoiced speech segment. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain different methods for music compression. What is MIDI? **[8]**

b) Explain A law and μ law companding. Why is it useful for speech coding? **[8]**

Q6) a) Define distorsion-rate problem and Rate-distorsion problem. Explain any one method to find the optimal code for a given distorsion. **[8]**

b) What is subband coding? What is its advantage? Describe the filters used for subband coding. **[8]**

Q7) a) Explain the use of DCT for image coding. How to quantize the DCT coefficients? Explain how it leads to compression of the data. Explain videocompression. **[8]**

b) Explain properties of Haar Wavelet. Explain the method of decomposition using Haar Wavelet. What is the advantage of using wavelet packet decomposition? **[8]**

Q8) a) Explain data structure used in EZW coder. Explain the method of scanning wavelet transform coefficients for encoding using EZW algorithm. **[8]**

b) Consider a wavelet decomposed 4 x 4 image with data specified rowwise as (26, 6, 13, 10), (–7, 7, 6, 4), (4, 4, 4, –3) and (2, –2, 2, 0) respectively for 4 rows. Demonstrate various steps in EZW algorithm. **[10]**

Total No. of Questions : 10] **[Total No. of Pages : 4**

P1433

[3865]-640

M.E. (Production)

MATHEMATICS AND STATISTICS

(2002 & 2008) (Old & Revised) (Common)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of Non programmable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Show that the polar forms of Cauchy-Riemann equations are $\frac{\partial u}{\partial r}=\frac{1}{r}\frac{\partial v}{\partial \theta}$ and $\frac{\partial v}{\partial r}=-\frac{1}{r}\frac{\partial u}{\partial \theta}$ and also deduce that

$$\frac{\partial^2 u}{\partial r^2}+\frac{1}{r}\frac{\partial u}{\partial r}+\frac{1}{r^2}\frac{\partial^2 u}{\partial \theta^2}=0 \ .$$ **[6]**

b) If $f(z)$ is an analytic function of z, prove that

$\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)|\ \text{Re}\ f(z)|^2=4\,|\ f'(z)|^2$ where $f'(z)$ denotes the derivative of $f(z)$ w.r.t. z. **[5]**

c) Find Laurent's series of $f(z)=\frac{2z-3i}{z^2-3iz+2}$ in the region $0 \le |z+i| < 2$ **[5]**

Q2) a) Evaluate $\int_{1-i}^{2+3i}(z^2+z)\,dz$ along the line joining the points (1, –1) and (2, 3). **[5]**

b) Find the image of $|z-2i|=2$ under the transformation $w=\frac{1}{z},\ z\neq 0$. **[5]**

P.T.O.

c) Find the bilinear transformation which maps the points (∞, i, 0) of the z-plane into the points (0, 1, ∞) of the w-plane respectively, further show that Re(z) maps into the interior of the unit circle. **[6]**

Q3) a) Solve the Poisson's Equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=-10\,(x^2+y^2+10)$ over the square with sides $x = 0$, $y = 0$ and $x = 3$, $y = 3$ with $u = 0$ on the boundary and mesh length = 1. **[9]**

b) Solve the wave equation $\frac{\partial^2 u}{\partial t^2}=16\frac{\partial^2 u}{\partial x^2}$. Taking $h = 1$ upto $t = 1.25$ subject to conditions.

i) $u(0, t) = 0$, $u(5, t) = 0$, $t > 0$

ii) $u(x, 0) = 0$

iii) $u(x, 0) = x^2(5 - x)$ $0 < x < 5$ **[8]**

Q4) a) On which curve the functional $\int_0^{\pi/2}\left(y'^2-y^2+2xy\right)dx$ with $y(0)$ and $y\left(\pi/2\right)$ = 0 be extremised. **[8]**

b) Use Galerkin's method to solve the boundary value problem $y''-y+x=0$, $0 \le x \le 1$ with $y(0) = 0$ and $y(1) = 0$. Compare your approximate solution with exact solution. **[9]**

Q5) a) Using Cauchy's Residuce theorem, evaluate $\int_0^{2\pi}\frac{\cos 2\theta}{5+4\cos\theta}\,d\theta$. **[7]**

b) Find the values of $u(x, t)$ satisfying the one dimensional heat equation $\frac{\partial u}{\partial t}=4\frac{\partial^2 u}{\partial x^2}$ subject to the conditions.

i) $u(0, t) = 0$, $u(8, t) = 0$, $t > 0$

ii) $u(x, 0) = 4x - \frac{1}{2}x^2$ at the points $x = i$, $i = 0, 2, 3, \ldots 8$ and $t=\frac{1}{8}j$, $j = 0, 1, 2, \ldots 5$. **[9]**

SECTION - II

Q6) a) For the Legendre's polynomial $P_n(x)$, prove that

$$P_n(x) = \frac{1}{2^n \cdot n!} \frac{d^n}{dx^n}(x^2 - 1)^n . \quad \textbf{[5]}$$

b) Prove that **[6]**

i) $(n + 1)\, P_{n+1}(x) = (2n + 1)\, xP_n(x) - nP_{n-1}(x)$

ii) $nP_n(x) - P_{n-1}(x) = 0$

c) Express $J_5(x)$ interms of $J_0(x)$ and $J_1(x)$. **[5]**

Q7) a) A news paper boy estimates the daily demand with a probability given below : **[8]**

Daily Demand :	0	10	20	30	40	50
Probability :	0.02	0.18	0.15	0.50	0.10	0.04

Use the following sequence to stimulate the demand next 10 days : 25, 65, 39, 76, 05, 70, 12, 81, 32, 43. Also estimated the daily average demand for news paper on the basis of simulated data.

b) If the probability that, an individual suffers a bad reaction from a certain injection is 0.001. Determine the probability that out of 2000. **[5]**

i) exactly 3 individuals

ii) more than 2 individuals.

c) The mean and variance of Binomial distribution are 5 and $5/2$ respectively. Find the probability $P(x \leq 1)$. **[4]**

Q8) a) Among 64 off spring of a certain cross breed between guinea pigs 34 were red, 10 were black & 20 were white. According to genetic model these numbers should be 9 : 3 : 4. Are the data consistent with the model 5% level of significance if $\chi^2_{2.005} = 5.99\%$. **[6]**

b) Fit the Poisson distribution to the set of observations **[5]**

x :	0	1	2	3	4
f :	57	41	28	8	1

c) Test the goodness of fit after fitting the Binomial distribution to the data **[5]**

x :	0	1	2	3	4	5
f :	27	14	6	3	0	0

Q9) a) A certain drug was administered to 500 people out of total 800, included in the samples to test its efficiency against typhoid. The result are given below : **[8]**

			Total
Drug	200	300	500
No Drug	280	20	300
Total	480	320	800

On the basis of this data, can it be concluded that the drug is effective in preventing the typhoid?

b) The following data refers to the visual defects found in the inspection of first 10 samples of size 100. Use the data to obtain upper and lower control limits for % defective in samples of 100. Represent the first 10 sample results in the chart that you prepared to show the central line and control limits. **[8]**

Sample No. :	1	2	3	4	5	6	7	8	9	10
No. of defectives :	1	1	3	2	2	3	4	2	2	0

Q10) a) If over a time it is found that 70% of customers using brand A continue to use it to next year, while 20% shift to brand B and remaining to C. Similarly 60% customers using B continue to use it, while 25% changed to A and 15% shift to C and for C, 75% are retained. While 20% are shifting to A & 5% to B. Find the transition probabilities and transition matrix of the Markov Chain. **[8]**

b) Which of the following stochastic matrices are ergodic and which of them are regular? **[9]**

i) $\begin{bmatrix} 1/2 & 1/4 & 1/4 \\ 0 & 1 & 0 \\ 1/2 & 1/2 & 1/4 \end{bmatrix}$

ii) $\begin{bmatrix} 0 & 0 & 1 \\ 1/2 & 1/4 & 1/4 \\ 0 & 1 & 0 \end{bmatrix}$

iii) $\begin{bmatrix} 1/4 & 1/4 & 1/2 \\ 1/4 & 3/4 & 0 \\ 1/2 & 0 & 1/2 \end{bmatrix}$

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1435

[3865]-647

M.E. (Production)

ADVANCE ROBOTICS

(Elective - II) (Revised 2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the following terms associated with robot. **[8]**

i) Robot Work Envelop.

ii) Accuracy.

iii) Repeatability.

iv) Payload capacity & compliance.

b) Write a note on safety measures in Robotics. **[8]**

Q2) a) Using following values, explain use of Denavit-Hartenberg method of representing Robot link chain.

Axis	θ	d_{mm}	a_{mm}	$\alpha_{radians}$
1	θ_1	250	0	$-\pi/2$
2	θ_2	0	180	0
3	θ_3	0	180	0
4	θ_4	0	0	$-\pi/2$
5	θ_5	130	0	0

Sketch the links assuming a suitable link position. Write all the six transformation matrices. **[8]**

P.T.O.

b) Explain inverse Kinematic solutions for path control of a robot. How do you decide on choice of a particular path when multiple feasible solutions are available? **[8]**

Q3) a) Compare servo motors with stepper motors. **[8]**

b) How does one arrive at specification for actuators? Write in brief about PID control. **[8]**

Q4) Write short note on Any THREE : **[18]**

a) Robot-types of drives.

b) Control of joints of Robot.

c) Classification for grippers.

d) Force analysis & gripper design.

SECTION - II

Q5) a) Write about the following w.r.t. Robot vision. **[8]**

i) Typical applications.

ii) Methods of lighting.

iii) Edge detection & its threshold.

iv) Shape analysis

b) Explain any two programming methods of Robot. **[8]**

Q6) a) Explain "WAIT", "DELAY", "SIGNAL" and "DEPART". **[8]**

b) An 8 × 8 gray level image with 16 gray level intensity value is given below. **[8]**

6	4	0	1	2	4	3	5
3	13	13	14	13	11	13	3
4	8	10	13	14	10	11	4
3	4	7	13	14	4	2	2
5	5	3	14	13	5	0	6
5	10	13	15	14	14	12	3
5	12	14	13	11	10	9	2
2	4	5	5	5	4	8	4

i) Construct histogram of image & obtain threshold value.

ii) Convert image into a binary (black & white) image.

Q7) a) Justify the social, economic factors associated with the use of robots. **[8]**

b) Explain robot arm parameters viz. joint angle (θ), joint distance (d), link length (a) and link twist angle (α) in D-H conventions. If the joints are either revolute or prismatic, how will the values of above parameters get affected? **[8]**

Q8) Write short notes on Any THREE : **[18]**

a) VAL system and language.

b) Proximity and Range sensors.

c) Degree of freedom (DOF) and mobility.

d) Jacobian and singularity.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1436

[3865]-648

M.E. (Production)

SHEET METAL PROCESSING

(Elective - II) (2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Solve any three questions from Section - I and three questions from Section - II***
2) ***Use separate answer books for each section.***
3) ***Use of calculator, std. data table is allowed.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What do you mean by sheet metal forming lines? **[8]**

b) Discuss the properties and grades of sheet metal giving the testing procedure for them. **[8]**

Q2) a) Describe various steps taken from the product design stage to the finished product while manufacturing in a small quantity, a small can to carry milk using Aluminium sheet. **[10]**

b) Explain different defects and their remedies for the parts drawn by press work. **[6]**

Q3) a) Explain with suitable examples methods to draw how axysymmetric parts are to be drawn. **[8]**

b) What is bending? Explain concept of spring back calculation in bending with suitable example. **[8]**

Q4) Write a short note on Any Three : **[18]**

a) Drawing of sheets,

b) Forming limit diagram,

c) Twinning,

d) Fine blanking.

P.T.O.

SECTION - II

Q5) a) Explain different sheet joining processes. **[8]**

b) Explain different methods of roll forming. **[8]**

Q6) a) Explain different drive systems used in presses used for sheet metal. **[8]**

b) Explain different devices used for handling of pressed out parts. **[8]**

Q7) a) Explain with suitable example how CAM is used in sheet metal forming. **[8]**

b) Explain with suitable example how modelling is done of a sheet metal component. **[8]**

Q8) Write a short note on Any Three : **[18]**

a) Transfer presses,

b) Press Brakes,

c) Warm forming,

d) Tube hydro forming.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1437

[3865]-649

M.E. (Production)

TOOL AND DIE DESIGN

(511105) (Elective - II) (Revised 2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the importance of following tool angles. **[12]**

i) Side cutting edge angle.

ii) End cutting edge angle.

iii) Side relief angle and End relief angle.

iv) Back and Side rake angle.

b) Explain ORS system. **[4]**

Q2) a) Explain various indexing devices with neat sketches. **[12]**

b) Explain V-location. **[4]**

Q3) Design a drawing die for a cup of diameter ϕ50 mm and height 80 mm from a sheet metal of thickness 1 mm. The yield strength of the material is 400 N/mm^2. Calculate Blank size required, Number of draws required and Press tonnage required. **[16]**

Q4) Design a progressive die for manufacturing a washer of external diameter ϕ40 and internal diameter ϕ10 from a sheet metal of thickness 1.5 mm. The shear strength of material is 260 N/mm^2. **[18]**

P.T.O.

SECTION - II

Q5) a) Explain the important design factors to be considered while forging a gear blank and a crane hook. **[9]**

b) Explain how the stock size is calculated in closed die forging. **[9]**

Q6) In open die forging, considering plain strain condition, show that the maximum pressure is $P_{max} = \sigma_o \cdot e^{2\mu L/h}$. **[16]**

where σ_o = yield strength of material

2L = Length of rectangular work piece

h = height of work piece

μ = Coeff. of friction

Q7) a) Explain various types of gating system in injection molding. **[8]**

b) Explain mold flow analysis. State the softwares used to carryout mold flow analysis. **[8]**

Q8) a) Explain the die casting process for low melting point alloys with neat sketch. **[8]**

b) Explain types of dies used in die casting operation. **[8]**

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Total No. of Questions : 10] **[Total No. of Pages : 2**

P1438

[3865]-650

M.E. (Production Engg.)

ENGINEERING ECONOMICS & ACCOUNTING

(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answers to the two sections should be written in separate books.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) "As a manager you have to deal with macro as well as micro economics." Do you agree with the statement? Justify your answer. **[8]**

b) Explain the use of knowledge of Economics for an Engineer. **[8]**

OR

Q2) a) Which areas are expected to be having beneficial effect as a result of visit of the American President to India recently? Discuss in brief. **[8]**

b) Discuss the concept of Macro Economics and its application in Industrial Planning. **[8]**

Q3) For the following items mention as to whether these are having price elasticity of demand [mention whether the elasticity is high, moderate, low or non-elastic], giving brief reasoning. – Any Six. **[18]**

a) Salt, b) LPG,

c) Sugar, d) Steel,

e) Rice, f) Electricity,

g) Water, h) Footwear

OR

Q4) Write short notes on any three of the following : **[18]**

a) Elasticity of Demand.

b) Demand Supply Curve.

c) Methods for Demand Forecasting.

d) Planning in Changing Demand.

P.T.O.

Q5) a) Mention different types of markets and how pricing is done in these market. **[8]**

b) Compare between monopoly and oligopoly. **[8]**

OR

Q6) a) How does pricing for Public Sector Undertakings differ from that for Private Sector? **[8]**

b) Discuss different methods of pricing used in industry. **[8]**

SECTION - II

Q7) Write short notes on any three of the following : **[18]**

a) Cost Benefit Analysis.

b) Cost Plus Pricing - benefits and limitations.

c) Public goods and Private goods.

d) Capital Expenditure budgeting for the central government.

e) Assumptions in cost benefit analysis and their implications.

Q8) a) Differentiate between Direct Cost and Indirect Cost with suitable examples. **[8]**

b) How does Absorption Costing differ from Marginal Costing? **[8]**

OR

Q9) a) Explain the terms - Prime Cost, Overheads, Variable Cost and Labour Cost. **[8]**

b) Derive the formula for P/V ratio. Give the use of this ratio in decision making. **[8]**

Q10) Write short notes on any four of the following : **[16]**

a) Discounted Cash Flow,

b) Internal Rate of return,

c) Depreciation,

d) Contents of Project Report,

e) Net Present Value Method,

f) Managerial Economics.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1440

[3865]-652

M.E. (Production)

MANUFACTURING MANAGEMENT

(Revised 2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is the importance of manufacturing excellence in world class manufacturing? **[8]**

b) Explain the contributions of recent management scientists after 1980 towards manufacturing era. **[8]**

Q2) a) Explain the relation of product design & development department with other departments in industry. **[8]**

b) Given the following network with activities and times estimated in days with their immediate predecessors.

Activity	Estimated duration in days			Immediate Predecessors
	Optimistic	Most likely	Pessimistic	
A	2	5	6	–
B	1	3	7	–
C	6	7	10	–
D	5	12	14	A
E	3	4	5	A
F	8	9	12	A, B
G	4	6	8	C
H	3	6	8	C
I	5	7	12	E, F, G
J	12	13	14	H
K	1	3	4	D, I, J

P.T.O.

i) What is the expected time to complete the project? What are the critical activities? **[4]**

ii) What is the probability that the project will take more than 28 days to complete? **[4]**

Q3) a) Explain the framework of Toyota production system. How production planning is done in TPS? **[8]**

b) "Simulation is an especially valuable tool in situation, where the mathematics needed to describe a manufacturing system realistically is too complex to yield analytical solution". Elucidate. **[8]**

Q4) Write short notes on Any THREE : **[18]**

a) Contributions of Prof. C. K. Pralhad.

b) Job shop scheduling.

c) Petrinet as a tool.

d) Value stream mapping.

e) Theory of constraints.

SECTION - II

Q5) a) "Hawthorne experiment even though failed; has largely contributed for development of ergonomics". Elucidate the statement and quote some examples. **[8]**

b) What are four major dimensions of MBTI? How can it be used effectively? **[8]**

Q6) a) Explain victor vroom's expectancy theory in brief. **[8]**

b) Explain Theory X and Theory Y of leadership. **[8]**

Q7) a) Explain causes of conflicts and tools to resolve. **[8]**

b) Explain relationship between job stress and outcome. **[8]**

Q8) Write short notes on Any THREE : **[18]**

a) The Gallup Path.

b) Job Satisfaction.

c) Team approach.

d) Theories of motivation.

e) Porter Lowler model.

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Total No. of Questions : 12] **[Total No. of Pages : 2**

P1442

[3865]-656
M.E. (Production)
WELDING AND JOINING
(2008 Course) (Elective - III)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer three questions from section-I and three questions from section-II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Your answers will be valued as a whole.***
7) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allwed.***
8) ***Assume suitable data, if necessary.***

SECTION - I

Unit - I

Q1) a) Explain the effect of welding parameters on weldability. **[8]**

b) Explain different cracking tests in welding. **[8]**

OR

Q2) a) What do you mean by weld thermal cycle? Explain its influence on microstructure of parent metal. **[8]**

b) With the help of CCT diagram explain phase transformation in welding of carbon steel. **[8]**

Unit - II

Q3) a) Explain the effect of welding parameters and process type on arc and melding efficiency. **[8]**

b) Explain different flux ingredients used in welding with their functions. **[8]**

OR

Q4) a) Differentiate between solid wire and flux cored wire? Explain the factors considered while selecting these wires. **[8]**

b) What is arc blow? Discuss the causes of arc blow and suggest suitable remedies to overcome them. **[8]**

Unit - III

Q5) a) Discuss role of surface tension on fusion welding. **[9]**

b) Explain in detail durability of high strength steel by GMAW welding. **[9]**

P.T.O.

OR

Q6) a) Discuss effect of welding parameters on FCAW welding. **[9]**

b) Explain process stability evaluation of MMAW welding. **[9]**

SECTION - II

Unit - IV

Q7) a) Explain constant current characteristics of power sources used in arc welding processes? **[8]**

b) What are the different rectifiers used in welding? Explain any one in detail. **[8]**

OR

Q8) a) Explain solid state inverter with its advantages over others. **[8]**

b) Discuss the three dimensional geometric effect on "Residual stress and strain" in welding process. **[8]**

Unit - V

Q9) a) Explain different modes of metal transfer in welding process? **[8]**

b) What is "Duty Cycle" in arc welding process? How it is estimated? **[5]**

c) Write a note on "surfacing of metals prior to welding". **[5]**

OR

Q10) a) What are the different parameters, affecting "Metal Transfer" in welding process? How are they overcome? **[9]**

b) Discuss the "Droplet transfer frequency for steel, using different welding processes. **[9]**

Unit - VI

Q11) a) Enumerate various methods of diffusion welding processes" and explain any one in detail. **[8]**

b) Describe the principle of operation of ultrasonic welding process" with its merits. **[8]**

OR

Q12) a) Explain the mechanism of friction welding what are the applications of this process? How does it differs from cold welding process? **[8]**

b) Compare Electron Beam welding with laser beam welding. **[8]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1443

[3865]-657
M.E. (Production)
SURFACE TREATMENT PROCESSES
(2008 Course) (Elective - III)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any three questions from section-I and three questions from section-II.***
2) ***Use separate answer books for each section.***
3) ***Use of calculator, std. data table is allowed.***
4) ***Assume suitable data, if required.***

SECTION - I

Q1) a) Discuss the importance and necessity of surface engineering. **[8]**

b) Explain different surface dependent engineering properties. **[8]**

Q2) a) What is surface cleaning? Explain different factors for selection of surface coating processes. **[8]**

b) Explain with neat sketch any two surface coating processes. **[8]**

Q3) a) Explain any two conventional surface modification methods. **[8]**

b) What is electro deposition and electroless deposition? Differentiate them in brief. **[8]**

Q4) Write a short note on any three : **[18]**

a) Mechanism of surface degradation.

b) Ultrasonic mechanical cleaning.

c) Different coating materials and their selection.

d) Surface treatment on advanced materials.

SECTION - II

Q5) a) Explain with neat sketch and controlling parameter for obtaining desired thickness of coating for following : **[10]**

i) Thermal spray.
ii) CVD.

b) Explain the influence of manufacturing processes on various surface properties of an engineering component. **[6]**

P.T.O.

Q6) a) Explain different methods to measure thickness of coating material on surface of engineering material. **[8]**

b) Explain the following with respect to coated surface of engineering material : **[8]**

i) Response properties.
ii) Surface geometry.

Q7) a) What is meant by Nano scale? Explain how it will be achieved? **[8]**

b) Explain tribological characteristics of engineered surface at different level of scale. **[8]**

Q8) Write a short note on : **[18]**

a) Ion Implantation.

b) Adhesion measurement.

c) Application of Laser beam in surface engineering.

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Total No. of Questions : 08] **[Total No. of Pages : 2**

P1444

[3865]-658

M.E. (Production) (Manufacturing and Automation)

OPTIMIZATION TECHNIQUES

(2008 Course) (Elective - IV)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Formulate an optimization problem for minimization of machining cost subjected to constraints of power and surface finish in a turning operation. Consider feed, speed, and depth of cut as process variables. **[8]**

b) What do you understand by local optimum solution and global optimum solution? Explain with neat sketch. **[8]**

Q2) a) Minimize the function $f(x) = x^3+(1/x^2)$ using Fibonacci search method within the bounds of 0.5 to 2. **[8]**

b) Explain various gradient based methods for single variable optimization. **[8]**

Q3) a) Minimize the function $f(x) = x_1^2 - 5x_1 + x_2^2 - 3x_2 - 10$ such that $1 \le x_1, x_2 \le 5$. **[8]**

b) Write the algorithm for steepest descent method and draw its flowchart. **[8]**

Q4) Write short notes on: **[18]**

a) Traditional methods of optimization.

b) Parato optimal solutions.

c) Pattern direction and conjugate direction.

P.T.O.

SECTION - II

Q5) a) Perform one iteration of generalized reduced gradient method for the following problem: **[8]**

Minimize $f(x) = x_1^2 + x_2^2$ subject to $x_1 x_2 - 9 = 0$. Consider starting point as x_1=2 and x_2=4.5.

b) Explain the method of feasible direction for constrained optimization problems. **[8]**

Q6) Solve following mixed integer programming problem using branch and bound method coupled with a graphical method for solving branching problem. **[16]**

Minimize $f(x) = 4x_1 + 5x_2$

Subject to following constraints:

$10x_1 + x_2 \geq 10$; $3x_1 + 7x_2 \geq 21$; $5x_1 + 4x_2 \geq 20$; $x_1 + 12x_2 \geq 12$

$x_i \geq 0$ and integer; $x_2 \geq 0$.

Q7) a) Calculate the initial temperature for simulated annealing algorithm to minimize the function $f(x) = x_1^2 - 5x_1 + x_2^2 - 3x_2 - 10$ for the bounds $1 \leq x_1, x_2 \leq 5$. **[8]**

b) What is the function value corresponding to the coded substring value 1101 in genetic algorithm to minimize the function $x_1^2 - 3x_2 + 10$ with $0 \leq x_1, x_2 \leq 3$. **[8]**

Q8) Write short notes on: **[18]**

a) Method of feasible direction.

b) Crossover operators in GA.

c) Engineering applications of discrete optimization problems.

Total No. of Questions : 8] **[Total No. of Pages : 4**

P1445

[3865]-662

M.E. (Computer)

APPLIED ALGORITHMS

(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer THREE questions from each section.***
2) ***Answers to the TWO sections should be written in SEPARATE answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define the following : **[4]**

i) Probability function

ii) Discrete probability space.

b) For any two events E_1 and E_2 prove that

$P(E1 \cup E2) = P(E1) + P(E2) - P(E1 \cap E2)$ **[6]**

c) Group of functions contain two percent erroneous functions. Each function is tested using suitable test case before integrating it. The test case itself is not totally reliable so that :

P("Test case result reflect function is correct" | "function is actually correct") = 0.95

P("Test case result reflects that function is erroneous" | "function is actually erroneous") = 0.94

If a tested function is indicated to be erroneous, what is the probability that it is actually erroneous? **[6]**

P.T.O.

Q2) a) Consider the following code segment. **[6]**

```
srch(int n, int x)
{  int t[max];   //array holding max integers
   int t, x;
   t[0] = x;      //t[0] is used as marker
      i = n;
   while (t[i]! = x)
            i = i – 1;
   if (i > 0) then
      printf("Found");
else
   printf("Not Found");
}
```

Assume uniform distribution and determine average search time for successful search.

b) Given three components with respective reliabilities $R_1 = 0.8$, $R_2 = 0.75$ and $R_3 = 0.98$. Compute the reliabilities of the three systems shown in the figure Q 2(b). **[6]**

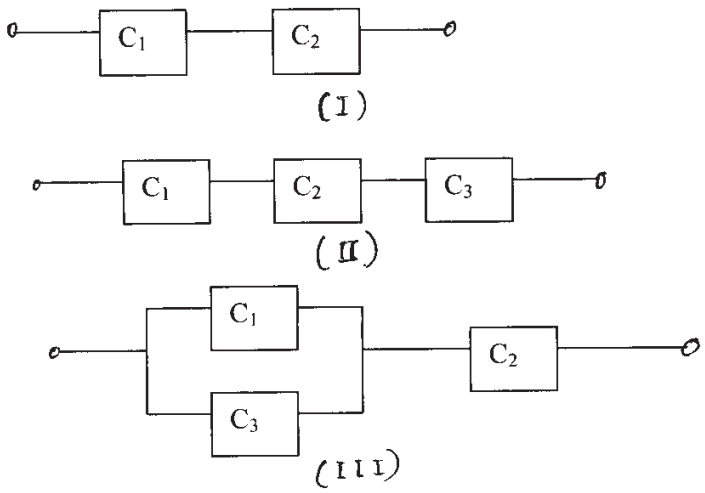

Fig Q2(b)

c) Incase of analyzing an algorithm, in what way the amortized constant time differs from constant time on the average? **[4]**

Q3) a) Solve the recurrence : **[6]**

$t_n = n$ ..... if n = 0, 1 or 2.

$= 5t_{n-1} - 8t_{n-2} + 4t_{n-3}$ .....other wise

b) Write a recursive relation for the following function and solve the same : **[8]**

```
int fib (int n)
{
    if (n < 2)
        return(n);
    else
        return (fib(n–1) + fib(n – 2));
}
```

c) Interpret the equation : $2n^2 + \Theta(n) = \Theta(n^2)$. **[2]**

Q4) a) Write a recursive binary search algorithm. Determine its time complexity. **[8]**

b) Write an algorithm for sorting n numbers using quick sort method. Determine its time complexity. Comment on stability of this method. **[10]**

SECTION - II

Q5) a) Consider the following algorithm for vertex cover problem : **[8]**

```
Alg_Vert_Cov(G)
{
    //G is an input graph
    // E[G] is an edge set of the graph
    //C contains vertex cover being constructed
    //E' is to maintain copy of an edge set
    C = ϕ; // Null set
    E' = E[G];
    while (E' is not empty)
    {
        let (u, v) be an arbitrary edge of E';
        C = C U {u, v};
        Remove from E' every edge incident on either u or v;
    }
    return (C);
}
```

Prove that this is a polynomial time 2-approximation algorithm.

b) Write an algorithm for finding Hamiltonian cycle in an undirected graph. How do you claim that, this algorithm is probabilistically good algorithm? **[8]**

Q6) a) Let F* (I) be the finish time of an optimal m-processor schedule for instance I of the task scheduling problem. Let $F^{\wedge}$ (I) be the finish time of an Longest Processing Time Schedule for the same instance. Then prove that :

$$\frac{\left| F^{*}(I) - F^{\wedge}(I) \right|}{\left| F^{*}(I) \right|} \leq \frac{1}{3} - \frac{1}{3m}$$ **[10]**

b) Write an approximation algorithm for a planar graph coloring. Clearly indicate assumptions made if any. **[8]**

Q7) a) Given an undirected graph G = (V, E), a cut of G is a partition of V into two non-empty sets A and B, where the size of (A, B) is the number of edges with one end in A and the other in B. A global minimum cut is a cut of minimum size.

Prove that there is a polynomial time algorithm to find a global min-cut in an undirected graph G. **[8]**

b) Obtain a set of optimal Huffman codes for the messages (M_1, M_2, ... M_6) with relative frequencies (q_1, q_2, ... q_6) = (2, 3, 5, 7, 9, 13). Draw the decode tree for this set of codes. **[8]**

Q8) a) What is the basic problem in CRCW PRAM, when more than one processor tries to write in the same cell? How it can be overcome? **[4]**

b) Write a complete parallel algorithm for evaluating simple arithmetic expression. Draw binary expression tree for the following expression :

((7 – (21/3)) * 3) + (9*((10 – 8)) + 6). Represent one iteration of above algorithm for the resulting tree. **[12]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1447

[3865]-666

M.E. (Computer)

INTELLIGENT SYSTEMS

(510104B) (2008 Course) (Elective - I)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Question Nos.3 and 7 are compulsory. Out of the remaining attempt 2 questions from Section - I and 2 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Classify agents based on various structures used for actions. **[16]**

Q2) a) Explain with illustration the problem formulation types. **[10]**

b) How problem solving performance is measured? **[6]**

Q3) a) Explain with example, time and completeness issues associated with searching strategies. **[10]**

b) Explain the Hill Climbing algorithm with application. **[8]**

Q4) a) Explain with illustration representations of states, goals and representation of actions. **[10]**

b) Compare between IDA* and SMA* memory bounded search strategies. **[6]**

P.T.O.

SECTION - II

Q5) a) Explain partial order planning algorithm. **[8]**

b) Explain with illustration analysis of hierarchical decomposition. **[8]**

Q6) a) Explain with example, resource constraints. **[8]**

b) With example compare bounded with unbounded indeterminacy. **[8]**

Q7) A timetable for undergraduate practical examination of computer engineering department is to be completed using planning agent. Discuss various issues related to conditional planning. **[18]**

Q8) a) Explain with example, probabilistic reasoning system. **[8]**

b) Explain with example, first order logic and associated interfaces. **[8]**

Total No. of Questions : 8] **[Total No. of Pages : 3**

P1448

[3865]-667

M.E. (Computer Engineering) (Common to Network Engg.)

INTERNET ROUTING DESIGN

(2008 Course) (Elective - I) (510104)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) For the network example presented in Figure 1.1, compute the shortest paths from node 2 to all other nodes using the centralized Bellman-Ford algorithm. **[8]**

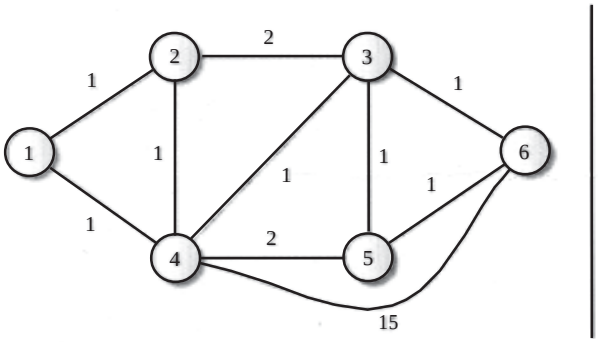

Figure 1.1 A six-node network (the entry shown next to a link is the cost of the link).

b) Explain different security measures taken in IPV6. Enlist the reserved IP address blocks. **[8]**

Q2) a) Explain *k*-shortest paths algorithm of routing by taking any suitable example. **[8]**

b) Compare : **[8]**

i) Bellman-Ford algorithm and Distance Vector algorithm.

ii) Shortest path routing and the widest path routing.

P.T.O.

Q3) a) Explain types of OSPF packets. What is the range of allowable metric values in OSPF and IS-IS? **[8]**

b) Consider a five-router OSPF network. How many entries will be in the routing table at each router? Which are those? **[8]**

Q4) Write short note on **Any Three** : **[18]**

a) BGP message format.

b) Classful IP Addressing Scheme.

c) Distance Vector Routing.

d) RIP V1 and RIP V2.

SECTION - II

Q5) a) For the prefixes in Table 5.1, construct a binary trie. Assuming each node in the binary trie requires a memory access, how many memory accesses will be required in the worst case during the search? **[8]**

Table 5.1 Prefix table

Prefix Label	Prefix
P1	0*
P2	10*
P3	111*
P4	10001*
P5	1*
P6	1001*
P7	101000*
P8	1010000*

b) Discuss the strengths and weaknesses of various router architectures. **[8]**

Q6) a) Explain different routing protocols for QoS routing. **[8]**

b) Draw the geometric view of the rules shown in Table 6.1 and identify the number of distinct regions. **[8]**

Table 6.1 A two-field classifier

Rule	F1	F2
R1	0*	10*
R2	0*	01*
R3	0*	1*
R4	00*	1*
R5	00*	11*
R6	10*	1*
R7	11*	00*
R8	*	00*

Q7) a) How does bandwidth guarantee required by services affect the performance it receives in a heterogeneous bandwidth environment?**[8]**

b) Compare different 2-Dimentional Packet Classification Algorithms on the basis of Time and Space complexity. **[8]**

Q8) Write short note on **Any Three** : **[18]**

a) MPLS.

b) Adoptive routing.

c) LSP Path determination.

d) ATM PNNI.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1449

[3865]-669

M.E. (Computer Engineering)

INFORMATION AND NETWORK SECURITY

(510105) (2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any THREE questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Enlist and discuss the principles of data security architecture. **[8]**

b) What is security policy? Explain steps necessary for developing security policy. **[8]**

Q2) a) What is the difference between a block cipher and a stream cipher? Why do some block cipher modes of operation only use encryption while others use both encryption and decryption? **[8]**

b) Explain authentication protocol based on symmetric and asymmetric cryptosystem. **[8]**

Q3) a) Explain the IPsec services and Authentication algorithm. **[8]**

b) Enlist and discuss fragmentation vulnerabilities and remedies. **[8]**

Q4) Write short notes on (Any Three) : **[18]**

a) ARP Hazards.

b) Routing algorithm vulnerabilities.

c) Issues in multi-level secure systems.

d) IPv4/IPv6 encapsulation header.

P.T.O.

SECTION - II

Q5) a) What is a simple network management protocol? With the help of a suitable diagram explain the network management architecture. **[8]**

b) Explain what is session key management with suitable example. **[8]**

Q6) a) Enlist and explain in brief four techniques used by firewalls to control access and enforce a security policy. **[8]**

b) What is a circuit-level gateway and application-level gateway? **[8]**

Q7) a) Discuss how Diffie-Hellman based Key Agreement protocol is beneficial for providing security in group communication issues. How can this protocol be used for secured cash transfer in a bank? **[8]**

b) Explain how wireless security is different from wired data security, and how WEP addresses security in wireless LANs. **[8]**

Q8) Write short notes on (Any Three) : **[18]**

a) DNS certificates.

b) Secure SNMP.

c) Shared secret data authentication.

d) Privacy enhanced mail (PEM).

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1450

[3865]-670

M.E. (Computer Engineering)

ADVANCED COMPILERS

(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain various issues involved in design of a compiler. What is "Incremental Approach" to compiler design? **[8]**

b) How the tools LEX and YACC are contributing in the implementation of the compiler? Support your answer by giving appropriate examples with proper syntax. **[8]**

Q2) a) Explain how code is generated for pipelined machines. **[8]**

b) Discuss in detail : Register allocation techniques. **[8]**

Q3) a) Explain : unified algorithm for data flow analysis. **[8]**

b) State and explain fundamental data flow properties. Support your answer with proper examples. **[8]**

Q4) Write short notes : **[18]**

a) SSA form.

b) Code generator.

c) Bi directional data flow analysis.

P.T.O.

SECTION - II

Q5) a) Explain in detail structure of a parallelizing compiler. **[8]**

b) Which are various approaches for parallelism detection? **[8]**

Q6) a) Discuss following terms with respect to compilation of distributed machines : Data partitioning, register allocation, instruction scheduling. **[8]**

b) Explain in what way the design of a compiler for standalone machine is different from design of compiler for distributed machines. **[8]**

Q7) a) Explain : Auto scheduling compilers. **[8]**

b) Why there is need for Just in Time compilation? Explain the process of JIT compilers in detail. **[8]**

Q8) Write short notes : **[18]**

a) Dynamic compilation.

b) Loop carried and loop independent dependences.

c) Phases of compiler.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1451

[3865]-672
M.E. (Computer)
EMBEDDED SYSTEM DESIGN
(510105) (2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Answer any three questions from each section.***

SECTION - I

Q1) a) What are the different classifications of embedded systems? Explain. **[8]**

b) With the help of neat diagram, describe different components of embedded systems. **[8]**

Q2) a) Give brief overview of 32 bit ARM architecture. **[8]**

b) Name and explain low power management modes of Bluetooth. **[8]**

Q3) a) What are the different packets used for bus transaction in USB? Also explain types of data transfers supported by USB protocol. **[10]**

b) Explain how bit transfer takes place in I2C. Also mention the applications of I2C. **[8]**

Q4) a) What is PCI-X? Compare it with PCI. **[8]**

b) Given : It is required to read the sensor inputs using a microcontroller with on-chip 8-channel 10-bit ADC. Two input channels of ADC, namely AIN2 and AIN4 are used for this application. Write Pseudo code to configure and read the digital outputs from these analog inputs. The digital output is available in ADDR register and configuration can be done using ADCR register. **[8]**

P.T.O.

SECTION - II

Q5) a) Compare Bluetooth protocol, 802.11 and IrDA w.r.t. following features. **[10]**

i) Technology.

ii) Distance.

iii) Security.

iv) Cost.

v) Data Rate.

b) Differentiate between 802.11 and 802.15. **[6]**

Q6) a) With the help of neat diagram, explain the structure of FPGA. **[8]**

b) Describe the following IPC mechanisms in detail : **[8]**

i) Mutex.

ii) Pipes.

Q7) a) What are cross compilers? When do you use them? How they are different than compilers? **[6]**

b) Object oriented programming is widely used in embedded system programming. Why? **[4]**

c) What are the different criteria, based on which RTOS is selected for an embedded system application? **[8]**

Q8) a) Explain development process of an embedded system along with different phases. **[10]**

b) VxWorks, QNX, WINCE and RTLINUX. Categorize these under soft RTOS or hard RTOS. **[6]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1452

[3865]-674

M.E. (Computer / Computer Networking)

HIGH PERFORMANCE DATABASE SYSTEMS

(510309) (2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***

SECTION - I

Q1) a) Comments on the following : **[10]**

i) How can one knows that one of the TPC-C benchmarks is relevant to his application or environment?

ii) Can one compare TPC-C results with other TPC benchmark results.

iii) We notice that some TPC-C results are labelled as "Withdrawn". Could you explain what that means.

b) What are the three broad levels at which a database system can be tuned to improve performance? **[6]**

Q2) a) List down atleast five equivalence rules used in query optimization and discuss the enumeration of equivalent expressions. **[8]**

b) Explain how to use a histogram to estimate the size of a selection of the form $\sigma_{A \leq v}(r)$ (conditional select operation). **[4]**

c) Explain : DBMS buffers, Cache. **[4]**

Q3) a) Discuss with merits and demerits : **[8]**

i) Optimistic locking.

ii) Pessimistic locking.

iii) Multi-attribute indexing.

P.T.O.

b) Various database systems have been developed for hand held devices i.e. PDA and handheld PC. Do you consider this kind of light-weighted database system as distributed database system. Justify your answer. **[4]**

c) Explain the difference between a system crash and a "disaster". **[4]**

Q4) Write short notes : **[18]**

a) Join algorithms.

b) Distributed queries.

c) Object oriented benchmarks.

SECTION - II

Q5) a) Explain in detail the architecture of a dataware house. **[8]**

b) State and explain OLAP operations. **[6]**

c) What is need for Dashboard? **[2]**

Q6) a) List the different data mining techniques and explain any one of them in detail. **[8]**

b) Explain the role of ETL process in data analysis. **[6]**

c) Discuss in brief : KDD process. **[2]**

Q7) a) Compare and Contrast : **[8]**

i) Object oriented and OR Databases.

ii) Active and Deductive Databases.

b) Explain the use of XML with following points : **[8]**

i) Storing data with complex structures.

ii) Data Exchange.

iii) Web services.

Q8) Write short notes : **[18]**

a) SQL Extensions.

b) STAR Schema.

c) Directory Services.

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Total No. of Questions : 8] **[Total No. of Pages :2**

P1453

[3865]-677

M.E. (Computer)

PATTERN RECOGNITION AND MACHINE VISION

(510111B) (2008 Course)

Time : 3 Hours*]** **[*Max. Marks : 100

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the projective camera images to obtain model-based vision. **[8]**

b) Explain the concept of invariants and cross-ratios with respect to affine transformation. **[8]**

Q2) a) What is the fundamental matrix? How it is used to describe the geometry of two cameras? **[8]**

b) Explain the nearest neighbor approach for multicategory classification. **[8]**

Q3) a) Discuss the use of PCA (Principal Component Analysis) for image formation. **[8]**

b) Describe the maximum likelihood discriminant classification with the help of an example. **[8]**

Q4) Write short notes on : **[18]**

a) Bayes minimum error rate classifier.

b) Fisher's discriminant using Mahalanobis distance.

c) Unbiased modeling.

P.T.O.

SECTION - II

Q5) a) Explain the segmentation of flexible shapes by clustering of pixels and intensity. **[8]**

b) Discuss the fitting a model using estimation theory. **[8]**

Q6) a) Describe the corner tracking using linear Kalman filter. **[8]**

b) Discuss the hierarchical approach for the motion analysis. **[8]**

Q7) a) Explain the motion estimation by surface trangulation. **[8]**

b) Discuss the stereo data fusion with respect to multiple camera stereo. **[8]**

Q8) a) Discuss the importance of feature extraction in object recognition. **[8]**

b) Explain the object recognition by linear combination of views. **[10]**

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1454

[3865]-682
M.E. (Computer Engineering)
DATA WAREHOUSING AND DATA MINING
(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Differentiate between the following terms using suitable examples. **[12]**

i) Supervised and unsupervised learning.

ii) Clustering and Regression.

iii) Lazy learning and Meta learning.

iv) Prediction and summarization.

b) Why is a fully automated data mining tool not desirable? Discuss the need of human intervention in the data mining process. **[4]**

Q2) a) Differentiate between the following terms using suitable examples. **[12]**

i) Fact table and dimension table.

ii) Data Warehouse and Data Mart.

iii) Roll-up and Drill-down.

iv) Slice and dice operations.

b) Why is data normalization important for databases but a hindrance for data warehouse? **[4]**

Q3) Consider a customer database given below. Calculate entropy and average entropy for each attribute and construct a decision tree. The attribute 'Buy Car' is a class attribute

Id	Age	Income	Student	Credit Rating	Buy Car
1	Young	High	No	Fair	No
2	Young	High	No	Good	No
3	Middle	High	No	Fair	Yes
4	Old	Medium	No	Fair	Yes
5	Old	Low	Yes	Fair	Yes
6	Old	Low	Yes	Good	No
7	Middle	Low	Yes	Good	Yes
8	Young	Medium	No	Fair	No
9	Young	Low	Yes	Fair	Yes
10	Old	Medium	Yes	Fair	Yes
11	Young	Medium	Yes	Good	Yes
12	Middle	Medium	No	Good	Yes
13	Middle	High	Yes	Fair	Yes
14	Old	Medium	No	Good	No

What prediction your constructed decision tree will make for the following test instance? **[18]**

<15.Old.High.No.Good>

Q4) Construct a naive-base classifier for the Customer database provided in Q3 above. **[16]**

SECTION - II

Q5) Consider the following eight data points with two dimensions x and y. Use the 'Manhattan' distance function and the single link method and show the steps in agglomerative clustering. Also draw the resultant dendrogram. **[18]**

Data Point	x	y
P1	1	1
P2	6	7
P3	4	6
P4	5	7
P5	5	2
P6	2	3
P7	1	2
P8	3	1

Q6) a) Why one shouldn't always discard the instances where data are incomplete and only perform data mining with cases that have no missing data? **[4]**

b) For missing data, what kind of imputation would you prefer and why? **[4]**

c) What is Sampling? Explain various forms of sampling. **[8]**

Q7) a) Consider the following transactions. **[8]**

Transaction	**Items**
T1	Bread.Jelly.PeanutButter
T2	Bread.PeanutButter
T3	Bread.Milk.PeanutButter
T4	Beer.Bread
T5	Beer.Milk

Calculate Support and Confidence for the following association rules.

i) Bread $\rightarrow$ PeanutButter
ii) PeanutButter $\rightarrow$ Bread
iii) Beer $\rightarrow$ Bread
iv) PeanutButter $\rightarrow$ Jelly
v) Jelly $\rightarrow$ PeanutButter
vi) Jelly $\rightarrow$ Milk

b) For the transactions shown in Q7 (a) above. Calculate the large itemsets. **[8]**

Q8) a) Compare the decision-tree neural network and lazy classifiers w.r.t. **[9]**

i) Accuracy
ii) Time to build the classifier
iii) Time to classify a test instance
iv) Generalization ability
v) Support for Incremental learning
vi) Model Comprehensibility

b) Write a note on 'Web Mining'. **[7]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1455

[3865]-684

M.E. (Computer) (Computer Networks)

ADVANCED TCP/IP

(510304) (Elective - I) (2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Describe IP address manipulation routines with examples. How information about networks and Protocols is obtained in a client server environment? **[8]**

b) An ISP is granted a block of addresses starting with 120.60.4.0/20. The ISP wants to distribute these blocks to 100 organizations with each organization receiving 8 addresses only. Design the sub blocks and give the slash notation for each sub blocks. Find out how many addresses are still available after these allocations? **[8]**

Q2) a) Show the contents of all fields for a BOOTP request & reply packet sent from a client with physical address 00:11:22:EF:EA:34? Encapsulate these packets in UDP user & IP datagram. **[8]**

b) How DHCP exchanges different messages? Explain DHCP options. **[8]**

Q3) a) What is a DNS query and response message? Discuss response message in detail. **[8]**

b) A DNS client is looking for the name of a computer with IP address 132.1.17.8. Show the query and response message. **[8]**

P.T.O.

Q4) Write short note on **Any Three** : **[18]**

a) RARP servers.

b) DNS resolution.

c) Complexity of servers.

d) Network Virtual Terminal.

SECTION - II

Q5) a) Explain option negotiation in Telnet. Show the sequence of character exchanged between client and server to switch from line mode to default mode. **[8]**

b) Explain the modes of operation of Telnet. Explain with diagram the use of SUPRESS GO AHEAD and ECHO options. **[8]**

Q6) a) Host A uses TFTP to read 2150 bytes of data from host B. Show all the TFTP commands including commands needed for connection establishment and termination. Assume error free communication. **[8]**

b) Explain FTP communication over control & data connection. **[8]**

Q7) a) Show the request that retrieves the document/usr/users/doc/docl. Use at least two general headers, two request headers and one entity header. Also show response header for a successful request. **[8]**

b) In SMTP, if we send a one line text between two users, how many lines of commands and response are exchanged? Which are they? **[8]**

Q8) a) Explain real time transfer protocol (RTP). Compare TCP with RTP.**[8]**

b) Write notes on : **[10]**

i) RSVP and Streaming.

ii) Multipurpose Internet Mail Extensions.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1456

[3865]-685
M.E. Computer (Computer Networks)
WIRELESS TECHNOLOGY
(2008 Course) (510305 A) (Elective - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the DSSS spreading with Barker code as a chipping sequence, also explain DSSS transmitter and receiver with block diagram.

b) What is a Channel Capacity? Discuss the Shannon contribution towards channel capacity. Suppose that the spectrum of a channel is between 3 MHZ and 4 MHZ and $SNR_{dB} = 24$ dB, then calculate Channel Capacity. **[18]**

Q2) a) Explain typical VSAT configuration with figure.

b) Why the values of frequency reuse factor (N) are 1,3,4,7,9,12,13,16,19,21, etc? Explain various approaches used to increase the cell capacity. **[16]**

Q3) a) Explain various dynamic power control mechanisms may be used in cellular systems.

b) Explain the operation of a piconet in terms of the states of operation during link establishment and maintenance using Bluetooth state transition diagram. **[16]**

Q4) Write short note on any two of the following : **[16]**

a) Diversity techniques.

b) GSM signaling Protocol Architecture.

c) Comparison between Bluetooth and 802.11 based on various technologies.

P.T.O.

SECTION - II

Q5) a) What are the access mechanisms that support contention and contention free access in IEEE 802.11? State the roles of different inter-frame spacings (IFSs) between the transmission of packets in assigning priority in MAC?

b) Explain how tunneling works in general and especially for mobile IP using IP-in-IP, minimal, and generic routing encapsulation, respectively. Discuss the advantages and disadvantages of these three methods. **[18]**

Q6) a) Draw a typical 802.11 MAC frame showing various fields. Expand the frame control field into its subfields. State what is the significance of type, subtype fields and ToDS, From DS bits.

b) Draw a diagram showing WEP operations which handle confidentiality and integrity simultaneously. Explain WEP data transmission. **[16]**

Q7) a) What are the design flaws of the WEP system? State what is meant by integrity check value.

b) Name the inefficiencies of mobile IP regarding data forwarding from a correspondent node to a mobile node. What are optimizations and what additional problems do they cause? **[16]**

Q8) Write short note on any two of the following : **[16]**

a) Advantages and disadvantages of Snoop-TCP and Mobile-TCP.

b) Comparison Wi-Fi and Wi-Max.

c) Cryptographic and Noncryptographic EAP methods.

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Total No. of Questions : 8] **[Total No. of Pages :2**

P1458

[3865]-691
M.E. Computer (Computer Networks)
CONVERGENCE TECHNOLOGIES
(510312) (2008 Course) (Elective - IV)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write down the benefits of Converged Networks, also discuss various speech codec used in Multimedia. **[8]**

b) An ISDN customer has offices at a number of sites. A typical office is served by two 1.544 Mbps digital pipes. One provides circuit switched access to ISDN the other is semi-permanent connection to another user site. The on-premises equipment consists of a digital PBX plus a host computer system with an X.25 capability. The user has three requirements–

i) Telephone service.

ii) A private packet switched network for data.

iii) Video teleconferencing at 1.544Mbps.

How might the user allocate the capability optimally to meet these requirements? **[8]**

Q2) a) What are the factors affecting the QoS Parameters in ATM? Derive the formula **BT = (MBS-1) / ((1/SCR) – (1/PCR))** **[8]**

b) Explain the structure of the ATM adaptation layer and compare AAL protocols in detail. **[8]**

Q3) a) With respect to AAL1, define the followings terms–

i) Correction and detection modes.

ii) Clock recovery.

iii) Structured Data Transfer (SDT) **[8]**

P.T.O.

b) The input bit stream is given as 11111011111011011111101011111111, Consider the following rule: A 0 is stuffed by the transmitter only after the appearance of 011111 Describe the de-stuffing rule and apply it to the given bit stream. **[8]**

Q4) Write short note **on any THREE.** **[18]**

a) ISDN Reference Points and Functional Groupings.

b) GFC algorithm in ATM.

c) Quality of service and VOIP.

d) Frame relay traffic management.

SECTION - II

Q5) a) What is SS7? Explain SS7 Protocol Architecture and its use in the maintenance of networks. **[8]**

b) Draw the graphs which depict the effect of congestion on Frame Relay network with Load Vs Throughput and Load Vs Delay. Also explain the Rate-Based and Windows-Based Control. **[8]**

Q6) a) Why encoding is required? Compare CMI with bipolar AMI, B8ZS, and HDB3 encoding techniques for the B-ISDN. **[8]**

b) What are the classifications of CAC algorithms Explain CAC Algorithm for ATM Service Categories. **[8]**

Q7) a) "Session Initiation Protocol is very useful in multimedia communication" Justify, enlist the benefits of SIP. **[8]**

b) Explain the interconnection of MGCP with PSTN, H.323 & SIP. **[8]**

Q8) Write short note on **any THREE.** **[18]**

a) Q.931 signalling in ISDN.

b) Features and benefits of VIOP.

c) MEGACO.

d) Convergence in Multimedia Applications.

Total No. of Questions : 8] **[Total No. of Pages : 4**

P1459

[3865]-693

M.E. (Chemical)

APPLIED STATISTICS FOR CHEMICAL ENGINEERS

(2008 Course) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any 3 questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Reaction temperatures (in °C) for certain catalyst concentration are given below :

310.95, 308.86, 312.80, 309.74, 311.03, 311.89,
310.93, 310.39, 310.24, 311.89, 309.65, 311.85,
310.73, 312.05, 312.20, 310.80, 313.60, 313.08

a) Classify the above data as grouped frequency distribution with 309 as the lower limit of first class and class width = 1. Also calculate less than type and more than type cumulative frequency. **[4]**

b) Find mean, mode and median using step deviation method with assumed mean a = 310 and h = 1. **[4]**

c) Find SD, variance, QD & COV. **[4]**

d) Find Karl Pearson and Bowley's coefficient of skewness and comment on symmetry of distribution. **[4]**

e) Calculate excers Kurtosis and comment on nature of Kurtosis. **[2]**

Q2) a) The pilot plant studies for reaction process A $\rightarrow$ B gave the following data for variation in yield (Y) with reaction temperature. (X °C).

X :	1	2	3	4	5	6	7	8	9	10
Y :	3	5	7	10	11	14	15	17	20	21

Obtain the regression model in the form Y = a + bX. Also calculate the estimator S^2 for variance σ^2. **[8]**

P.T.O.

b) Explain the principle of least square used to obtain best estimates b_0 & b_1 for the unknown parameters β_0 & β_1 in establishing simple linear regression between the variables X & Y in the form.

$Y = \beta_0 + \beta_1 X + \in$,

where $\in$ is a random error or residual. **[8]**

Q3) a) What is statistical estimation? Explain the following properties of the best estimator for evaluating the population parameter consistency, bias, efficiency. On a pilot plant reactor 11 runs are taken at constant conditions and have obtained the following values of the percentage yield of desired product. **[8]**

32, 55, 58, 59, 59, 60, 63, 63, 63, 63, 67.

i) Calculate mean, mode and median of the sample data.

ii) Check whether sample mean $\overline{X}$ is unbiased estimator of the population mean of 58.4.

iii) Also check whether sample variance S_X^2 is unbiased estimator of population variance.

b) For the data given in Q. 3(a) assuming $\sigma_x^2 = 81$, find 95% confidence interval with

i) α = 0.05 (assume $Z_{\alpha/2} = -1.96$ & $Z_{1-\frac{\alpha}{2}} = +1.96$)

ii) α = 0.01 (assume $Z_{\alpha/2} = -1.645$ & $Z_{1-\frac{\alpha}{2}} = 1.645$) **[8]**

Q4) a) i) Define – Statistical hypothesis, null hypothesis alternative hypothesis, type I error, type II error.

ii) Explain seven step procedure for testing a hypothesis. **[8]**

b) For pilot plant reactor data given in Q. 3 (a), test whether population mean equal 63. (Take α = 0.05, $t_{1-\frac{\alpha}{2}} = 2.23$ & $t_{\frac{\alpha}{2}} = -2.23$) **[4]**

c) In a random sample of size 500, the mean is found to be 20. In another independent sample of size 400, the mean is 15. Could the samples have been drawn from the same population with SD = 4. (Take LOS = 1% & Z_α = 2.58). **[4]**

SECTION - II

Q5) a) A quantity of each of three chemical fertilizers was applied to three groups of five corn plants each, with all plants growing under identical conditions of temperature, rainfall, soil, seed, etc. From the following measures of corn growth (height after one month), determine whether there is any reason for one fertilizer to be better than another.

Fertilizer No. →	1	2	3
Height	23	16	18
	21	23	22
	24	20	25
	17	21	21
	19	18	20

(Take LOS = 5% & $F_{5\%}(2, 12) = 3.88$) **[8]**

b) Determine whether the type of catalyst or temperature has any effect on the setting time of a new plastic from the following data. The data gives elapsed setting time (in minutes) to a uniform criterion of hardness.

Catalyst No.→ / Temp (°C)	1	2	3	4
25	25	28	22	24
50	27	29	23	23
75	30	32	26	29

Construct the ANOVA table.

(Take LOS = 5% & $F_{5\%}(3, 6) = 4.76$, $F_{5\%}(2, 6) = 5.14$) **[8]**

Q6) a) Explain the basic principles of design of experiments – randomisation, replication, local control. **[8]**

b) The amount of fluoride in the local water supply is determined by four colorimetric methods in a comparative study A, B, C & D, with five replications for each test. The results in ppm are given below :

A	:	2	3	6	5	4
B	:	5	4	4	2	3
C	:	1	3	2	4	4
D	:	2	1	1	2	1

Construct the ANOVA table and hence state whether the methods are equivalent.

(Take LOS = 5% $F_{5\%}(3, 16) = 3.24$) **[8]**

Q7) a) Define the elements of optimization problem : objective function, constraints, feasible solution, optimal solution, feasible solution. **[6]**

b) Figure 1 shows feedstocks and products for the refinary with the costs of raw material and sales price of the products.

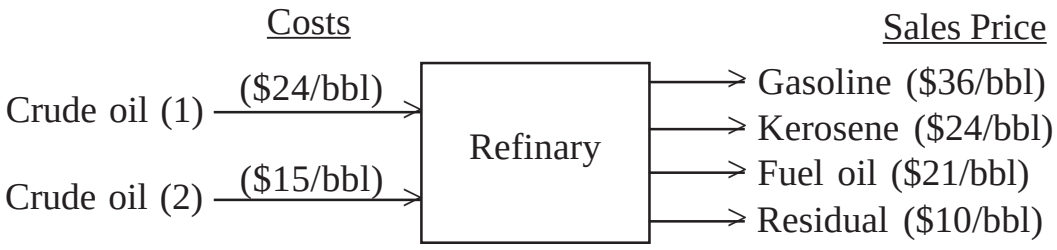

Figure - 1

The following table gives expected yields of the two types of crudes when processed by the refinary.

	Vol. % yield		Maximum allowable production (bbl/day)
	Crude 1	Crude 2	
Gasoline	80	44	24,000
Kerosene	5	10	2,000
Fuel oil	10	36	6,000
Processing cost ($/bbl)	0.50	1.00	

Set up the LP problem and find the optimum consumption of crude oils (1), (2), production of gasoline, kerosene, fuel oil, (in bbl/day) and resulting maximized profit. **[10]**

Q8) Write short notes on the following : **[18]**

a) Latin square design of experiments.

b) Transportation problem in LP.

c) Simplex method of solving LP problem.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1461

[3865]-697
M.E. (Chemical)
PROCESS DESIGN & SYNTHESIS
(Elective - I) (2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the approach for product design. **[10]**

b) What are the various engineering ethics? **[8]**

Q2) a) Discuss the steps involved in process design by shortcut method. **[8]**

b) Explain chemical process design with respect to environmental concerns. **[8]**

Q3) a) Discuss the various parameters affecting selection of reactor. **[8]**

b) What is an attainable region? Explain with its applications. **[8]**

Q4) a) Discuss with example the separation of liquid-liquid mixtures. **[6]**

b) Explain the principle of reaction invariants in detail. **[10]**

P.T.O.

SECTION - II

Q5) a) Explain the heuristics for determining favorable distillation column sequences for ideal mixture separation. **[8]**

b) Discuss the qualitative diagram for separation of 5 components A, B, C, D, E with decreasing order of relative volatilities using distillation column sequencing. **[8]**

Q6) a) Draw a residue curve map diagram for given system : **[8]**

Component/Mixture	B.P.(°C)
Hexane (A)	69.2
Methanol (B)	64.5
Malic Anhydrate (C)	56.9
Binary azeotrope (A - B)	50.5
Binary azeotrope (A - C)	52.3
Binary azeotrope (B - C)	53.6
Ternary azeotrope (A, B, C)	48.2

b) Explain how RCM is used for sequencing columns for homogeneous azeotropic mixture separation. **[10]**

Q7) a) Describe thermally coupled distillation sequences. **[8]**

b) Explain the procedure for drawing composite curves. **[8]**

Q8) Write short note on (Any Two) : **[16]**

a) Bow & Tie Region.

b) Utility Selection.

c) Co generation.

d) Problem Table Algorithm.

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1462

[3865]-700
M.E. (Chemical)
INDUSTRIAL POLLUTION CONTROL
(2008 Course) (509105)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) A coal fired power plant burns 24000 tonnes of coal per day. The coal has a sulfur content of 4.2 percent. The physical stack height is 200m. The ID of stack is 8m. The stack gas exit velocity is 18.3m/s, the gas has a temperature of 140°C. The ambient air temperature is 8°C. The atmospheric pressure is 1000 millibars and the average wind speed is 4.5m/s. compute the effective stack height. What is the maximum ground level concentration of SO_2 at a distance of 850m along the plume centreline? Use moderately unstable conditions. The constants are A = 0.295, B = 0.119, P = 0.986. **[10]**

b) With neat sketches explain the effect of lapse rate on plume behavior. **[8]**

Q2) a) An electrostatic precipitater must be designed to process $5m^3/s$ of stack gas. The drift velocity of fly ash particles has been determined to be $W = 1.5 \times 10^5$ dp. Determine the plate area required to remove particles with diameter $0.7\mu m$ with 95 percent efficiency. If the flow rate of the system is suddenly increased to $7.5m^3/s$, determine the decrease in efficiency. **[8]**

b) Explain nitrogen cycle in detail. **[8]**

Q3) a) Explain the selection of treatment process flow diagram. **[6]**

b) Determine the surface area required for a 20 and 30ft deep plastic media filter to treat waste water with a BOD_5 of 300mg/L after primary sedimentation. The final effluent BOD_5 is to be 25mg/L or less. Assume that the K_{20} determined using a 20ft deep test filter is 0.85 $(gal/min)^{0.5}/ft^2$ at 20°C for an *n* value of 0.5. The flow rate is 2Mgal/day. **[10]**

P.T.O.

Q4) Explain the environmental pollution caused by a fertilizer industry and discuss the various methods and equipments which can be used for controlling the pollution. **[16]**

SECTION - II

Q5) a) A completely mixed activated sludge process is to be used to treat wastewater flow of $500m^3$/hr having a soluble BOD_5 of 250mg/L. The concentration of soluble BOD_5 escaping the treatment is 10mg/L. Design criteria are as follows. Y = 0.5, K = 5 day^{-1}, $K_d = 0.06d^{-1}$, K_s = 100mg/L and the concentration of MLVSS (X) = 2000mg/L. Compute

i) The treatment efficiency.
ii) The mean cell residence time.
iii) The hydraulic retention time.
iv) The volume of the aeration tank.

Also calculate the F/M ratio for the system. **[10]**

b) Differentiate between activated sludge process and trickling filters. **[6]**

Q6) a) Ordinary municipal wastewater is to be treated by the conventional activated sludge process. The design loading is $0.1m^3$/s and 250mg/lit BOD. The design criteria and operating values of the process are as follows. **[12]**

BOD removal = 90%.

Organic loading = 0.5kg BOD/day per kg MLVSS
The target for MLSS in aeration tank = 2000mg/L
Excess sludge production = 0.5kg sludge solids per kg BOD destroyed.
Air flow rate = $100m^3$/day per kg BOD/day
Final settling tank overflow rate = $(30m^3/day)/m^3$ surface
Solids concentration in recycled sludge = 10,000mg/L
Solids concentration in effluent leaving the system = 25mg/L. Calculate

i) Aeration period.
ii) Amount of solids leaving the system.
iii) Amount of BOD destroyed.
iv) Air flow requirement.
v) Surface area of the settling tank.

b) Explain any advanced oxidation process for wastewater treatment. **[6]**

Q7) a) Write short notes on the following : **[8]**

i) Deep well injection.

ii) Gases and leachates in land fill.

b) Explain various processing techniques used in solid waste management. **[8]**

Q8) a) Explain recycling of solid waste and its necessity. **[6]**

b) Discuss the various physical properties of solid waste. **[6]**

c) What are the different factors necessary for effective incineration of solid waste. **[4]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1464

[3865]-705

M.E. (Chemical)

ADVANCED TRANSPORT PHENOMENA

(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Verify the relation : **[8]**

$$[u\times[v\times w]]=v(u\cdot w)-w(u\cdot v)$$

b) Derive expressions for $(\nabla\cdot v)$ and ∇v in cylindrical coordinates. **[8]**

Q2) Derive the equation for steady state laminar flow inside the annulus between two concentric horizontal pipes. The flow occurs in concentric pipe exchangers. **[16]**

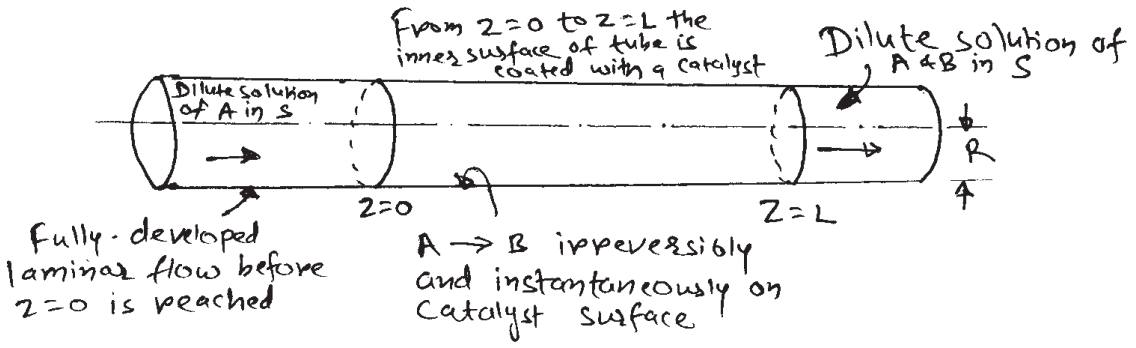
Q3) a) Develop equations for the relationship of local pressure to density or temperature in a stream of ideal gas in which the momentum flux τ and the heat flux q are negligible. **[8]**

b) What are the semi-empirical expressions for the turbulent energy flux? **[8]**

P.T.O.

Q4) A catalytic tubular reactor shown in fig. A dilute solution of solute A in a solvent S is in fully developed, laminar flow in the region $z < 0$. When it encounters the catalytic wall in the region $0 \leq z \leq L$, solute A is instantaneously and irreversibly rearranged to an isomer B, write the diffusion equation appropriate for this problem and find the solution for short distances into the reactor.

Assume that the flow is isothermal and neglect the presence of B. **[18]**



SECTION - II

Q5) Explain steady state transport in binary boundry layers (binary fluid around a submerged object). **[16]**

Q6) a) Compare turbulent thermal conductivity and turbulent viscosity, order of magnitude and dependance on physical properties and the nature of flow. **[8]**

b) What is Reynolds analogy and what is its significance? **[8]**

Q7) Air at 70 °F and 1 atm is to be pumped through a straight 2 in I.D. tube at a rate of 70 lbm/hr. A section of the tube is to be heated to an inside wall temperature of 250 °F to raise the air temperature to 230 °F. What heated length is required? **[16]**

Q8) Write short note on : **[18]**

a) The Prandtl mixing length.

b) Turbulent flow in ducts.

c) Enhancement of mass transfer by a first order reaction in turbulent flow.

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1465

[3865]-706
M.E. (Chemical)
ADVANCED PROCESS CONTROL
(2008 Course) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) A cylindrical liquid tank has $1m^2$ cross-section area. Water enters the tank from top at the rate of 0.15 m^3/min and leaves from bottom of the tank through pipe section having resistance 1.00 min/m^2. Find the time required for 80% change in level of water if input flow rate is decreased by unit step magnitude. Also find level of water after 30 sec. **[6]**

b) Draw the root locus of a closed-loop system with the following transfer functions of the hardware components

$$Gp(s) = \frac{1}{(s+1)(2s+1)}, \qquad G_c(s) = k_c,\ G_m(s) = G_f(s) = 1$$

Find the range of values of k_c for which system will remain stable. Also find the values of k_c which will cause the output to undergo sustained oscillations. Find the frequency of sustained oscillations. **[12]**

Q2) a) Draw block diagram of cascade control system. Explain cascade control strategy for controlling temperature of liquid inside the CSTR with jacket liquid temperature as the secondary variable. **[8]**

b) Explain split-range control strategy for controlling pressure inside the reactor where a gas-phase reaction occurs. **[8]**

Q3) a) Draw block diagram of a 2×2 MIMO process having 2 inputs m_1, m_2 and 2 outputs y_1, y_2. State transfer function model for this system.

If single-loop controllers having transfer functions Gc_1 & Gc_2 are installed between the input-output pairs m_1-y_1 and m_2 -y_2 respectively. Find the

P.T.O.

expression for response of y_1 and y_2 when **[8]**

i) Control loop between $m_1 - y_1$ is closed and that between $m_2 - y_2$ is opened.

ii) Both control loops are closed.

b) For a process having input-output relationship **[8]**

$$\bar{y}_1 = \frac{1}{s+1}\bar{m}_1 + \frac{1}{0.1s+1}\bar{m}_2$$

$$\bar{y}_2 = \frac{-0.2}{0.5s+1}\bar{m}_1 + \frac{0.8}{s+1}\bar{m}_2$$

Find the RGA and recommend the best pairing of input and output variables which will form two control loops with minimum interaction.

Q4) a) For a process having input-output relationship **[8]**

$$\bar{y}_1 = \frac{0.5e^{-1.5s}}{s+1}\bar{m}_1 + \frac{e^{-0.5s}}{2s+1}\bar{m}_2$$

$$\bar{y}_2 = \frac{2e^{-1.0s}}{0.5s+1}\bar{m}_1 + \frac{1}{s+1}\bar{m}_2$$

Form the two control loops by coupling m_1 - y_1 and m_2 - y_2. Design decouplers D_1 & D_2 for both the control loops. Are these decouplers physically realizable?

b) What is process identification? How will you determine the parameters K, t_d, τ of a FOPDT process having transfer function **[8]**

$$Gp(s) = \frac{ke^{-t_d s}}{\tau s+1}$$

using step-response data in the form of values of output y(t) at different time instants t starting from the instant when step change occurs in the input to the process.

SECTION - II

Q5) a) Explain direct synthesis (DS) of model-based controllers, for

i) *a* pure-gain process having G (s) = k.

ii) *a* pure capacitive process having G (s) = k/s.

iii) *a* F.O. process having G (s) = $\frac{k}{\tau s+1}$

Assume that the resulting closed-loop output response trajectory is given by– **[8]**

$$Q(s)=\frac{1}{\tau_r s+1}$$

b) Synthesize a DS – controller for a FOPDT process having transfer function $G(s)=\frac{ke^{-t_d s}}{\tau s+1}$

with desired output trajectory

$$Q(s)=\frac{1}{\tau_r s+1}$$ **[8]**

Q6) a) Synthesize a DS controller for open-loop unstable system having transfer function $G(s)=\frac{k}{\tau s-1}$ with **[8]**

desired output trajectory $Q(s)=\frac{1}{\tau_r s+1}$

b) For a feedback control system consisting of a process (Gp), the controller (Gc) and $G_m = G_f = 1$, derive the IMC controller based on the approximate process model Gp (s). Draw block diagram of the resulting IMC structure. **[8]**

Q7) a) Explain basic principles and advantages of SPC over single-loop conventional feedback control. **[8]**

b) Describe the distinguishing features of batch process control problem. **[8]**

Q8) Write short notes on: **[18]**

a) Fuzzy logic tuned controllers.

b) Design of plantwide control systems.

c) Interaction of plant design and control system design.

Total No. of Questions : 8] **[Total No. of Pages : 3**

P1466

[3865]-712

M.E. (Environmental Engineering)

APPLIED STATISTICS FOR ENVIRONMENTAL ENGINEERS

(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss Spearman's Rank correlation coefficient. **[8]**

b) The following data was calculated from the equation $y = 5 + 4x_1 - 3x_2$

x_1	x_2	y
0	0	5
2	1	10
2.5	2	9
1	3	0
4	6	3
7	2	27

Use least square regression to fit this data. **[8]**

P.T.O.

Q2) As a part of the investigation of the collapse of the roof of a building, a testing laboratory is given all the available bolts that connected the steel structure at three different positions on the roof. The forces required to shear each of these bolts (coded values) are as follows :

Position 1	90, 82, 79, 98, 83, 91
Position 2	105, 89, 93, 104, 89, 95, 86
Position 3	83, 89, 80, 94

Perform an analysis of varience to test at the 0.05 level of significance whether the differences among the sample means at three positions are significant. **[16]**

Q3) a) A research worker wants to determine the average time it takes to mechanic to rotates the tires of a car, and wants to be able to assert with 95% confidence that the mean of the sample is off by at most 0.50 minute. If researcher presume from past experience that $\sigma = 1.6$ minutes, how large a sample will have to take? **[8]**

b) Discuss relation between moments about mean in terms of moments about any point. **[8]**

Q4) An optical firm purchases glass to be ground into lenses, and it knows from past experience that the variance of the refractive index of this kind of glass is 1.26×10^{-4}. As it is important that the various pieces of glass have nearly the same index of refraction, the firm rejects such a shipment if the sample variance of 20 pieces selected at random exceeds 2×10^{-4}. Assuming that the sample values may be looked upon as a random sample from a normal population. What is the probability that a shipment will be rejected even though $\sigma^2 = 1.26 \times 10^{-4}$. **[18]**

SECTION - II

Q5) a) Elaborate model equation for latin square design. **[8]**

b) Explain graphical procedure for sequential sampling. **[8]**

Q6) An experiment was designed to study the performance of four different detergents. The following whiteness readings were obtained with specially designed equipment for 12 loads of washing distributed over three different models of washing machines :

	Machine 1	Machine 2	Machine 3	Totals
Detergent A	45	43	51	139
Detergent B	47	46	52	145
Detergent C	48	50	55	153
Detergent D	42	37	49	128
Totals	182	176	207	565

Looking on the detergents as a treatments and the machines as blocks, obtain the appropriate analysis of variance table and test at the 0.01 level of significance whether there are differences in the detergents or in the washing machines. **[16]**

Q7) Write short notes on : **[18]**

a) Northwest Corner Rule.

b) Least Cost Rule.

c) Transportation Algorithm.

Q8) a) What are unbounded solutions in simplex method? **[8]**

b) Maximize : $Z = 3x_1 + 2x_2$

Subject to : $-x_1 + 2x_2 \leq 4$

$3x_1 + 2x_2 \leq 14$

$x_1 - x_2 \leq 3$

$x_1 \geq 0, x_2 \geq 0$

Use graphical method. **[8]**

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Total No. of Questions : 6] **[Total No. of Pages : 1**

P1467

[3865]-713
M.E. (Chemical)
ENVIRONMENTAL GEOSCIENCES
(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Write an essay on Air pollution and Global warming. **[16]**

Q2) Describe Terrestrial and Aquatic ecosystems of the Earth. **[16]**

Q3) Give a detailed account of Volcanism. **[18]**

OR

Explain in detail Food chain and Food web. **[18]**

SECTION - II

Q4) Write an essay on Application of Remote sensing and GIS in Environmental science. **[18]**

Q5) Write a detailed note on Acid mine drainage. **[16]**

Q6) a) Give classification and mobility of trace elements. **[8]**

b) Describe Geochemical cycle. **[8]**

OR

Explain the following:

a) Biochemical factors in Environmental health. **[8]**

b) Diseases induced by human use of Land. **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1469

[3865]-716

M.E. (Chemical) (Environmental)

GROUNDWATER CONTAMINATION AND POLLUTION TRANSPORT

(509142) (2008 Course) (Theory)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the significance of ground water pollution & what are the source of ground water pollution? **[4]**

b) With neat sketch explain various ground water formation. **[6]**

c) A fully penetrating 15 cm diameter penetrates a unconfined aquifer of 20 m thickness which is pumped at a rate of 20 cps. The resulting drawdown measured at 2 observation well 20 m & 160 m distance recorded 6 m & 0.5 m respectively. Determine the average hydraulic conductivity. Find at what distance the drawdown will be insignificant. **[8]**

Q2) a) Describe in brief : **[4]**

i) Radius of influence.

ii) Well interference.

b) What are the aspects to be considered for groundwater pollution investigation? **[6]**

P.T.O.

c) Determine the velocity of groundwater through an aquifer which has the following data.

Effective particle size of aquifer = 0.20 mm.

Hydraulic gradient 1 in 100, Viscosity coeff. of water at 10°C = 1.0. Slitcher const = 400, Hazon const = 1000.

Assuming aquifer to be 120 m & 15 m deep, find the discharge using Slitcher formula. **[6]**

Q3) a) How is discharge through flow medium found by flownet? What are singular points & how are they classified? **[8]**

b) Explain laboratory method of determination of hydraulic conductivity either by constant or falling head method. **[8]**

Q4) a) Explain aquifer pumping test to determine the aquifer parameter. What are its advantages & disadvantages. **[8]**

b) Explain in brief : **[8]**

i) Principle of Super position.

ii) Transmissivity & its significance.

iii) Storativity & its significance.

iv) Perched aquifer.

SECTION - II

Q5) a) What are the advantages of artificial groundwater recharge with neat sketch explain induced infiltration technique. **[6]**

b) Write brief description on : **[6]**

i) Safe yield.

ii) Mining yield.

iii) Perrintal yield.

c) Discuss in brief groundwater resources development in view of ground water pollution. **[6]**

Q6) a) Discuss the effect of soil & rock on groundwater quality with the help of geochemical cycle. **[8]**

b) Derive the limiting condition for saltwater intrusion. **[6]**

c) State the sources of contamination of land. **[2]**

Q7) a) What are the different types of Analog model? Explain RC network Analog model. **[8]**

b) What are the water quality plots & maps. Discuss i) Collin bar chart ii) Piper's trilinear diagram iii) Stiff's polygon of epm. **[8]**

Q8) a) With the help of break-through curve explain the tracer test for spreading of contamination in ground water. **[6]**

b) Explain the influence of Numerical grid of numerical moment method of solute transport. **[6]**

c) Explain the importance of model study in groundwater pollution. What are the practical disadvantage? **[4]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1470

[3865]-718

M.E. (Environmental Engineering) (Chemical Engineering)

AIR & NOISE POLLUTION CONTROL

(509134) (Elective - I) (2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss Lapple's correlation for cyclone efficiency.

b) Write Lapple's correlation for cut size and Shephard correlation for pressure drop in cyclone, explaining the notation.

c) With the help of sketch draw a comparision between different particle emission control techniques showing the efficiency viz-a-viz particle size range.

[18]

Q2) a) Classify the air pollutants according to the source type.

b) Explain air pollution control method actually used in industry, giving details of flow rate, temperature and broad composition of polluted and cleaned gases, type of dust collection equipments, flow sheet of control scheme, pollution control standards for the industry concerned.

[16]

Q3) Write short notes on : **[16]**

a) Air pollution laws & regulations.

b) Sampling Train.

P.T.O.

Q4) Draw neat figure and explain the working with efficiency equations of

a) Spray chamber.

b) Fabric filter with pulse jet cleaning.

[16]

SECTION - II

Q5) Comment on noise pollution status of India and the action plan to control noise pollution. **[16]**

Q6) It is desired to control of SOX from a Industry. Give the techniques such as dry and wet method and explain them in detail. **[18]**

Q7) Give the types of Electro-static precipitator. Explain the principle and working with efficiency equation of plate type ESP. **[16]**

Q8) Write short notes on : **[16]**

a) Wet scrubber.

b) Fabric filters.

c) Plume Behaviour.

d) Effective stack Height.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1471

[3865]-719
M.E. (Chemical)
MEMBRANE TECHNOLOGY IN ENVIRONMENTAL ENGINEERING
(2008 Course) (509135)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Question No. 1 & 5 are compulsory and remaining attempt any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) How separation processes are classified in terms of the physical or chemical properties of the components to be separated? **[6]**

b) What are the benefits and drawbacks of the membrane technology? **[6]**

c) Give applications of membrane technology and explain how performance of a membrane is determined? **[6]**

Q2) a) Which factors control the state of a polymer to be used for the membrane? **[8]**

b) Which materials are selected for the synthetic membrane preparation? **[4]**

c) Define a membrane and membrane processes according to driving force employed? **[4]**

Q3) a) What different techniques are adopted for synthetic membrane preparation? **[8]**

b) How membranes are prepared by phase inversion process? **[8]**

Q4) Write short notes on : **[16]**

a) Light transmission curves.

b) Ionic Membranes.

c) Modules for membranes.

d) Desalination of seawater.

P.T.O.

SECTION - II

Q5) a) Why composite membranes are used in industrial applications? What are their preparations techniques? How plasma polymerization is carried out? **[6]**

b) What is a demixing process? Explain it on a ternary diagram. **[6]**

c) Explain types of membrane formation during precipitation of concentrated polymer phase. **[6]**

Q6) a) Explain the importance of instantaneous and delayed demixing of a polymer solution. **[8]**

b) Explain how glass membranes are prepared. **[4]**

c) What is the difference between osmosis and reverse osmosis process? **[4]**

Q7) a) Explain separation mechanism of a gas mixture by membrane technology. **[8]**

b) How membrane technology is used for the separation of azeotropic mixtures. **[4]**

c) What driving force is used in dialysis operation? Explain with schematic drawing the dialysis process. **[4]**

Q8) Write short notes on : **[16]**

a) Membrane contactors.

b) Membrane reactors.

c) Polarisation phenomena.

d) Turbulence promoters.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1474

[3865]-725
M.E. (Chemical) (Environmental Engineering)
INDUSTRIAL WASTE TREATMENT
(2008 Course) (509140)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is the necessity of Industrial Waste Treatment? Discuss in detail with one example.

b) What is water budgeting? **[16]**

Q2) What is waste minimization? What are the classification of waste minimization techniques? **[16]**

Q3) Explain the treatment method for the removal of fluoride and copper. **[18]**

Q4) Write short notes on : **[16]**

a) Cleaner Technology.

b) Indian standards for drinking water for Sulphates, Nitrates.

P.T.O.

SECTION - II

Q5) What is common effluent treatment plant? What are the advantages of it? Draw a layout of common effluent treatment plant. **[18]**

Q6) Explain any two of the following industries.

a) Sugar.

b) Paper & pulp.

c) Textile.

With respect to sources of wastewater and method of wastewater treatment. **[16]**

Q7) Draw a flowsheet for the treatment of Dairy Industry Wastewater Treatment and discuss all the details. **[16]**

Q8) Write short notes on : **[16]**

a) Significance of BOD Test.

b) Primary Wastewater Treatment of Sugar Industry.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1475

[3865]-727

M.E. (Environmental Engg.)

WATER QUALITY MODELING

(2008 Course)

Time : 3 Hours*]** **[*Max. Marks : 100

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain various steps involved in model building. **[18]**

b) Write the sources of water pollution.

c) Classify the point and nonpoint sources.

Q2) a) Explain the terminology : **[8]**

i) Carbonaceous Deoxygenation Rate Coefficient.

ii) Reaeration rate coefficient.

iii) Settling rate and sediment oxygen demand.

iv) Pollution load.

b) Explain hydrological considerations in Water Quality Modeling. **[8]**

Q3) a) What are ocean wastewater outfalls explain its reuse benifits and costs? **[8]**

b) Explain water quality planning and management. **[8]**

Q4) a) Discuss Hierarchy of water resource scheme (WRS) model. **[8]**

b) What is model validation? **[8]**

P.T.O.

SECTION - II

Q5) Determine the length and number of discharge ports for a multiport diffuser that will provide a nearfield dilution of 10, when discharging a maximum flow of 53 ft^3/s in a river. Under low flow conditions, the river water depth is 4 ft and the current speed is 2 ft/s. **[16]**

Q6) Develop a model for BOD reaction. **[16]**

Q7) A municipal wastewater having a BOD of 250 g/m^3 is to be treated by a two stage trickling filter. The desired effluent quality is 25 g/m^3 of BOD. If both of the filter depths are to be 1.83 m and the recirculation ratio 2:1, find the required filter dimensions. **[16]**

Data :-

Flow rate = 7570 m^3/d.

Wastewater temperature = 25°C.

BOD removal in primary sedimentation = 35%

$E_1 = E_2$.

Q8) a) Explain biological nitrification and growth kinetics. **[18]**

b) Write note on DO.

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1476

[3865]-741
M.E. (Petroleum)
WELL CONTROL
(New Course 2008) (Elective - II (d)) (512105)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Q. 1 and Q. 5 are compulsory. Out of the remaining attempt two questions from Section-I and two questions from Section-II.***
4) ***Use of cm scale graph paper is allowed.***
5) ***Figures to the right indicate full marks.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Describe in detail indications and reasons of well kick and blowout separately. **[12]**

b) Determine the height in feet of the influx using following data. **[6]**

Pit gain = 25 bbl
Hole size = 8.5 in
Drill collar OD = 6.5 in
Drill collar length = 490 ft.
Drill pipe OD = 5.0 in

Q2) a) Explain primary, secondary and tertiary method of well control, in brief. **[4]**

b) How the change in hydraulic properties of drilling fluid may affect well control operations? Explain. **[4]**

c) 600 ft. of 13 3/8" surface casing is to be set in 16" hole. The slurry yield is 1.18 cubic ft/sack and 75% excess is needed. The cement slurry weight is 15 ppg and requires 5.2 gal/sack of water. Cement is circulated to the surface. Capacity of the annulus to be cemented is 0.42305 cubic ft/ft. Capacity 13 3/8" casing is 0.1497 bbl/ft. Calculate :

i) No. of sacks.
ii) Volume of water in bbl and in litrs. **[4]**

P.T.O.

d) Use following data and calculate reduction in bottom hole pressure if, while pulling out, driller forgot to fill the hole and 30 stands of drill pipes were pulled out dry.

Well depth = 8900 ft. (TVD), Casing shoe depth = 5000 ft. (TVD)
Mud weight = 17 ppg., Open hole capacity = 0.1482 bbl/ft.
Casing capacity = 0.1611 bbl/ft., Drill pipe metal displacement = 0.0076 bbl/ft., Length of one stand = 93 ft. **[4]**

Q3) a) Explain the design considerations for relief well. **[8]**

b) Draw and explain in brief, the generic nature of graph to indicate pressure variation across drill pipe and across the annulus due oil kick during well killing operation. **[8]**

Q4) Write short notes on : **[16]**

a) Role of GTO in well control.

b) Well completion in abnormally pressured zones.

c) Well kick through drill pipe.

d) Factors affecting rate of penetration.

SECTION - II

Q5) Following data is given : **[18]**

Hole size - 12.25” Hole depth 6000 ft TVD
Casing : 13-3/8” set at 4800 ft TVD
Drill pipe : 5” Capacity 0.0176 bbls/ft
Drill collar : 8.3”, 530 ft long, capacity 0.0087 bbls/ft
Mud wt. : 11.4 ppg
Capacities :
Drill collar in open hole : 0.0836 bbl/ft
Drill pipe in open hole : 0.1215 bbls/ft
Drill pipe in casing : 0.1353 bbls/ft
Mud pump output = 0.119 bbls/stroke
Slow circulation rate = 440 psi at 30 SPM
SIDP = 340 psi
SICP = 410 psi
Pit gain = 12 bbls.

Calculate :
No. of strokes required to pump kill mud from surface to bit and bit to surface.

Kill mud density
Initial circulating pressure
Final circulation pressure
Time for one complete circulation
Plot step down plan for driller's method
Total annular volume.

Q6) a) Determine the type of influx using following data. **[6]**

SICP = 1084 psi
SIDPP = 770 psi
Height of influx = 400 ft.
Mud weight = 19.00 ppg.

b) Write a note on : **[10]**

i) Indirect method of fracture gradient calculation.
ii) Offshore safety procedures.

Q7) a) Write in brief procedure of well control using, **[10]**

i) Concurrent method.
ii) Wait and weight method.

b) A well is being drilled with 11.5 ppg mud. How much barite is required to increase the mud density to 13 ppg.? **[6]**

Hole volume = 799 bbl. Surface volume = 300 bbl
Barite density is 35.4 ppg.

Q8) Write short notes on : **[16]**

a) Sub-sea well head assembly.

b) BOP surface hydraulic control unit.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1477

[3865]-750
M.E. (Petroleum)
ADVANCED OFFSHORE TECHNOLOGY
(2008 Course) (Elective - III) (512111)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is Station keeping? Draw the sketches and discuss in detail mooring sequence and mooring system for, 'Tension Leg Platform'. **[9]**

b) Explain the mathematical expressions to calculate wave and wind forces acting on a floating offshore vessel. **[9]**

Q2) a) Explain 'ballast control and stability for a semi submersible offshore vessel. **[4]**

b) Define the following : **[2]**

i) Offset of riser.
ii) Buoyancy.

c) Draw the typical chart graph for drill stem testing operation (DST), for two flowing and shut-in pressure readings. Indicate all the points in it. **[5]**

d) Explain operation of sub-sea well control using, 'Lower Marine Riser Package' in brief. **[5]**

Q3) Write the various modes available for storage and transportation of oil and gas at offshore. Discuss in detail the pipe line design considerations for transportation of natural gas. **[16]**

P.T.O.

Q4) Write short notes on : **[16]**

a) API types-cement.

b) Secondary well control.

c) Offshore oil and gas processing system.

d) Offshore Safety.

SECTION - II

Q5) a) Write the primary functions of a riser tensioner system and drill string motion compensator? Draw the schematic sketch of any one. **[9]**

b) Write the challenges involved in deep water drilling. Explain important factors that you will consider, during design of drilling fluid programme in case of deep water drilling. **[9]**

Q6) a) Explain various motions and vessel offset measurement. Write the permissible values in different operating conditions, for these two. **[8]**

b) Write the basis to select an offshore transportation system? Draw the sketch and explain in brief any one type of offshore distribution system. **[8]**

Q7) a) State and explain the design considerations for various structural members of Concrete gravity offshore platform. Describe construction and working principle of this platform. Draw the free-body diagram, graph along with mathematical expressions if any. **[12]**

b) Discuss in brief, 'diving equipment'. **[4]**

Q8) Write short notes on : **[16]**

a) Dynamic positioning system.

b) Forces acting on a drilling platform.

c) Repeat formation testing.

d) Sub-sea wellhead equipment.

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Total No. of Questions : 10] **[Total No. of Pages :2**

P1480

[3865]-764

M.E. (Information Technology)

INTERNET AND WEB TECHNOLOGIES

(Rev 2008) (Elective - III)

Time : 3 Hours*]** **[*Max. Marks : 100

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Illustrate LDAP Directory Services. **[8]**

b) Identify the 8 business applications which are ideal for Internet type implementations. **[8]**

Q2) a) What is SNMP protocol used for? **[8]**

b) How CGI works? **[8]**

Q3) a) Illustrate Kerberos System Functioning. **[8]**

b) What are the Merits and Demerits of using Proxy Servers? **[8]**

Q4) a) Explain functioning of Search Engine. **[8]**

b) Compare Perl and PHP. **[8]**

Q5) Answer any three short notes (with illustration) : **[18]**

a) XML.

b) SOAP.

c) AJAX.

d) WEB 2.0.

e) WSDL.

P.T.O.

SECTION - II

Q6) a) What are the advantages and disadvantages of N-Tier Web System? **[8]**

b) Draw and explain the Functional Diagram of FTP system. **[8]**

Q7) a) What are different skills set available to develop the web systems? **[8]**

b) Explain any three Java Patterns. **[8]**

Q8) a) Explain Servlet Life Cycle. **[8]**

b) Compare Applets with Servlets. **[8]**

Q9) a) Illustrate Java Beans. **[8]**

b) Illustrate use of Java Mail. **[8]**

Q10) Short notes (any three) : **[18]**

a) JSR 168.

b) Internationalization vs Localization.

c) COM vs CORBA.

d) ASP vs Active X technology.

e) Application Server.

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Total No. of Questions : 10] **[Total No. of Pages : 2**

P1481

[3865]-767

M.E. (Information Technology)

MOBILE COMPUTING AND M-COMMERCE

(514411 C) (2008 Course) (Elective - III)

Time : 3 Hours] [***Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the services provided in a GSM system? Explain how a mobile station connects to and talks with another mobile station? How will the in between interfaces differ when a mobile station connects to a PSTN destination. **[8]**

b) Show master slave architecture in a piconet of blue tooth devices. What are the states in which a blue tooth device can be found? **[8]**

Q2) a) Discuss the spread spectrum techniques. **[8]**

b) What are the various protocols used in WLL? What are the services provided by WLL? **[8]**

Q3) a) Show the various subsystems and units in the GSM system architecture. How do these subsystems and units differ from those in GPRS? **[8]**

b) What are advantages of MANETs and Wireless Sensor Networks integrated with IPv6? **[8]**

Q4) a) What is MMS? How is it different from Short Message Service and Extended Message Service? Explain the MMS architecture with diagram. **[8]**

b) Describe protocol layers of WLAN. Explain PMD, PLCP and CCK layers. **[8]**

P.T.O.

Q5) Write a short note on : **[18]**

a) Mobile IP protocol

b) EDGE

c) CDMA2000

SECTION - II

Q6) a) Draw and explain four-tire architecture. How do multimedia databases serve mobile device in client server architecture? **[10]**

b) Explain the concept of wireless markup language. **[8]**

Q7) a) Describe m-business along with its benefits and challenges. **[8]**

b) Show master-slave architecture in piconet of Bluetooth devices. What are the states in which a Bluetooth device can be found? **[8]**

Q8) a) Write a short note on – Limitations of Mobile Devices. **[8]**

b) What is Wi-Max? How it is different than Wi-Fi? **[8]**

Q9) a) Differentiate between the functions of labels, tags and cards. How do smart cards, smart labels, smart tokens and RFID tags work, if they have no internal battery? **[8]**

b) Why does a mobile device take quality of service issues into account while computing? List the object models for application adaptation for the quality of service constraints. **[8]**

Q10)a) Explain the function of the components of the WAP architecture. **[8]**

b) What are the emerging issues in mobile commerce? **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1482

[3865]-768
M.E. (CSE) IT
INTERNET ROUTING DESIGN
(2008 Course) (Elective - IV)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) From the TCP packet format, you will notice that it does not have a field that indicates the length of a TCP packet. How can you determine the TCP payload length, i.e., the length of the data carried in a TCP packet? Why is it necessary to reserve some addresses from an address space rather than making all of them available. **[8]**

b) Explain Router architecture in terms of functional view with the help of labeled diagram. **[8]**

Q2) a) In what ways, are the Bellman-Ford algorithm and the distance vector algorithm different? What are the main differences between shortest path routing and widest path routing? **[8]**

b) Consider the network topology in Figure 1. The number listed next to the links are link costs. Determine the shortest path from node 1 to node 5 using Bellman-Ford algorithm and the distance vector algorithm different? **[8]**

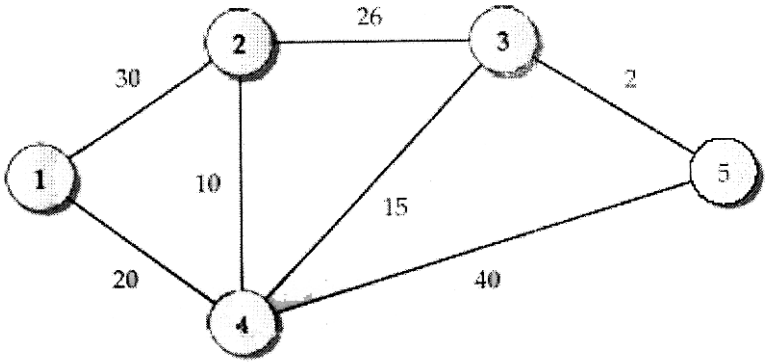

Figure 1: A 5-node example.

P.T.O.

Q3) a) Develop a specialized *k*-shortest paths algorithm, given that a path cannot consist of more than two links. **[9]**

b) Implement a distance vector protocol using socket programming where the different "nodes" may be identified using port numbers. For this implementation project, define your own protocol format and the fields it must constitute. **[9]**

Q4) a) Explain the Interconnection of ISPs of different tiers: a representative view. How session flows in the typical architecture, explain with well labeled diagram. **[8]**

b) Consider a fully-mesh N node network that is running a link state protocol. Suppose one of the nodes goes down. Estimate how many total link state messages will be generated. **[8]**

SECTION - II

Q5) a) What is the relation between an AS and an ISP? Is policy routing checked on the inbound or the outbound interface of a BGP speaker? **[8]**

b) Define Packet classification problem. A router performs a route lookup followed by classification. If the route lookup operation takes 15 nanosec, how much time is available for packet classification to sustain a data rate of 40 Gbps with an average packet size of 100 bytes? **[8]**

Q6) a) For the rules shown in Table 1, construct a hierarchical trie. What is the best matching rule for a packet with $F_1 = 0011$ and $F_2 = 0011$? How many memory accesses are required? **[9]**

TABLE 1: A two-field classifier

Rule	F_1	F_2
R_1	0*	10*
R_2	0*	01*
R_3	0*	1*
R_4	00*	1*
R_5	00*	11*
R_6	10*	1*
R_7	11*	00*
R_8	*	00*

b) Construct a grid-of-tries using the rules in Table 1. Describe the steps involved in classifying the packet with $F_1 = 0011$ and $F_2 = 0011$? **[9]**

Q7) a) How is QoS routing different from best-effort routing? Explain in details. **[8]**

b) Discuss where and how MPLS-based IP/MPLS traffic engineering is different from "pure" IP traffic engineering. **[8]**

Q8) a) Describe the IP-PSTN-IP call routing scenario, along with the different protocol messaging involved in call routing setup. **[8]**

b) Explain the main differences between BGP/MPLS IP VPN and layer 2 VPN. **[8]**

Total No. of Questions : 8] **[Total No. of Pages :1**

P1483

[3865]-771
M.E. (Information Technology)
SERVICE ORIENTED ARCHITECTURE
(2008 Revised Course) (Elective - IV)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Consider a hospital System and model it with SOA Architecture. **[12]**

b) Identify the 8 business applications which are ideal for SOA type implementations. **[6]**

Q2) a) Illustrate the SOA life cycle. **[8]**

b) What are SOA Delivery strategies. **[8]**

Q3) a) Illustrate non run time and run time business qualities in SOA. **[8]**

b) Give the examples of Technical and business constraints while designing SOA. **[8]**

Q4) a) What are merits and Demerits using SOA implementations in business. **[8]**

b) State the Enterprise solution assets. **[8]**

SECTION - II

Q5) a) Consider Online Banking and model it with SOA architecture. **[12]**

b) Identify and justify 4 web portals application based on interdisciplinary businesses. **[6]**

Q6) a) How the security problems are addressed in SOA? **[8]**

b) What are the different standards used to implement SOA? **[8]**

Q7) a) What are the software tools used for End to End SOA solution for a business? **[8]**

b) Illustrate SOA Governance. **[8]**

Q8) a) How the change in a service is addressed? **[8]**

b) Illustrate Quality of Service Compliance in SOA. **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1484

[3865]-794

M.E. (Instrumentation and Control)

TRANSDUCER DESIGN

(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Suggest a scheme to measure velocity of jet in the tail exhaust of aeroplane using known standard transducer. However, any optical transducer also could be proposed for the measurement. Suggest frequency spectrum analysis method of the velocity. **[10]**

b) Describe a non contact displacement transducer with suitable analogue output to measure displacement of an eardrum. Justify the selection and then discuss suitable signal conditioning circuit for the same transducer. **[6]**

Q2) Design a Force transducer to monitor the force on spillway divide wall of a longest dam model in India. The force is static plus fluctuating and has to have a typical natural frequency greater than 250 Hz. The maximum force expected is 200 N. The transducer has to be made from non corrosive material like stainless steel. The force is acting on the wall.

(a) Suggest a type of sensing element that should be employed. (b) The output expected is 25 mV for maximum force. (c) Make suitable assumptions for the design. (d) Draw a neat end view and plan sketch showing details of transducer. (e) Suggest amplification and signal conditioning to measure peak, average and rms values of a force the length (height) of wall is 6 cm. Width margin, maximum allowable is 3 cm, however assume little less and design a section and cross section be rectangular. **[18]**

P.T.O.

Q3) a) Describe a device to monitor non contact rotational measurement in a CNC machine. Consider an accuracy of better than 1% and resolution of less than 10 seconds. **[6]**

b) Describe merits of Moiré fringes based linear transducer in linear measurement on CNC machine over other linear transducers employed traditionally. **[4]**

c) Discuss MEMS based accelerometer and its design considerations. **[6]**

Q4) a) Strain measurement is planned on a rock portion of side walls of a tunnel on Konkan Railway. Whether inductive type strain transducer or Vibrating wire type strain transducer should employed? Justify your choice. Housing for the signal conditioning and monitoring Units are permitted only after 500 mtrs from transducer site and should be within 2 km distance of the tunnel. **[10]**

b) Describe working of Force balance accelerometer and elaborate two more applications of the same transducer. **[6]**

SECTION - II

Q5) Discuss methods to evaluate linearity parameters of the readings in LVDT calibration. Explain all steps in the solution, with simple example. **[16]**

Q6) Write notes on *any two* of the following : **[18]**

a) Fiber Optic based Ring Laser Gyro.

b) Sensor for measuring partial pressure of O_2.

c) Sensor to monitor pulses and saturated oxygen in blood.

Q7) Design a pressure transducer to measure soil pressure of 1000 MPa on the bottom of the giant stadium in a sports complex. Prefer to employ a transducer to measure deflection of the diaphragm of this transducer. Use appropriate formulae and apt dimensions. Justify choice of the diaphragm material and encasing material in this condition. Which type of signal conditioning and signal transportation is preferred? The situation may have EMI effect surrounding the structure. **[16]**

Q8) a) Elaborate the roll of bio sensor in measuring & monitoring water pollution. Give design considerations of its instrumentation. **[6]**

b) Describe salient features of temperature measuring instrumentations to monitor temperature of erupting Volcano in Andaman Islands. **[10]**

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Total No. of Questions : 8] **[Total No. of Pages : 1**

P1486

[3865] - 797

M.E. : (Instrumentation & Control)

ANALYTICAL INSTRUMENTATION

(5061104) (2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any Three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Derive Beer-Lambert's law and discuss limitations of it. **[18]**

Q2) Discuss importance of IR spectrometry. Also discuss constructional details of FTIR spectrometer with advantages. **[16]**

Q3) Discuss principle, construction, and working of Time of Flight Mass spectrometer. **[16]**

Q4) Discuss principle, construction and working of NMR spectrometer. **[16]**

SECTION - II

Q5) Explain principle of Atomic Absorption Spectrometry. Also explain working of AAS. Discuss role of hollow cathode lamp in AAS. **[18]**

Q6) Explain working of High Performance Liquid Chromatography (HPLC). Also explain sample introduction system in HPLC. **[16]**

Q7) Explain 'Raman Effect'. Also explain Instrumentation for Raman Spectrophotometer and its applications. **[16]**

Q8) Write short notes on (any two) **[16]**

a) Abbey refractometer.
b) GM counter.
c) Electrophoresis.
d) Monochromator.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1488

[3865]-801

M.E. (Instrumentation, Process & Biomedical)

FUNDAMENTALS OF BIOMEDICAL INSTRUMENTATION

(Revised 2008 Course) (Elective - I) (5061201 (A)) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Design clinical thermometer using thermister to measure the body temperature if resistance of thermometer is R_{TH} is $3.9K\Omega$. Consider the span of transducer from 32ºC to 42ºC for the design. Assume that change in resistance will be $R_{TH} = 3.97K\Omega$ at 32ºC and $2.57K\Omega$ at 42ºC as well Vcc is 5V. **[10]**

b) Why silver-silver chloride electrode is suitable in biomedical applications? What are the important of use of Electrolytic Jelly at the skin-electrode interface? **[8]**

Q2) a) Draw and explain inverted bell Spiro meter for respiratory measurement. **[8]**

b) Explain the following terms with respect to lung volume capacities. **[8]**

i) RV.
ii) ERV.
iii) TLC.
iv) TV.

Q3) a) Explain the function of the following in the cell : **[8]**

i) Mitochondria.
ii) Endoplasmic reticulum.
iii) DNA.
iv) Golgi Apparatus.

b) Discuss coulter counter method for counting of various blood cells associated with blood. **[8]**

P.T.O.

Q4) a) Explain in detail preamplifier stage in ECG machine. **[8]**

b) Explain Necessity of Pacemaker. Give the classification of Pacemakers with definition according to temporary and permanent requirement. **[8]**

SECTION - II

Q5) a) Elaborate how hearing threshold plays important role in accessing indirect blood pressure measurement. Draw and explain indirect blood pressure measurement which is popular in clinical practice. **[8]**

b) Explain electromagnetic blood flow measurement with neat diagram. How the transformer voltage problem is tackled in the same? **[10]**

Q6) a) What is EEG? Discuss various waveforms in EEG with their significance and frequency. **[8]**

b) Enlist various electrodes for EEG. Explain the EEG 10-20 montage system. **[8]**

Q7) a) Define a "Hearing threshold". Elaborate on the speech audiometer and pure tone audiometer. **[8]**

b) i) Explain the various vision errors in human vision system and also explain the way of elimination of the same. **[6]**

ii) Suggest suitable devices that are used to recover the percentage losses in EAR or EYE, if some residual capacity has been remain with these organs. **[2]**

Q8) a) Explain the various methods of accident prevention in medical equipments. **[8]**

b) Draw structure of nephron and explain the process of urine formation. **[8]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1489

[3865]-804

M.E. (Instrumentation and Control)

ADVANCED SIGNAL PROCESSING

(Process and Biomedical - 2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Define the terms Decimation and Interpolation. Explain interpolation by factor I and obtain an expression for interpolated signal at the output. Draw the respective spectrums. **[18]**

Q2) Explain the different steps in sampling rate conversion by a rational factor I/D. What are the noble identities in sampling rate conversion system?**[16]**

Q3) What is Cepstrum? What are the properties of complex cepstrum? Explain in detail any one application of Homomorphic deconvolution. **[16]**

Q4) What do you mean by adaptive filtering? Describe the LMS algorithm for adaptive filtering. Explain one application of adaptive filtering. **[16]**

SECTION - II

Q5) Define the terms Power spectrum and Periodogram. What are the different power spectrum estimation methods? Explain any one Nonparametric methods of power spectrum estimation. **[16]**

Q6) What is Wavelet Transform? Explain in detail image compression using wavelet transform. **[16]**

P.T.O.

Q7) Define the following terms : **[16]**

a) Random variable.

b) Random process.

c) Stationary random process.

d) Wide sense stationary process.

Explain the AR model of stochastic process in detail.

Q8) a) What is Orthogonal Transform? Explain FT, STFT and WT. State the advantages and drawbacks of one over another. **[10]**

b) Explain the signal analysis using subband decomposition. **[8]**

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Total No. of Questions : 8] **[Total No. of Pages :2**

P1490

[3865]-814

M.E. (Instrumentation) (Process & Biomedical Specialization)

BIO-IMAGING MODALITY

(Sem. - II) (Revised Course 2008) (5061205(A))

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw and Explain X-ray machine along with neat block diagram. Specify the factors deciding the quality of X-Rays. **[12]**

b) Specify the target material used in generation of X-ray? Give its technical reason for the used. **[6]**

Q2) a) What Abnormalities Does Mammography Detect and Diagnose? How Does Digital Mammography differ From Standard Mammography? **[8]**

b) What are the benefits offers by Digital mammography provides over standard mammography equipment. And also discuss disadvantages to Digital Mammography. **[8]**

Q3) a) Explain the principle of CT - scanning. How it overcomes the draw back of X-Ray imaging? **[8]**

b) Explain the operation of X-ray system that is used for real time imaging. List out the real time application of X-ray system. **[8]**

Q4) a) What are grids and collimators used in X-ray machine? Enlist various collimators with their specific clinical applications. **[8]**

b) Write short note on "Hounsfield Numbers" in CT scanning. **[8]**

SECTION - II

Q5) a) Discuss the various transmission modes of ultra sound transmission? **[8]**

b) Specify the frequency ranges for abdominal, Brain Examination and for ophthalmic & pediatric study in M-scan Mode. Explain the advantages of ultrasound imaging over the other imaging modalities. **[10]**

P.T.O.

Q6) a) Why Nal (Ti) is most popular in radionuclide imaging? Explain the principle of PET imaging. What is the main advantage offered by PET over other medical imaging modality? Why the PET is costlier imaging system? **[10]**

b) Enlist clinical applications of SPECT and give the reason why SPECT is accepted instead of conventional nuclear medical imaging. **[6]**

Q7) a) Explain limitation and advantages of MRI techniques. **[8]**

b) Discuss various magnets used in MRI to produce appropriate magnetic field. **[8]**

Q8) a) What is Medical thermography. **[8]**

b) Draw and explain block diagram of infrared imaging. **[8]**

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Total No. of Questions : 6] **[Total No. of Pages : 3**

P1491

[3865]-806
M.E. (Instrumentation and Control)
MODERN CONTROL THEORY
(2008 Course) (5061111 (A)) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Obtain the state equation in phase variable form for the following differential equation. **[5]**

$$2\frac{d^3y}{dt^3} + 4\frac{d^2y}{dt^2} + 6\frac{dy}{dt} + 8y = 10u(t).$$

b) For the following transfer function draw the simulation diagram and find the state-space representation of the above transfer function. **[10]**

$$G(s) = \frac{Y(s)}{U(s)} = \frac{s^2 + 7s + 2}{s^3 + 9s^2 + 26s + 24}$$

Q2) a) Calculate the z-transfer function from input u to output y for the difference equation which is given as : **[5]**

$y(k) = -a_1 y(k-1) - a_0 y(k-2) + b_1 u(k-1) + b_0 u(k-2)$.

b) A system is described by the following state-space equations. **[10]**

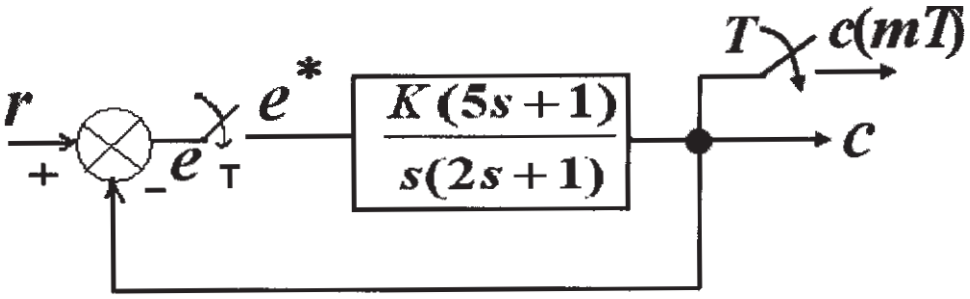
$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 10 \\ 0 \\ 0 \end{bmatrix} u(t)$$

$$y = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

Find transfer function.

P.T.O.

Q3) a) For the digital system shown in Fig. below, Assume : K = 10, T = 0.5s, r (t) = 1 (t). Determine the output c* (mT). **[10]**

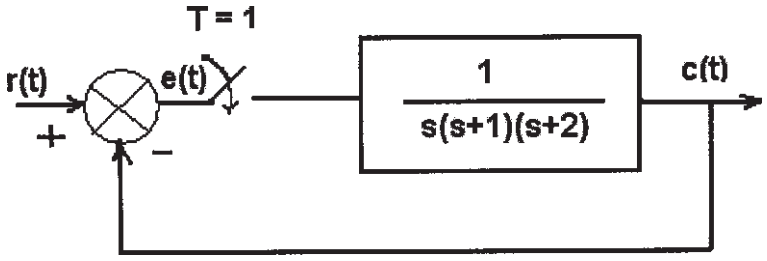


b) Determine K for stable system. **[10]**

$$1+G(z)=1+\frac{0.632Kz}{z^2-1.368z+0.368}=0$$

SECTION - II

Q4) a) Find the stability of system with the help of Bilinear transformation. **[10]**



b) For a nominal plant model **[10]**

$$Go(s)=\frac{s-4}{(s-1)(s+4)}$$

consider all closed loop poles to lie to the left of – 0.5 in the complex plane also controller include integral action.

i) Find a particular controller satisfying these conditions.
ii) Parameterize all controllers satisfying this condition.

Q5) a) A diagonal controller C (s) is proposed to control a MIMO plant with nominal model Go (s). If C (s) and Go (s) are given by **[10]**

$$Go(s)=\begin{bmatrix}\frac{2}{(s+1)} & \frac{1}{(s+1)(s+2)}\\ \frac{1}{(s+1)(s+2)} & \frac{2}{(s+2)}\end{bmatrix} C(s)=\begin{bmatrix}\frac{2}{s} & 0\\ 0 & \frac{1}{s}\end{bmatrix}$$

Determine whether the closed loop is stable.

b) Explain in detail McMillan form with suitable example. Also explain how RMFD build for a model with procedure. **[10]**

Q6) Write short notes for **[10]**

a) Nyquist stability criterion.

b) Affine parameterization for multivariable control system.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1493 **[3865]-809**

M.E. (Instrumentation and Control)
(Biomedical Instrumentation)
BIO SIGNAL PROCESSING
(5061204-A) (2008 Course)

Time : 3 Hours] [***Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from Section - I and Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain in detail the basic elements of DSP. Also, compare between DSP and Analog Signal Processing. **[8]**

b) Find the even and odd components of the following signals: **[8]**

i) $x(t) = u(t)$

ii) $x(t)=\sin\left(\omega_0 t+\frac{\pi}{4}\right)$

iii) $x(n) = \delta(n)$

Q2) a) Determine the output response of the low-pass RC network subjected to an input $x(t) = te^{-t/RC}$ by convolution property of Fourier transform. **[8]**

b) Sketch the pole-zero plot for the transfer function

$$H(z)=\frac{1-z^{-1}-2z^{-2}}{1-1.75z^{-1}+1.25z^{-2}-0.375z^{-3}}$$ **[8]**

Q3) a) Determine the cross-correlation sequence of the following sequences using z-transform :

$x_1(n) = \{1, 2, 3, 4\}$

$x_2(n) = \{4, 3, 2, 1\}$ **[8]**

b) Sketch the signal flow graph of 8-point decimation-in-time algorithm. **[8]**

P.T.O.

Q4) Design the causal linear phase FIR filter for following specifications:

$$H_d(e^{j\omega}) = \begin{cases} e^{-j\alpha\omega}, & \omega_{c1} \le |\omega| \le \omega_{c2} \\ 0, & \text{otherwise} \end{cases}$$

ω_{c1}= 2 rad/sec, ω_{c2} = 3 rad/sec and M = 7.

Use the window functions :

a) Rectangular window
b) Bartlett window
c) Hanning window
d) Hamming window **[18]**

SECTION - II

Q5) Design a digital Chebyshev Type I filter to satisfy the conditions :

$0.707 \le |H(e^{j\omega})| \le 1, 0 \le \omega \le 0.2\pi$

$|H(e^{j\omega})| \le 0.1,\ 0.5\pi \le \omega \le \pi$

Using bilinear transformation and assuming T = 1 s. **[16]**

Q6) a) Apply the bilinear transformation to $H(s) = \dfrac{2}{(s+1)(s+3)}$ with T = 0.1s. **[4]**

b) Design a digital Butterworth filter to satisfy the conditions :

$0.9 \le |H(e^{j\omega})| \le 1,\ 0 \le \omega \le \pi/2$

$|H(e^{j\omega})| \le 0.2,\ 3\pi/4 \le \omega \le \pi$

Using bilinear transformation and assuming T = 1 s. **[14]**

Q7) a) Describe the advantages and disadvantages of modified Huffman coding. **[8]**

b) What are the various finite word length register effects? **[8]**

Q8) a) Write short note on integer filters. **[8]**

b) Compare the functional advantages of floating point and fixed point registers. **[8]**

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Total No. of Questions : 10] **[Total No. of Pages : 4**

P1496

[3865]-818
M.E. (Polymer Engg.)
PRINCIPLES OF MANAGEMENT
(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Question No. 1 from section I and question No. 6 form section II are compulsory. Attempt any other two from section - I and attempt any other two from section - II.***
2) ***Figures to the right indicate full marks.***
3) ***Answers to the two sections should be written in separate answer books.***
4) ***Use of pocket calculator is allowed.***
5) ***Assume suitable data, if required.***

SECTION - I

Q1) Discuss any four of the following concepts in short: **[20]**

a) Marketing Mix.

b) Product positioning.

c) Consumer buying behavior.

d) Concept of value chain.

e) Offering and brand.

Q2) Discuss concept of and importance of environmental scanning while crafting marketing strategies. What aspects need to be considered while scanning the environment? **[15]**

Q3) Discuss the scope and role of branding. What is brand equity? Discuss in brief concepts of brand reinforcement and brand revitalization. **[15]**

Q4) Discuss the following pricing methods **[15]**

a) Mark up pricing.

b) Target return pricing.

c) Percieved value pricing.

Q5) What is the role of marketing channels? Discuss the concept of direct marketing channels and service sector channels. **[15]**

P.T.O.

SECTION - II

Q6) Answer any four:

a) Explain the use of beta-distribution in PERT analysis. **[20]**

b) Write in short about 'profit and loss account'.

c) You want to borrow Rs. 10,80,000/– to buy a flat. You approach a housing finance company which charges 12.5% interest you can pay Rs. 1,80,000/– per year towards loan amortisation. What should be maturity period of the loan?

d) Define

i) Competitive game.

ii) Two person, zero sum (or rectangular games).

e) Write a short note on 'Return on Investment'.

Q7) a) Solve following transportation problem. **[10]**

					Available
0_1	1	2	1	4	30
0_2	3	3	2	1	50
0_3	4	2	5	9	20
Required	20	40	30	10	100

b) Determine the sales of a firm given following informing.

Current ratio : 1.4

Acid test ratio : 1.2

Current liability : 1,600

Inventory turnover ratio : 8 **[5]**

Q8) a) A shop owner places orders daily for goods which will be delivered 7 days later. ie order lead time is 7 days. On a certain day owner has 10 items in the stock. Further more, on 6 previous days, he has already placed orders, for the delivery of 2, 4, 1, 10, 11, and 5 items in that order, over each of next 6 days. Holding cost per item per unit time is Rs.0.15 shortage cost per item per unit time is Rs.0.95. Distribution requirement-over 7 day period x' is $f(x') = 0.02 - 0.0002\ x'$. How many items should be ordered for the 7^{th} day hence? **[9]**

b) Sales of a company was recorded at Rs.2,00,000/–. The variable cost and fixed cost were Rs.50,000/– and Rs.60,000/– respectively. Find break even point and margin of safety. **[6]**

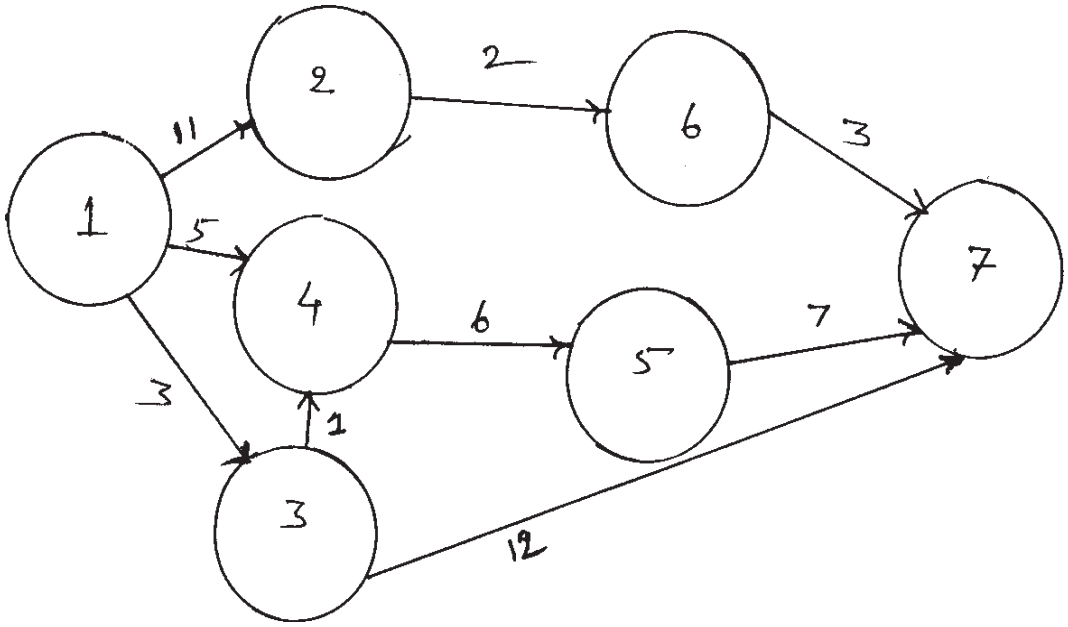
Q9) a) Two major parts P_1 & P_2 for a product require processing through six machining centers. The technological sequence of the parts on six machines and manufacturing times on each machine are

	Machine sequence	C	A	E	F	D	B
Part P_1	Time (hrs)	2	3	4	5	6	1

	Machine sequence	B	A	E	F	C	D
Part P_2	Time	3	2	5	3	2	3

What would be the optimum scheduling to minimise the total processing time for these two parts? Find also total elapsed time. For each machine specify the job that should be done first. **[8]**

b)



For the CPM network shown, find total float. **[7]**

Q10) a) A baking company sells one of it's types of cakes by weight. It makes a profit of 95 paise a pound on every pound of cake sold on the day it is baked.It disposes of all the cakes not sold on the day they are baked at a loss of 15 paise a pound. If demand is known to be rectangular between 3000 and 4000 pounds, determine the optimum amount to be baked.**[5]**

b) Find the optimal quantity of product for which the price breaks are as follows. **[7]**

Quantity	Unit cost (Rs.)
$0 < q < 500$	Rs. 10
$500 \leq q < 750$	Rs. 9.50
$750 \leq q$	Rs. 8.75

The monthly demand for the product is 200 units, storage cost is 2% of the unit cost and cost of ordering is Rs. 100.

c) Write advantages of ABC analysis. **[3]**

Total No. of Questions : 12] **[Total No. of Pages : 4**

P1497

[3865]-820

M.E. (Polymer Engineering)

SYNTHESIS AND CHEMISTRY OF POLYMERS

(509104) (2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Three samples of monodisperse Nylon 6, 6 are mixed together as follows :

20 g of A having molecular weight 60,000

10 g of B having molecular weight 50,000

5 g of C having molecular weight 40,000

Find out the poly-dispersity index of the polymer mixture. **[5]**

b) Comment on the limitations of 'end group analysis' and 'colligative property' for molecular weight. **[8]**

c) What is Mark Houwin Sakurada equation? Give its significance. **[5]**

OR

Q2) a) What is the significance of Carother's equation in the polymer field? Derive Carother's equation. **[9]**

b) What is molecular weight distribution? Enlist different methods for the determination molecular weight distribution. Explain any one method in detail. **[9]**

P.T.O.

Q3) a) Compare in detail Emulsion and Solution polymerization techniques. **[8]**

b) Explain the following polymerization techniques with suitable examples (any two). **[8]**

i) Interfacial polymerization.

ii) Melt poly-condensation.

iii) Plasma polymerization.

OR

Q4) a) Compare in detail Bulk and suspension polymerization techniques. **[8]**

b) Explain the following polymerization techniques with suitable examples (any two). **[8]**

i) Gas phase polymerization.

ii) Solid state polymerization.

iii) Group transfer polymerization.

Q5) a) Discuss the effect of i) initiator concentration, ii) temperature and iii) monomer concentration on molecular weight or degree of polymerization in case of free radical polymerization. **[8]**

b) Enlist commercially significant polymers manufactured by cationic polymerization technique. Derive the equation for kinetics of Cationic polymerisation. **[8]**

OR

Q6) a) Explain in brief the mechanisms of "Living" polymerization technique. Give it's applications. **[6]**

b) A monomer sample in storage becomes thick after eight months. Discuss the possible reasons. Suggest a remedy for the storage of this monomer in future. **[5]**

c) Enlist the various chain transfer reactions in radical polymerization. **[5]**

SECTION - II

Q7) a) Nylon 6 can be formed by two mechanisms such as ring opening and condensation. Comment on the rate of reactions, molecular weight, molecular weight distribution in both the cases. **[6]**

b) Write a short note on Polyaddition polymerization. **[5]**

c) Predict the effect of different impurities in the monomer for/addition polymer/condensation polymer. **[5]**

OR

Q8) a) A polymerization reaction is in progress. How will you know whether it is a condensation or addition polymerization? Explain. **[6]**

b) During condensation polymerization removal of by-product is essential. Justify the statement. **[5]**

c) What is functionality? Calculate average functionality in following reaction mixture : **[5]**

i) 1 mole of Melamine and 1 mole of Formaldehyde.

ii) 1 mole of Terephthalic acid and 1 mole of Ethylene Glycol.

Q9) a) Discuss the importance of solubility parameters with respect to the formation of polymer solution. **[5]**

b) Compare degradation of polymer by radiation, increase in temperature. **[5]**

c) Write down the chemical reaction involved in the synthesis of any two of the following polymers. **[6]**

i) Epoxy.

ii) Polyurethanes.

iii) Silicones.

OR

Q10) a) Write down the chemical reaction involved in the synthesis of any two of the following polymers. **[6]**

i) Phenolic resins (Either resol or Novolak)

ii) Amino resins

iii) Unsaturated polyesters.

b) Compare properties of polymeric solutions with that of solutions of low molecular substances. **[5]**

c) Calculate the quantity of di-ethylene tri-amine required to completely cross-link 100 gm of DGEBA (epoxy resin) with epoxy equivalent of 170. **[5]**

Q11) a) Describe chlorosuphonation of polymers. Give its significance. **[6]**

b) What is hydrogenation reaction? What type of catalysts are used for hydrogenation? How this reaction is used in polymer modification? **[6]**

c) Give chemical reactions for the synthesis of polyvinyl alcohol. **[6]**

OR

Q12) a) Discuss at length vulcanization reaction for rubbers with respect to its importance and types of vulcanization agents used. **[9]**

b) What is cellulose? Why is it necessary to modify cellulose? Which reactions are used to modify cellulose? Explain at least two of them with suitable examples. **[9]**

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Data :

Speed in rpm	5	15	30	50	100	300	500
Torque in N-m	1.22	1.83	2.34	2.81	3.61	5.36	6.44

b) Discuss various forces acting on the bubble of extrusion blown film process and explain the effect of melt flow instability on the process. **[8]**

Q9) a) Obtain expressions for estimating first and second normal stress differences using cone and plate rheometer. **[9]**

b) Explain the effect of temperature on viscoelastic behaviour of polymer materials. **[6]**

Q10) a) Derive an expression for the flow length of power law fluid when it is injected at constant pressure into a rectangular section channel assuming there is freezing off as the melt flows. **[10]**

b) Explain the effect of molecular weight and molecular weight distribution on viscosity. **[5]**

Q4) a) Discuss any two rheological models for extensional viscosity. **[7]**

b) Explain time temperature superposition and use of shift factor as developed by Williams, Landel and Ferry. **[8]**

Q5) a) Derive an expression for the velocity gradient tensor. Write down velocity gradient tensor for uni-axial extension. **[7]**

b) Explain : **[8]**

i) Storage modulus and loss modulus.

ii) Dynamic viscosity.

SECTION - II

Q6) Attempt any four : **[20]**

a) With suitable examples, explain the effect of first and second normal stress differences.

b) Discuss melt fracture with reference to extrusion.

c) Explain the use of Brinkman number to estimate if visions heat dissipation is important in polymer processing.

d) Calculate the pressure drop through a circular runner having 5mm radius and 100mm length. The mass flow-rate is 50gms/sec and melt density is 0.7gms/cm^3. The polymer follows power law of the form.

$$\tau = 1{,}50{,}000\ \dot{\gamma}_a^{\,0.8}$$

where shear stress τ is in N/m^2 and shear rate $\dot{\gamma}$ is in sec^{-1}.

e) Explain the concept of Activation Energy.

Q7) a) Explain the classification of rheometers. Explain how melt flow indexer can be used to generate a rheogram. **[6]**

b) Explain the constructional features of a capillary rheometer. **[5]**

c) Explain Rabinowitsch correction factor. **[4]**

Q8) a) A concentric cylinder rheometer is used to estimate the rheological behaviour of LDPE melt at 150ºC. The inner diameter of the outer cylinder is 30mm and outer diameter of the inner cylinder is 28.4mm. The height of the inner cylinder is 50mm. The inner cylinder is rotated with different speeds and the torque is measured at the outer cylinder. Determine the rheological nature of the melt and develop the power law equation for the system. **[7]**

Total No. of Questions : 10] **[Total No. of Pages : 3**

P1498

[3865]-823
M.E. (Polymer Engg.)
POLYMER RHEOLOGY
(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer Q.No.1 from section-I and Q.No.6 from section-II. Answer any other two questions from section-I and answer any other two questions from section-II.***
2) ***Figures to the right indicate full marks.***
3) ***Answers to the two sections should be written in two separate answer books.***
4) ***Use of log-log paper, pocket calculator is allowed.***
5) ***Assume suitable data, if required.***

SECTION - I

Q1) Attempt any four : **[20]**

a) What do you understand by

i) On-line and

ii) Off line rheological measurements.

b) Determine the invariants of the stress tensor T whose components are

$$T = \begin{bmatrix} 4 & 2 & -1 \\ 2 & 2 & 1 \\ -1 & 1 & 0 \end{bmatrix}$$

c) Obtain expression for velocity distribution using power law model-for flow through circular channel.

d) Explain the use of isometric and isochronous graphs.

e) What do you understand by tensile viscosity and shear viscosity.

Q2) a) Discuss turbulent flow analysis for non-newtonian fluids using : **[10]**

i) Von Karman's approach.

ii) Universal velocity profile approach.

b) Write down expression for velocity distribution for Ellis Fluids through circular channel and comment on it. **[5]**

Q3) a) Explain Bolzmann superposition principle. Explain the principle with reference to step changes of stress and continuous changes of stress.**[8]**

b) Discuss Rouse Theory and its application to polymer melts. **[7]**

P.T.O.

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1500

[3865]-831

M.E. (Polymer)

SPECIALITY POLYMER MATERIALS

(509125) (2008 Course)

Time : 3 Hours*]** **[*Max. Marks : 100

Instructions to the candidates:

1) ***Answer three questions from Section-I and three questions from Section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is mesomorphic phase? Give classification of liquid crystalline polymers. **[5]**

b) Explain as to why liquid crystalline polymers are often blended with engineering plastics? Give rheological properties of these blends. **[5]**

c) What structural features are needed in a polymer to exhibit the thermotropic liquid crystalline behaviour. **[6]**

OR

Q2) a) Enlist at least three commercially important liquid crystalline polymers and give their properties. **[6]**

b) Give synthesis of at least one liquid crystalline polymer. **[5]**

c) What is a molecular composite? How it can be made using LCP? What are the processing conditions required to make a molecular composite? **[5]**

Q3) a) Explain different ways by which a polymer can be made to conduct electricity. **[5]**

b) Give synthesis of conducting polymers. **[8]**

P.T.O.

c) Compare doping in conducting polymers and inorganic semiconductors like silicon or Germanium. **[5]**

OR

Q4) a) Explain in brief the theory of conduction in conducting polymers. **[6]**

b) Explain the following terms : **[6]**

i) Soliton

ii) Polaron

iii) Bipolaron

c) Give various applications of conducting polymers. **[6]**

Q5) a) Draw structure of PEEK, PPO and polyetherimide. Give synthesis and applications of any one of them. **[8]**

b) What structural features are needed in a polymer to withstand high temperatures in excess of 200^{o}C? Explain them briefly. **[8]**

OR

Q6) a) Compare properties of PEEK and polyimides. **[8]**

b) Enlist the various parameters by which the heat resistance of a polymer can be measured? Describe an experimental technique to measure heat resistance of a polymer. **[8]**

SECTION - II

Q7) a) In what way membrane separation is different from ordinary filteration? Describe various physico-chemical factors which can be used to introduce permselectivity in polymers. **[8]**

b) Give various methods for manufacturing membranes. **[8]**

OR

Q8) a) Write a short note on ion-exchange resin membranes and their applications. **[8]**

b) What is reverse osmosis? Which materials will you use for membranes used for desalination? Give design features. **[8]**

Q9) a) Write structures of polycaprolactum, polylactic acid poly-hydroxybuteric acid. How biodegradability can be built in a polymer? **[8]**

b) Write a short note on the applications of biopolymers in following areas:

i) tissue engineering.

ii) drug delivery.

iii) orthopaedic prosthesis and dental applications. **[10]**

OR

Q10)a) How synthetic biopolymers are made? Explain with two case studies. **[9]**

b) How polymers are used for controlled release of pesticides? Why plastic pipes are preffered in agriculture? **[9]**

Q11)a) Write a short note on : **[8]**

Polymeric materials used in communication systems.

b) What is polymer impregnated concrete? Give approximate composition for the same. **[8]**

OR

Q12)a) Give mathematical aspects of Flory Hygins theory relevent to polymeric blends. **[8]**

b) How polymer blends are designed? Enlist at least two important commercial blends and give their applications. **[8]**

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Total No. of Questions : 6] **[Total No. of Pages :2**

P1502

[3865]-836
M.E. (Printing Engg. & Graphic Communication)
PRINTING TECHNOLOGY MANAGEMENT
(2008 Course) (508102)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections must be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, wherever necessary.***

SECTION - I

Q1) Answer the following:

a) Explain function & Scope of production department. **[9]**

b) Explain the types of Production. **[9]**

c) The following data gives the sales of the company for various years. Fit the straight line forecast the sales for the year 2010 & 2011 **[7]**

Year	Sales(000)
2001	13
2002	20
2003	20
2004	28
2005	30
2006	32
2007	33
2008	38
2009	43

Q2) Answer the following:

a) Explain different stage of process design. **[10]**

b) Describe the steps involved in SLP Procedure. **[15]**

Q3) Answer the following:

a) Describe the classification of forecasting methods. **[9]**

P.T.O.

b) Estimate the sales forecast for the year 2000, using exponential smoothing forecastor. Take $\alpha = 0.5$ & the forecast for the year 1995 as 160×10^5 units. Compare the forecast with least square method. **[16]**

year	2005	2006	2007	2008	2009
sales Rs. ($X10^5$)	180	168	159	170	188

SECTION - II

Q4) Answer the following:

a) Explain the types of inventories. **[8]**

b) Derive the deterministic Economic order quantity model. **[8]**

c) The demand for an item is uniform at the rate of 25 units/month ordering cost is Rs.30 & cost per unit is Rs.2 per unit. Inventory carrying cost is Rs, 0.5 per unit per month & if shortage cost is Rs.0.3 per unit per month. Determine Economic Order Quantity & how often to make production run. **[9]**

Q5) Answer the following:

a) Explain specification of Quality & Quality Assurance. **[10]**

b) Explain the implementation of six sigma concept in printing Industry. **[8]**

c) A subgroups of 4 items is taken from the manufactured items. After 20 subgroups the values of $\overline{X}$ & R were found out to be $\Sigma\overline{X} = 350$ & $\Sigma R = 8.5$. The specification limits for the part are 17.5 ± 0.23. Assuming the process is in control, what conclusion would you draw about the ability of the process to produce the items within the specified limits. **[7]**

Q6) Answer the following:

a) A double sampling plan is as follows select a sample of 2 from a lot of 20. If both the articles inspected are good, accept the lot. If both are defective reject the lot. If one is good & one is defective take a second sample of one article. If the article in a second sample is good, accept the lot. If it is defective reject the lot. If the lot with 20% defective is submitted what is the Probability of acceptance of the lot? Compute by method that is theoretically correct & approximate method. **[13]**

b) For the following data calculate sample size & AOQ for single sampling plan. Data given as **[12]**

i) Probability of acceptance for 0.4% is 558.

ii) Lot size = N = 10,000 units.

iii) Acceptance number = C = 1.

iv) NP = 1.5.

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1504

[3865]-839

M.E. (Printing Engineering and Graphic Communication)

PRINTING AND PACKAGING MATERIALS

(508104 (Elective - I(b)) (2008 Course) (New)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain materials used for pre-press films, plates, chemicals and light sources. **[13]**

b) Discuss various chemicals used for making Gravure Cylinders. **[12]**

Q2) a) Discuss various types and properties of papers used for printing and packaging. **[10]**

b) Explain the process associated with manufacturing of B.O.P.P. film. **[10]**

c) Write a short note on Ink and Paper interaction. **[5]**

Q3) a) Explain the method to identify HDPE, LDPE, LLDP and PP by density measurement. **[10]**

b) Explain burning tests used for HDPE, LDPE, PP, PET and PA materials. **[15]**

P.T.O.

SECTION - II

Q4) a) Explain various types of vehicles used in printing process. **[9]**

b) Explain the composition of Newsprint Ink. **[8]**

c) What is dyne level? Give the range of dyne level for good printability. **[8]**

Q5) a) How packaging materials is selected for printing applications? **[15]**

b) What is the importance of COF while films are moving on the machine? **[10]**

Q6) a) Explain different values of viscosity used for Offset, Flexo, Gravure and Screen printing. **[9]**

b) What is Scotch Tape Test? How this test is used to decide printability? **[8]**

c) Explain process involved in testing of ink supplied for printing applications. **[8]**

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Total No. of Questions : 6] **[Total No. of Pages : 3**

P1505

[3865]-840

M.E. (Printing Engineering and Graphic Communication)

DESIGN OF EXPERIMENTS & RESEARCH METHODOLOGY

(508104 C) (2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Answer the following :

a) What do you mean by research? Explain its significance of research. **[9]**

b) Describe the different types of research. **[8]**

c) Distinguish between Research methods & Research Methodology. **[8]**

Q2) Answer the following :

a) Explain the characteristic of research which uses scientific method. **[9]**

b) How do you define research problem? Give one example to illustrate your answer. **[8]**

c) What is hypothesis? What are desirable qualities of good hypothesis? **[8]**

Q3) Answer the following :

a) Explain process of formulation of model based on simulation. **[13]**

b) Find the diameter & height of a cylinder of max volume which can be cut from a sphere of radious 12 cm. **[12]**

P.T.O.

SECTION - II

Q4) Answer the following :

a) Describe experiment design procedure steps & product design procedure. **[8]**

b) Describe feature of response surface design. **[8]**

c) A randomized block design was used to compare seven varieties of guayule, a Mexican rubber producing plant, with respect to yield of rubber. The varieties are distinguished by the no. 109, 130, 405, 406, 407, 416 & 593. These were planted in five blocks of seven plots each. One plant was selected at random from each plot & rubber obtained from it weighted. The layout of the design was as follows, the figure in brackets shows the yield (in grams) **[9]**

	1	2	3	4	5	6	7
1	2.06	2.53	2.96	1.46	6.85	6.65	4.66
2	4.07	5.92	1.85	4.06	4.35	9.27	5.00
3	6.29	5.20	6.42	2.03	7.77	2.59	3.88
4	4.43	6.84	6.49	5.41	6.71	6.46	6.12
5	7.66	7.35	8.11	7.30	0.48	6.64	5.82

Q5) Answer the following :

a) Explain the term data & need of data calculation. **[12]**

b) Table contains the sales data for the soft drinks each flavour was assigned to five localities for test marketing & the no. of cases sold per 1000 population during the study period was recorded for each locality.**[13]**

Flavour

		Colourless	Pink	Orange	Green
Locality	1	26.5	31.2	27.9	30.8
	2	28.7	28.3	25.1	29.6
	3	25.1	30.8	28.5	32.4
	4	29.1	27.9	24.2	31.7
	5	27.2	29.6	26.5	32.8

Q6) Answer the following :

a) What are steps involved in report writing? **[8]**

b) What are the factors to evaluate the research report? **[8]**

c) Discuss in brief various types of research report. **[9]**

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Total No. of Questions : 8] **[Total No. of Pages : 1**

P1506

[3865]-842
M.E. (Printing)
ENTREPRENEURSHIP IN PRINTING AND ALLIED FIELDS
(2008 Course) (508105 (B))

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Explain with case study the entrepreneurship in Printing Industry. **[25]**

OR

Q2) Explain in detail the supervisory structure in Printing Industry. **[25]**

Q3) Explain the office routine functional and planning aspects in running a Printing Press. **[25]**

OR

Q4) Explain with case study the workflow management in Printing Industry. **[25]**

SECTION - II

Q5) Explain in detail the procedure for selling, estimating & quoting printing work. **[25]**

OR

Q6) Explain the methods to establish production standards in printing. **[25]**

Q7) Explain in detail the market study and market research. **[25]**

OR

Q8) Explain in detail the legal aspects in commerical printing process. **[25]**

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1509

[3865]-845

M.E. (Printing Engineering and Graphic Communication)

WEB HANDLING ON PRESS

(508109) (2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain splicing mechanism of web on Gravure, Flexo and Offset machines. **[15]**

b) Explain the concept associated with video viewing. Explain its working. **[10]**

Q2) a) What is Carona Treatment? **[10]**

b) Explain formulation of Dyne-level checking chemical. **[8]**

c) Explain the principle of operation of flame treatment. **[7]**

Q3) a) Explain the basic principle of M.D. Registration Control. **[15]**

b) Discuss limitations of Automatic Registration Control. **[10]**

SECTION - II

Q4) a) Discuss basic operating principle of unwinding tension control. **[9]**

b) Explain Lateral and Circumferential tension control. **[8]**

c) Explain the function of spreader roller. **[8]**

P.T.O.

Q5) a) How imbalance of rollers affects the print quality in printing? **[15]**

b) Explain the basic principle of operation of static and dynamic balancing. **[10]**

Q6) a) What is wrap angle? What are the effects of wrap angle on web? **[10]**

b) Explain the deciding factors for outer diameter of transport roller. **[8]**

c) Discuss – Deflection of Web guide Roller. **[7]**

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Total No. of Questions : 6] **[Total No. of Pages :2**

P1510

[3865]-848

M.E. (Printing)

TOTAL PRODUCTIVE MAINTENANCE IN PRINTING

(508111B) (2008 Course)

Time : 3 Hours*]** **[*Max. Marks : 100

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Define TPM. Explain in brief need and objectives of TPM. **[10]**

b) Explain the stages of implementing TPM in Printing Industry. **[15]**

Q2) a) Explain in detail QA, QX and QM matrix. **[15]**

b) Explain the different types of maintenance. **[10]**

Q3) a) Explain Autonomous maintenance in detail. **[15]**

b) Explain Pareto Analysis. **[5]**

c) Explain methods of waste minimisation. **[5]**

SECTION - II

Q4) a) Explain Lubricant Analysis. **[15]**

b) Explain different methods to increase life span of spare parts. **[10]**

P.T.O.

Q5) a) Explain statistical process control in Printing Industry. **[10]**

b) Explain capability analysis of offset Printing Machine. **[15]**

Q6) a) Explain the concept of Logistics in detail. **[15]**

b) Explain the supporting pillars in detail. **[10]**

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Total No. of Questions : 12] **[Total No. of Pages : 4**

P1513

[3865]-827

M.E. (Polymer)

POLYMER STRUCTURE & PROPERTIES

(509123) (2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer 3 questions from Section I and 3 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the effect of following structural feature on the hindrance potential or potential barrier for rotation. **[6]**

i) chain length of a substituent.

ii) presences of a double bond.

iii) unsymmetrically arranged halogen.

b) Explain in brief, how the chemical composition affects the following properties : **[8]**

i) Flammability

ii) Charring

iii) Moisture absorption

iv) Wheatherability

c) Why isotactic PP has higher tensile strength atactic PP? **[4]**

Q2) a) Why rubbers are flexible? Justify on the basic of chain flexibility. **[6]**

b) Derive an expression to determine end to end distances of polymer chain in terms of khun segment. **[6]**

c) Discuss the effect of VanderWaals forces, dipolar interaction and hydrogen bonding on the mechanical and thermal properties of polymer molecules. **[4]**

P.T.O.

Q3) a) Discuss the structure (state) of a polymer chain in dilute solution. How the solute solvent interaction affect chain length in dilute solution? **[6]**

b) Explain the formation of spherulite morphology as the polymer melt is cooled. **[6]**

c) Differentiate between fibrillar crystals and single crystals. **[4]**

Q4) a) Which techniques are available for the investigation of polymer structure? Explain Electron microscopy method with neat sketch. **[6]**

b) Explain effect of orientation on properties of polymer with examples. **[6]**

c) Discuss "Shish Kebab" morphology in the Polyethylene. **[4]**

Q5) a) What is the meaning of Broad Molecular Weight distribution and Narrow Molecular Weight distribution with reference to polymers? How it can be determined? Which one of them will be more suitable for Blow Molding? Why? **[7]**

b) Discuss a method for determining the glass transition temperature of a polymer composite. **[4]**

c) Write a short note on morphology and its relation to end properties in case of a polymer blend. **[7]**

Q6) a) Polymer processing is easy with a polymer of low molecular weight, while the end properties are best at high molecular weight, justify this statement. Is it possible to achieve this in practice? If your answer is yes, then cite an example where it is done? **[8]**

b) What are molecular weight requirement for process

i) Thermoforming

ii) Injection molding

iii) Extrusion

iv) Calendaring

Justify your answer. **[6]**

c) Which one of the following is difficult to process? **[4]**

i) thermoplastic A sample with narrow molecular weight distribution.

ii) thermoplastic B sample with broad molecular weight distribution.

(Polymer sample "A" and polymer sample "B" has same average molecular weight and chemical composition) why?

SECTION - II

Q7) a) Explain the various factors that affect the flexibility of a polymer chain, with suitable examples. **[8]**

b) How presence different functional groups in a monomer affect the glass transition temperature of a polymer made from it? **[8]**

OR

Q8) a) What is the effect of polar group on the end properties (such as tensile strength, solution viscosity melt viscosity and adhesion) of a polymer? Discuss with suitable examples. **[8]**

b) Melt viscosity of Polyvinyl Fluoride is more than that of polyethylene of the same MW, MWD. Explain it on the basis of molecular interactions. **[8]**

Q9) a) Define fracture. State type of fracture. Discuss effect of the molecular chain mobility on the fracture (mechanical failure) in case of polymers. **[8]**

b) Discuss the effect of molecular flexibility on any two of the following : **[8]**

i) Refractive index

ii) Angle of loss tangent (tan δ)

OR

Q10) a) Discuss the mechanism and kinetics of crystallization in brief. **[8]**

b) Explain crystallizability of polymer and state and explain factor affecting it. **[8]**

Q11) a) How will you use the information pertaining to the Glass transition temperature (Tg) and melting temperature (Tm) to set machine parameters for any one of the following processes : **[6]**

i) Thermoforming

ii) Injection molding

iii) Extrusion

iv) Calendaring

b) Discuss the effect of crystallinity on the (i) Impact strength, (ii) Melting point, (iii) Hardness. **[6]**

c) What is the effect of presence of a polar group in the repeat unit of polymer' on thermal properties, decomposition temperature and combustibility? **[6]**

OR

Q12) a) Explain the development of crystallinity in course of (during) the following processes : **[6]**

i) Injection molding

ii) Extrusion of film

iii) Thermoforming

b) Enlist and explain various factors which influence the electrical properties of a polymer. **[6]**

c) Explain the thermodynamic aspects of polymer crystallization. **[6]**

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Total No. of Questions : 10] **[Total No. of Pages : 5**

P1514

[3865]-828
M.E. (Polymer Engineering)
PROCESSING AND MECHANICS OF COMPOSITES
(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Question No.1 from Section I and Q.No.6 from Section II are compulsory. Answer any other two questions from Section I and any other two from Section II.***
2) ***Figures to the right indicate full marks.***
3) ***Use of scientific calculator, log-log graph paper is allowed.***
4) ***Assume suitable design data, if required.***
5) ***Answers to the two sections should be written in separate answer books.***

SECTION - I

Q1) Attempt any Four : **[20]**

a) State Maximum Stress Theory of failure for orthotropic material.

b) Give limitations and constraints imposed on poisson's ratio for orthotropic material.

c) Discuss compaction and resin flow during antoclave cure.

d) Derive an expression for shear modulus G_{12} for an orthotropic material.

e) Write in short about extended chain polyethylene fibers and boron fibers.

Q2) a) Discuss applications, basic processing steps, methods of applying heat & pressure, advantages and disadvantages of resin transfer moulding process. **[10]**

b) For anisotropic composite materials, show that stiffness matrix is symmetric and $C_{ij} = C_{ji}$. **[5]**

Q3) a) Discuss applications, basic processing steps, methods of applying heat and pressure, advantages and disadvantages of wet lay-up and prepeg lay-up process. **[10]**

b) Discuss the significance of invariant properties of an orthotropic lamina. **[5]**

P.T.O.

Q4) a) A Unidirectional lamina has fibers inclined at 45° to *x*-axis. The engineering constants for the lamina are -

E_{11} = 145 GPa E_{22} = 12 GPa

G_{12} = 6 GPa and Poisson's ratio ν_{12}= 0.3

Failure strength in tension for direction 1 = 1500 MPa
Failure strength in compression for direction 1 = 1200 MPa
Failure strength in tension for direction 2 = 50 MPa
Failure strength in compression for direction 2 = 250 MPa
Failure strength in shear = 70 MPa

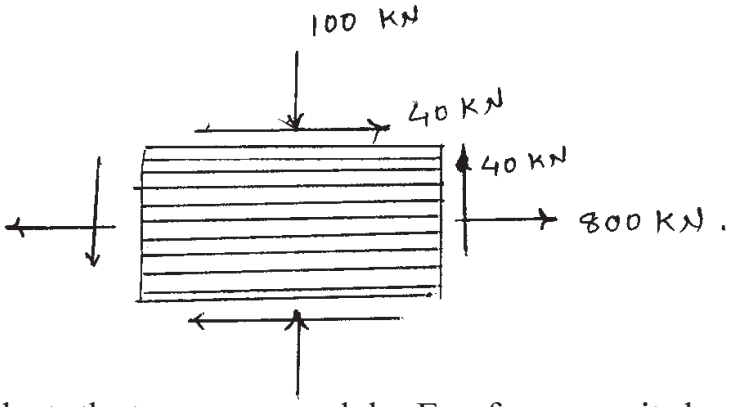
Determine off axis positive and negative shear strengths using Tsai-Hill criteria. **[7]**

b) A Unidirectional lamina is subjected to a stress system as shown in fig. The engineering constants are –

E_{11} = 150 kN/mm^2 E_{22} = 12 kN/mm^2

G_{12} = 6 kN/mm^2 ν_{12}= Poisson's ratio in 1-2 direction = 0.3

Failure strength in tension for direction 1 = 1550 N/mm^2
Failure strength in compression for direction 1 = 1150 N/mm^2
Failure strength in tension for direction 2 = 60 N/mm^2
Failure strength in compression for direction 2 = 240 N/mm^2
Shear strength = 75 N/mm^2
Using Tsai-Wn theory, check the safety. **[8]**



Q5) a) Evaluate the transverse modulus E_{22} of a composite lamina with following properties.

E_{2f} = 14.8 GPa Poisson's ratio of matrix = ν_m = 0.36

E_m = 3.45 GPa

Volume fraction of fiber = V_f = 0.65

Determine E_{22} by strengths of materials approach and Halpin-Tsai relationship. Assume, E_1, measure of reinforcement of composite as 1. **[5]**

b) Following are engineering constants of orthotropic lamina.

E_{11} = 145 GPa
E_{22} = 12 GPa
G_{12} = 6 GPa
Poisson's ratio = ν_{12} = 0.25

For ply angle of $\theta = 45°$, calculate transformed reduced stiffness matrix. **[5]**

c) Determine Poisson's ratio ν_{xy} at an angle $\theta = 30°$ with the fiber direction for a material with following properties.

$$\frac{E_{11}}{E_{22}} = 3 \qquad \frac{G_{12}}{E_{22}} = 0.5 \qquad \nu_{12} = 0.25$$ **[5]**

SECTION - II

Q6) Attempt any Four : **[20]**

a) Give force and moment resultants in matrix form for single layered generally orthotropic laminate.

b) Give laminate stiffnesses for single layered specially orthotropic laminate and write force and moment resultants.

c) Give the governing vibration differential equations for laminated plates.

d) Discuss regular symmetric angle ply laminates and explain why element A_{16} & D_{16} of extension and bending stiffness matrices can be quite small compared to other A_{ij} and D_{ij} respectively.

e) Give the governing differential equations for buckling in case of laminated plates.

Q7) a) A laminate of [0 | $\pm$ 45° | 90°]s lay up is loaded under in plane biaxial loading such that

N_x = 2 No, N_y = 4 No, N_s = 0

where N_x and N_y are force per unit width in *x* & *y* direction. N_s is in plane shear force per unit width. The midplane strains obtained due to loading were –

$\in {}^{o}x = 2.6 \times 10^{-3}$
$\in {}^{o}y = 10.2 \times 10^{-3}$
$\in {}^{o}s = 0$

Determine poisson's ratio, ν_{xy}. **[8]**

b) The stiffness matrix for a glass-polymer composite is given by

$$[c] = \begin{bmatrix} 160 & 5.5 & 5.5 & 0 & 0 & 0 \\ 5.5 & 15 & 7.2 & 0 & 0 & 0 \\ 5.5 & 7.2 & 15 & 0 & 0 & 0 \\ 0 & 0 & 0 & 3.5 & 0 & 0 \\ 0 & 0 & 0 & 0 & 4.5 & 0 \\ 0 & 0 & 0 & 0 & 0 & 4.5 \end{bmatrix}$$

The composite material is fully restrained. The coefficient of thermal expansions in principle material directions 1, 2 & 3 are –

$\alpha_1 = 6.34 \times 10^{-6}$ / °C

$\alpha_2 = 23.3 \times 10^{-6}$ / °C

$\alpha_3 = 23.3 \times 10^{-6}$ / °C

Calculate the changes in stresses. **[7]**

Q8) a) An E glass-polyester composite laminate comprising of woven cloth, CSM and woven roving plies are required to support a tensile load. The particulars of plies are given below.

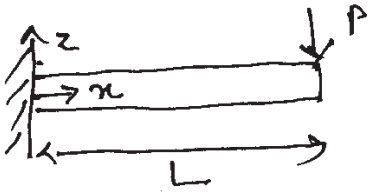
Woven cloth	CSM	Woven Roving
F_{WC} = 125 MPa	F_{CSM} = 50 MPa	F_{WR} = 165 MPa
E_{WC} = 10 GPa	E_{CSM} = 6.5 GPa	E_{WR} = 9.5 GPa
Thickness = 2 mm	Thickness = 7 mm	Thickness = 3 mm

Calculate

i) Elastic modulus per unit width of composite laminate. **[10]**

ii) Maximum load carrying capacity of the laminate in tension per unit width of the laminate.

b) Derive an expression for bending of a laminated cantilever beam under tip loading. **[5]**

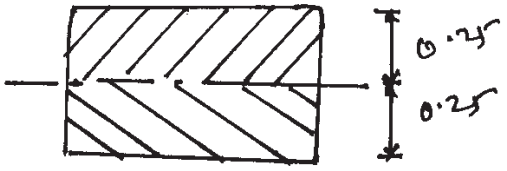


Q9) a) A [$\pm$ 45]s laminate has individual ply thickness of 0.25 mm. Engineering properties are –

E_{11} = 145 GPa E_{22} = 10.5 GPa and

G_{12} = 7.5 GPa ν_{12} = 0.28.

Calculate [A], [B] & [D] matrices. **[9]**



b) Discuss with reference to elements of extensional, coupling and bending stiffness matrices regular symmetric cross ply laminate. **[6]**

Q10) a) Discuss assumptions of classical lamination theory and obtain expression for force and moment resultant in terms of extensional coupling and bending matrices. **[10]**

b) Explain what is meant by : **[5]**

i) Balanced laminates.

ii) Hybrid laminates.

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Total No. of Questions : 6] **[Total No. of Pages : 4**

P1519

[3865]-835

M.E. (Printing Engineering and Graphic Communication)

PROBABILITY, STATISTICS AND QUEUEING THEORY

(2008 Course) (508101)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data wherever necessary.***
5) ***Use of Electronic Calculator is permitted.***
6) ***Use of Statistical Data tables is permitted.***
7) ***Figures on right indicate marks.***

SECTION - I

Q1) a) Two shooters have probability of accurate hit as 0.85 and 0.95 respectively. Prepare two separate tables showing the probability distribution of number of accurate hits if each one of them tries 5 shots. Draw the cumulative graphs. **[10]**

b) If average rate of arrival of customers per hour is x = 6;

i) Find the probability of arrival of 8 customers in a particular hour.
ii) For continuous monitoring, what is the probability of having the 4^{th} hour in sequence to be the second case of 4 customers in an hour?
iii) If x becomes 7, what is probability of having 15 customers in two hours? **[9]**

c) A job can be done on an average in 4 days. The time requirement follows exponential distribution. **[6]**

i) What is the probability of completing job within 3 days?
ii) What is the probability of not completing the job before 4 days?

Q2) a) In a hospital, the recovery chance with medicine 'X' is 60%. If 200 patients are given the medicine 'X';

i) What is the probability of recovering more than 50 patients?
ii) What is the probability of recovering between 30 to 50 patients?
iii) What is the probability of recovering less than 40 patients? **[8]**

P.T.O.

b) The chosen populations in following conditions are normally distributed : **[12]**

i) $(\mu + 1\sigma) = 300$ and $(\mu - k\sigma) = 200$. Area under the curve between them is 0.5004. Find the point above which the are under the curve is 0.063.

ii) Mean length of 5 sticks is 50cm with standard deviation of 3cm. What are the chances of having the mean length of next 5 sticks more than 53cm?

iii) The area under the curve between 'r' standard deviations on both sides of mean is 0.34. Area under the curve between r^{th} standard deviation and m^{th} standard deviation is 0.2. Find all possible values of m. Round the answer to nearest 3^{rd} decimal.

c) Find the limits of the ratio of two population variances. Both the populations are normally distributed. The sample sizes are $n_1 = 13$ and $n_2 = 16$. The sample standard deviations are $S_1 = 20$ and $S_2 = 22$. $\alpha = 0.1$ **[5]**

Q3) a) The data given below shows amount of dissolved salts at given temperature. **[13]**

Dissolved salt (%)	31.5	32	34.3	35.1	37.2	38.7	39.3	40.1	41.5
Temperature (Celsius)	20	25	30	35	40	45	50	55	60

i) Fit a linear regression model and provide the ANOVA.

ii) Will the salt dissolve at 0 degree Celsius according to the model?

iii) Estimate the amount of dissolved salts at 42 degrees Celsius.

iv) Find the residual at 35 degrees Celsius.

b) The car type and its fuel efficiency were studied based on its running. **[12]**

Fuel efficiency (kmpl)	14.3	15.6	14.9	15	14	14.2	13.5	13	14.2
Car type	Small	Small	Small	Small	Sedan	Sedan	Sedan	Sedan	Sedan
Running (km)	85000	70000	81000	75000	80000	80000	83000	87000	81000

i) Fit the linear regression model and provide the ANOVA table.

ii) Comment on the type of car and the fuel efficiency.

iii) What will be the fuel efficiency of small car after 87000km?

SECTION - II

Q4) a) Number of defectives in sample size of 40 is given in the table. There are 24 samples taken. Draw a control chart for fraction defectives. **[10]**

Sample No.	Defectives		Sample No.	Defectives
1	5		13	5
2	6		14	5
3	7		15	7
4	8		16	2
5	4		17	3
6	6		18	7
7	7		19	6
8	3		20	3
9	8		21	5
10	9		22	8
11	4		23	9
12	6		24	4

b) A product must survive 50 minutes below water level at 1m depths. The product life in these conditions is normally distributed. A batch of product has standard deviation of 3 min for survival time. If 36 samples are to be chosen for acceptance sampling test, draw an OC curve, which will indicate the acceptance probabilities for different amount of mean survival time. Also find the probability of acceptance of batch if mean survival time is 49 min. **[9]**

c) The acceptance scheme for metal parts is to drop them from a predetermined height and accept the batch if less than 3 out of 50 randomly chosen parts break. Find the probability of accepting the whole batch if the average probability of survival of a metal part from this test is 0.97. **[6]**

Q5) a) Prepare ANOVA for the output shown in following table. There are two factors considered for the output. Factor A has 4 levels and B has 3 levels comment on the effectiveness of individual factor and the interaction. Each combination of factor level has two output readings separated by comma in single cell. Comment on the findings. **[11]**

Factor A's levels	Factor B's levels		
	1	2	3
1	20,24	31,29	25,24
2	27,24	28,28	25,23
3	17,21	26,23	23,24
4	21,24	24,25	23,22

b) For 2^k factorial experiment with 5 factors (A, B, C, D, E), prepare a quarter factorial design. Provide any one block. The interaction 'ABCE' is not important however the individual factors are important. Provide the list of alias for the main effects. What is the resolution of design that you have chosen? **[14]**

Q6) a) Explain the queueing theory and Kendall's notations. What are Little's formulae? **[13]**

b) For a fast food counter, the time of serving is 1.5 minutes per customer. The customers arrive at rate of 30 per hour. The queue model is M/M/1.

i) What is the queue length at any given time?

ii) What will be the queue length if the arrival rate is reduced by (1/3) of the original?

iii) If the serving time is increased by 15sec., and the waiting time for the customer is considered as Rs.2 per min.; what will be the loss per customer? **[12]**

Total No. of Questions : 8] **[Total No. of Pages : 4**

P1520

[3865]-752
M.E. (Computer Science and Engineering - IT)
APPLIED ALGORITHMS
(2008 Course) (514421)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) If $f(n) = a_m n^m + a_{m-1} n^{m-1} + \ldots\ldots\ldots + a_1 n + a_0$, then prove that $f(n) = O(n^m)$, assume that m is of fixed size. **[4]**

b) Prove by contradiction : There exist two irrational numbers x and y such that x^y is rational. **[6]**

c) Write a recursive relation for the following function and solve the same :

```
int fib (int n)
{
    if (n < 2)
       return (n);
    else
       return (fib (n – 1) + fib (n – 2));
}
```
[8]

Q2) a) Interpret the following equations : **[4]**

i) $2n^2 + \Theta(n) = \Theta(n^2)$

ii) $2n^2 + 3n + 1 = 2n^2 + \Theta(n)$

b) Solve the recurrence : **[6]**

$t_n = n$ ..... if $n = 0$, 1 or 2.

$= 5t_{n-1} - 8t_{n-2} + 4t_{n-3}$ ..... other wise

c) Write a recursive binary search algorithm. Determine its time complexity. **[6]**

P.T.O.

Q3) a) Write an algorithm for finding Hamiltonian cycle in an undirected graph. How do you claim that, this algorithm is probabilistically good algorithm? **[8]**

b) What is minimum spanning tree? Why we need it? What are the applications of minimum spanning trees? **[8]**

Q4) a) Prove that the worst case behavior of Kruskal's algorithm is O (|E| log |E|). **[8]**

b) Consider the algorithm for MAX-HEAPIFY used in heap sort algorithm. : **[8]**

```
MAX-HEAPIFY (A, i)
{
    l = LEFT (i);
    r = RIGHT (i);
    if (l < = heap _ size [A] and A [1] > A [i])
        then largest = 1;
    else
        largest = i;
    if (r < = heap _ size [A] and A [r] > A [largest])
        then largest = r;
    if (largest ! = i) then
        exchange A [i] and A [largest];
        MAX-HEAPIFY (A, largest);
}
```

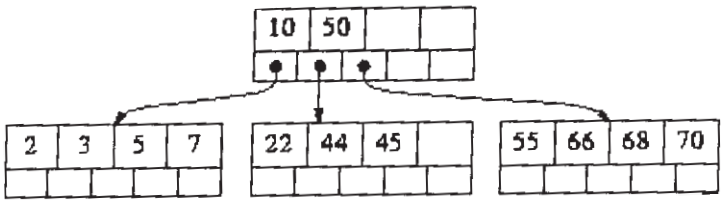
Determine the time complexity of this algorithm.

SECTION - II

Q5) a) Write Graham's scan algorithm for solving convex hull problem? What is the running time of this algorithm? **[8]**

b) Prove that computing the convex hull of n given points in the plane needs Ω (n lg n) time. **[8]**

Q6) a) What is B-tree? Consider the following B-tree with M = 5, so each node other than the root must contain between 2 and 4 values. **[8]**



Show stepwise process of inserting 17,6,21 and 67 to this tree.

b) Define the following terms : **[8]**

i) Absolute approximation of algorithm.
ii) ε (epsilon) approximation of algorithm.
iii) Polynomial time approximation of algorithm.
iv) Approximation ratio.

Q7) a) Consider the following algorithm for vertex cover problem : **[8]**

```
Alg _ Vert _ Cov (G)
{
        // G is an input graph
        // E [G] is an edge set of the graph
        // C contains vertex cover being constructed
        // E' is to maintain copy of an edge set
        C = Ø; // Null set
        E' = E [G];
        while (E' is not empty)
        {
           let (u, v) be an arbitrary edge of E';
           C = CU {u, v};
           Remove from E' every edge incident on either u or v;
        }
           return (C);
}
```

Prove that this is a polynomial time 2-approximation algorithm.

b) Solve the following program by linear programming : **[8]**

Maximize :

$Z = x_1 + 9x_2 + x_3$

Subject to :

$x_1 + 2x_2 + 3x_3 \leq 9$

$3x_1 + 2x_2 + 2x_3 \leq 15$

Where all the variables are non negative.

Q8) a) What is the basic difference between approximate algorithm and heuristic algorithm? **[2]**

b) What is the basic problem in CRCW PRAM, when more than one processor tries to write in the same cell? How it can be overcome? **[4]**

c) When do you claim that a parallel algorithm is work optimal? Briefly explain. **[4]**

d) Write a complete parallel algorithm for evaluating simple arithmetic expression. **[8]**

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1521

[3865]-731

M.E. (Petroleum Engineering)

NUMERICAL METHODS AND SIMULATION IN PETROLEUM ENGINEERING

(2008 Course) (New) (512101)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answers to the two sections must be written in separate answer books.***
2) ***Answer two questions from each section.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams should be drawn wherever necessary.***
5) ***Use of a non-programmable calculator is allowed.***
6) ***Assume suitable data if necessary and clearly state it.***

SECTION - I

Q1) a) For the following system of equations, find x, y, z using SOR, LUD decomposition, and Gauss Jordon method. $w = 1.1$

$$x + y + z = 3$$

$$2x + 3y + z = 4$$

$$x - y + z = 3$$

b) What is a banded matrix and a diagonal dominant matrix. **[25]**

Q2) Solve the following system of equations by Newton Raphson method and iterative methods. **[25]**

$$x^2y + x^2y = 54$$

$$\sin(x^2y) + xy = \cos y$$

Q3) Solve $y' = xy + \cos(x) + 7$, $y(1) = 2$, using Heun, RK-5 and Adam Bashforth predictor corrector method. $h = 0.2$. **[25]**

SECTION - II

Q4) Given a 1 D reservoir. Find the pressures in the interior of the reservoir, if the pressures are at 50 psi for one well and 6000 psi at the other well, both at each boundary. Length of the reservoir are 400ft. Assume delx = 100ft. Pi = 6000psi. Solve by explicit, Crank-Nicolson and implicit method. Only set up the matrix. **[25]**

Q5) Derive the IMPES method formulation for a black oil reservoir. **[25]**

Q6) Write a detailed Essay on Reservoir Simulation and history matching. **[25]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1522

[3865]-589
M.E. (E & T/C) VLSI & Embedded Systems
ANALOG AND DIGITAL CMOS IC DESIGN
(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are different wire and device parasitics? Explore in detail. How do these put limitations on the design with CMOS? **[8]**

b) Design CMOS logic for F = ABC (D + E) + FG. Does your schematic suffer from body effect? If yes then what is solution? Compute active area on chip. **[8]**

Q2) a) Design a simple current sink using single MOSFET for 10μA. What is its output resistance? Modify this sink to cascode. Compute output resistance. **[8]**

b) What are the characteristics of band gap reference? Explore the block diagram of BGR. List the performance parameters and their typical values. **[8]**

Q3) a) Design CMOS differential amplifier for voltage gain of 40dB. Comment on ICMR. **[8]**

b) What are the techniques used in Micro Power opamp? **[8]**

Q4) Write short notes on any three : **[18]**

a) Low noise opamps.

b) λ Parameter and layout design.

c) Transmission gate, its applications, merits & demerits.

d) Domino logic & its applications.

P.T.O.

SECTION - II

Q5) a) Certain CMOS logic operates at supply of 2.5 volt and load of 1nF. If the constraint on power dissipation is 1mW maximum, at what speed/ frequency maximum will this logic operate? What are the techniques to increase speed of CMOS logic? **[8]**

b) What is feature size? What is meant by technology scaling? What are its types? Explore the advantages & challenges being faced while CMOS design because of scaling? **[8]**

Q6) Draw FSM state diagram and write VHDL code for 10001 Moore sequence detector. Write test bench for it. What are merits and demerits of synchronous design? **[16]**

Q7) a) What is meant by metastable state of logic? What are its causes? What are remedies to nullify? Explore with suitable schematics. **[8]**

b) How is hazard different than glitch? Draw the hazardious combinational logic and redesign it so as to eliminate hazard? **[8]**

Q8) Write short notes on any three : **[18]**

a) Advance trends in logic circuits.

b) Buffered opamp.

c) Power dissipations in CMOS logic.

d) MOSFET as an active load.

Total No. of Questions : 12] **[Total No. of Pages : 2**

P1523

[3865]-537
M.E. (Electrical) (Control System)
ADVANCED MATHEMATICAL TECHNIQUES FOR CONTROL SYSTEM
(503101) (2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer Q.No. 1 or 2, 3 or 4, 5 or 6, 7 or 8, 9 or 10, 11 or 12.***
2) ***Answers to two sections in separate books.***

SECTION - I

Q1) a) Explain what do you understand by Euclidian space. **[6]**

b) Define vector space and vectors. **[6]**

c) Explain the concept of convex function. **[6]**

OR

Q2) a) Explain the method of Lagrange multiplier. **[9]**

b) Write the concept of local and global extrema. **[9]**

Q3) Use analytical method to investigate for extremum points.

$f(x) = x_1^3 + x_2^3 + x_3^3 + 2x^2_1 + 6x_2^2 + 9x^2_3$ **[16]**

OR

Q4) a) Write the steepest descent method of optimisation of a problem. **[8]**

b) Explain single variable and multivariable optimisation with no constraints. **[8]**

Q5) Consider the problem of maximizing $f = 2x_1 - x_2 + 5x_3$ subject to the constraints. $x_1 - 2x_2 + x_3 \leq 8$, $3x_1 - 2x_2 \geq -18$ and $2x_1 + x_2 - 2x_3 \leq 4$ state this linear programming problem in standard form. **[16]**

OR

Q6) a) Explain what do you understand by dual simplex method. **[8]**

b) Explain the step by step procedure in revised simplex method. **[8]**

P.T.O.

SECTION - II

Q7) Find the maxima of $f = x\,(1.5 - x)$ in the interval (0.0 to 1.00) to within 10% of exact value by dichotomous search method. **[16]**

OR

Q8) Maximize the function $f(x) = x/2$ for $x \leq 2$ and this function $= -x + 3$ for the interval $x \geq 2$. In the interval (0 , 3) by Fibonacci search using $n = 6$ (or within an accuracy of 10%) **[16]**

Q9) Explain the concept of suboptimization and principle of optimality used in multistage decesion problem. **[17]**

OR

Q10) Explain the method of conversion of non serial system to a serial system problem. **[17]**

Q11) a) Explain the Gomory's Cutting Plain method. **[8]**

b) Explain the integer non linear programming. **[9]**

OR

Q12) Minimize $f = -3x_1 - 4x_2$

Subject to $3x_1 - x_2 + x_3 = 12$

$3x_1 + 11x_2 + x_4 = 66$

$x_i \geq 0$, $i = 1$ to 4

and all x_i are integers. **[17]**

Total No. of Questions : 10] **[Total No. of Pages : 3**

P1524

[3865]-512

M.E. (Mechanical) Mechatronics

APPLIED NUMERICAL METHODS AND COMPUTATIONAL TECHNIQUES

(2008 Course) (Semester - I) (502801)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Find approximate value of y at $x = 2$. The governing differential equation is $\frac{dy}{dx} = 3x^2 + 2x + 1$ and initial conditions are $x = 0$ and $y = 1$. Using step size $h = 0.25$ and $h = 0.5$ and any method from Eular, Modified Eular or Predictor-Corrector method. Comment on error with respect to step size. **[16]**

Q2) Consider a differential equation **[16]**

$$\frac{\partial^2 y}{\partial x^2} + 0.01(20 - y) = 0$$

For Y(0) = 40 and Y(10) = 200, find the solution using Shooting method with trapezoidal rule with step size of 2 and initial guesses as $\frac{dy}{dx}$ at $x = 0 =$ 10 and 20. Interpolate the results to rectify the value of $\frac{dy}{dx}$ at $x = 0$ and calculate the values of y at $x = 2, 4, 6$ and 8.

P.T.O.

Q3) a) Compute L and U matrix for the matrix. **[8]**

$$A = A = \begin{bmatrix} 3.0 & -0.1 & -0.2 \\ 0.1 & 7.0 & -0.3 \\ 0.3 & -0.2 & 10.0 \end{bmatrix}$$

b) For the following table **[8]**

X	1	2	3	4	5	6	7
Y	0.5	2.5	2	4	3.5	6.0	5.5

Fit a straight line using linear regression method.

Q4) a) Given Gauss points and weights as **[10]**

Weights	0.5555	0.8888	0.5555
Points	-0.7745	0.0	0.7745

Calculate the integral $\int_4^7 (3x^2 + 2x + 1)\,dx$. Compare the result with analytical solution and comment on error.

b) Write a short note on Polynomial regression used in numerical methods. **[6]**

Q5) a) For (1, 13), (2, 20), (3, 33), (4, 52), (5, 77), using Lagrange's interpolation polynomial, calculate y at $x = 3.5$. **[10]**

b) Write a short note on Hermite Interpolation Polynomial. **[8]**

SECTION - II

Q6) For $f(x) = 3x^2 + 2x + 5$ and $a = 0$ and $b = 4$, Evaluate $\int f(x)dx$ using no of steps as $n = 1, 2$ and 4 with Trapezoidal rule. Compare your results with analytical solution. Calculate the error in percent. **[16]**

Employ Ricardsons Extrapolation to improve the estimate and comment on error.

Q7) For $y = f(x) = 3x^2 + 2x + 1$ from $x = 0$ to 2, with $y(0) = 5$, employ adaptive fourth order R-K to evaluate the integral with $h = 1$ and 2.

Calculate the error for these two estimates and correct the prediction of $y(2)$. **[16]**

Q8) **[16]**

$$\begin{bmatrix} 2.01475 & -0.20875 & 0 & 0 \\ -0.20875 & 2.01475 & -0.20875 & 0 \\ 0 & -0.20875 & 2.01475 & -0.20875 \\ 0 & 0 & -0.20875 & 2.01475 \end{bmatrix} \begin{Bmatrix} T1 \\ T2 \\ T3 \\ T4 \end{Bmatrix} = \begin{Bmatrix} 4.175 \\ 0 \\ 0 \\ 2.087 \end{Bmatrix}$$

Use Thomas algorithm to find T1, T2, T3 and T4.

Q9) a) Employ Power method to determine the highest Eigen value of the system. **[8]**

$$\begin{bmatrix} 3.556 & -1.778 & 0 \\ -1.778 & 3.556 & -1.778 \\ 0 & -1.778 & 3.556 \end{bmatrix} \begin{Bmatrix} x_1 \\ x_2 \\ x_3 \end{Bmatrix} = \begin{Bmatrix} \lambda x_1 \\ \lambda x_2 \\ \lambda x_3 \end{Bmatrix}$$

b) Describe in brief four steps in Finite Element Method. **[8]**

Q10) Consider a thin plate with 10 cm length, 10cm width. The left vertical edge ($x = 0$) is constrained at 75ºC, top horizontal edge ($y = 10$) is constrained at 50ºC, right vertical edge ($x = 10$) is constrained at 100ºC and bottom horizontal ($y = 0$) is maintained at 25ºC. **[18]**

To solve the governing differential equation.

$$\frac{\delta^2 T}{\delta x^2} + \frac{\delta^2 T}{\delta y^2} = 0$$

Discritize with grid of $\Delta x = \Delta y = 2.5cm$ using Libmann's Method calculate the temperature of inside nodes. With $T^{New} = \lambda T^{New} + (1-\lambda) T^{Old}$ and $\lambda = 1.5$ over relax each value in the each iteration.

Compute four iterations and tabulate the result.

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Total No. of Questions : 8] **[Total No. of Pages : 5**

P1527

[3865]-401

M.E. (Civil) (Construction and Management)

MATHEMATICS - PROBABILISTIC METHODS, STATISTICAL METHODS, SIMULATION APPLICATIONS IN CONSTRUCTION

(2008 Course)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) On a multistoried housing building complex involving similar buildings, the contractor's data for actual total cost/m^2 of built up area, as well as the actual duration required for building completion is as follows : **[18]**

Building No.	Cost in Rs./sq.m	Duration (months)
1	12,000	22
2	8,550	19
3	11,300	23
4	7,450	16
5	8,250	18
6	8,600	19
7	9,800	21
8	8,000	16
9	12,800	24
10	7,995	17

The contractor has to tender for another multistoried building complex which involves construction of buildings. Using Moute Carlo simulation, simulate the mean cost and the mean duration for his next 6 works.

P.T.O.

Q2) While tunneling in soft strata, the following costs have occured on 20 of the previous projects. **[16]**

Sr. No.	Cost in Rs.
1	2,500
2	7,200
3	16,000
4	4,500
5	2,800
6	9,000
7	12,700
8	3,500
9	12,200
10	6,300
11	8,000
12	14,100
13	9,300
14	4,000
15	2,500
16	3,700
17	8,900
18	7,800
19	11,400
20	4,400

a) Determine mean, standard deviation.

b) The rate payable to the contractor is Rs.4,500 which includes a 10% profit. Assuming a normal distribution, determine the probability of completing the above activity in the tendered cost.

c) Based on a 3 point cost estimate determine the reasonable cost, its probability of occurrence and whether the work is profitable to the contractor.

Q3) a) With an example, explain how mathematical indices are very useful in the management of a godown storing materials on a construction site. **[10]**

b) Explain spearman's rank co-relation coefficient with an example. **[6]**

Q4) a) Explain with an example, how mathematical modeling and sensitivity analysis are very useful in optimization of inventory in construction. **[10]**

b) Explain application of $FCP_{(ma)}$ in determining $EFCS_{(ma)}$ for construction equipment, working in a group, with an example. **[6]**

SECTION - II

Q5) Ten construction works executed by the contractor were rated on a scale of 10, based on the total number of non-conformities detected as below : **[18]**

Sr. No.	Rating (R)	Non-Conformities (NC)
1	6.3	14
2	4.5	19
3	3.5	25
4	2.8	33
5	2.4	30
6	8.5	7
7	7.5	9
8	5.5	15
9	5	17
10	6	13

Determine :

a) Karl Pearsonan co-relation coefficient.

b) Probable error of co-relation coefficient.

c) Linear regression equation between (R) and (NC).

Q6) Determine the partial co-relation coefficient between the output lost and the actual working hours of the equipment based on the following data : **[16]**

Sr. No.	Actual working hours (x_1)	Management factor (x_2)	Output lost in cubic meter (y)
1	6.25	3.8	450
2	4.2	4.2	410
3	6.0	7.2	430
4	7.25	1.6	300
5	4.0	5.5	500
6	3.6	4.8	230
7	0	1.3	900
8	3.5	6.5	600
9	7.25	7.8	160
10	2.5	4.4	400

Interprete from the co-relation co-efficients.

Q7) a) Explain as a project manager your overall approach towards risk management. Explain role of multiple linear regression equations involving many variables in the same, with an example. **[10]**

b) Explain applications of Cox and Nunally models with an example. **[6]**

Q8) a) With an example, explain how the various measures of dispersion are very useful to a quality control engineer. **[8]**

b) A tenderer is bidding for construction works averagely 10 numbers in a year for the past 5 years. Find the probability that **[8]**

i) He gets at least 3 works.
ii) He does not get any work.
iii) He gets only 4 works.
iv) He gets not more than 2 works.

APPENDIX 'C'

TABLE OF RANDOM NUMBERS

39 65 76 45 45	19 90 69 64 61	20 26 36 31 62	58 24 97 14 97	95 06 70 99 00
73 71 23 70 90	65 97 60 12 11	31 56 34 19 19	47 83 75 51 53	30 62 38 20 44
72 20 47 33 84	61 67 47 97 19	98 40 07 17 66	23 05 09 51 80	59 78 11 52 69
75 17 25 69 17	17 95 21 78 48	24 33 45 77 48	69 81 84 09 29	93 22 70 45 80
37 48 79 88 74	63 52 06 34 30	01 31 60 10 27	35 07 79 71 53	28 99 52 01 41
02 89 08 16 94	85 53 83 29 95	56 27 09 24 43	21 78 55 09 82	72 61 88 73 61
87 18 15 70 07	37 40 79 12 38	48 13 93 15 96	41 92 45 71 51	09 18 25 58 94
98 83 71 70 15	89 09 39 59 24	00 06 41 41 20	14 36 59 25 47	54 45 17 24 89
10 08 58 07 04	76 62 60 48 68	58 76 17 14 86	59 53 11 52 21	66 04 18 72 87
17 90 56 37 31	71 82 13 50 41	27 55 10 24 92	28 04 67 53 44	95 23 00 84 47
93 05 31 03 07	34 18 04 52 35	74 13 39 55 22	68 95 23 92 35	36 63 70 35 31
21 80 11 47 99	11 20 99 45 18	76 51 94 84 86	13 79 93 37 55	98 16 04 41 67
95 18 94 36 97	23 37 83 28 71	79 57 95 13 91	09 61 87 25 21	56 20 11 32 44
97 08 31 55 73	10 65 81 92 59	77 31 61 95 46	20 44 90 32 64	23 99 76 75 63
69 26 88 86 13	59 71 74 17 32	48 38 75 93 29	73 37 32 04 05	60 82 29 20 25
41 27 10 25 03	87 63 93 95 17	81 83 83 04 49	77 45 85 50 51	79 88 01 97 30
91 94 50 63 62	08 61 74 51 68	92 79 43 83 79	29 18 94 51 23	14 85 11 47 23
80 06 54 18 47	08 52 85 08 40	48 40 35 94 22	72 65 71 08 86	50 03 42 99 36
76 72 77 63 99	89 85 84 46 06	64 71 06 21 66	89 37 20 70 01	61 65 70 22 12
59 40 24 13 75	42 29 82 23 19	07 94 76 10 08	81 30 15 89 14	81 83 17 16 33
63 62 06 34 41	79 53 36 02 95	94 61 09 43 62	20 21 14 68 86	84 95 48 46 45
78 47 23 53 90	79 93 96 38 63	34 85 52 05 09	85 43 01 72 73	14 93 87 81 40
87 68 62 15 43	97 48 72 66 48	53 16 71 13 81	59 97 50 99 92	24 62 20 42 30
47 60 92 10 77	26 97 05 73 51	88 46 38 00 58	72 63 49 29 31	75 70 16 08 24
56 88 87 59 41	06 87 37 78 48	65 88 69 58 39	88 02 84 27 82	85 81 56 39 38
22 17 68 65 84	86 02 22 57 51	68 69 80 95 44	11 29 01 95 80	49 34 35 86 47
19 36 27 59 46	39 77 32 77 09	79 57 92 36 59	89 74 39 82 15	05 50 94 34 74
16 77 23 02 77	28 06 24 25 93	22 45 44 84 11	87 80 61 65 31	09 71 91 74 25
78 43 66 07 61	97 66 63 99 61	80 45 67 93 82	59 73 19 85 23	53 33 65 97 21
03 28 28 26 08	69 30 16 09 05	53 58 47 70 93	66 56 45 65 79	45 56 20 19 47
04 31 17 21 56	33 63 99 19 87	26 72 39 27 67	53 77 57 68 93	60 61 97 22 61
61 06 98 03 91	87 14 77 43 96	43 00 65 98 50	45 60 33 01 07	98 90 46 50 47
23 58 35 26 00	99 53 93 61 28	52 70 05 48 34	56 65 05 61 86	90 92 10 79 80
15 39 25 70 99	93 86 52 77 65	15 35 59 05 28	22 87 26 07 47	86 96 98 29 06
58 71 96 30 24	18 46 23 34 27	85 13 99 24 44	49 18 09 79 49	74 16 32 23 02
93 22 53 64 39	07 10 63 76 35	37 03 04 79 88	08 33 33 85 51	55 34 57 72 69
78 76 58 54 74	92 38 70 96 92	52 06 79 79 45	82 63 18 27 44	69 66 92 19 09
61 81 31 96 82	00 57 25 60 56	46 72 60 18 77	55 66 12 62 11	09 99 55 64 57
42 88 07 10 05	24 98 65 08 21	47 21 61 88 32	27 80 30 21 60	10 92 35 36 12
77 94 30 05 33	28 10 99 00 27	12 73 73 99 12	39 99 57 94 82	96 88 87 17 91

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1528

[3865]-263
M.E. CSE (Information Technology)
OPERATING SYSTEMS
(Revised 2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***

SECTION - I

Q1) a) Discuss the reasons why distributed computing systems are gaining popularity? **[8]**

b) Describe four distributed computing system models with the help of neat diagrams. **[8]**

Q2) a) Implement the Reader Writer problem using semaphores and discuss how the critical section requirements are fulfilled. **[8]**

b) Explain the probe based distributed algorithm for deadlock detection. **[8]**

Q3) a) Explain the Token Ring algorithm for implementing mutual exclusion in a distributed environment. **[8]**

b) What are the desirable features of a good message passing system. **[8]**

Q4) a) Explain the three cache location policies. Which of these policies can be preferred to extend scalability and reliability? **[8]**

b) A process references pages in the following order: **[10]**

J, K, L, M, J, K, N, J, K, L, M, N,

Use the FIFO and LRU page replacement algorithms to find out the number of page faults for this reference string using 3 page frames. Repeat for 4 page frames. Analyse the differences in the results.

P.T.O.

SECTION - II

Q5) a) Discuss the relative advantages and disadvantages of implementing a thread package in user space and in the kernel. **[8]**

b) Explain any two address space transfer mechanisms which are suitable for a process migration facility with high performance and high reliability goals. **[8]**

Q6) a) Describe the general architecture of a DSM system with the help of a neat diagram. State in brief the design issues of a DSM. **[8]**

b) What is the primary motivation behind the development of a light weight RPC system? Describe the four techniques used in a LRPC system that makes it more efficient than a conventional RPC system. **[8]**

Q7) a) How does the Gifford Quorum based protocol handle the network partition problem and increase the availability of write operations at the expense of read operations? **[8]**

b) Explain what is meant by consistent ordering and causal ordering of messages. Give a mechanism to implement each one. **[8]**

Q8) Write short notes (Any three): **[18]**

a) Transparency.

b) Bully algorithm.

c) Virtual memory.

d) Clock synchronization.

Total No. of Questions : 6] **[Total No. of Pages :1**

P1529

[3865]-215

M.E. (Petroleum Engineering)

NUMERICAL METHODS AND SIMULATION IN PETROLEUM ENGINEERING

(2002 Revised Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answers to the two sections must be written in separate answer books.***
2) ***Answer two questions from each section.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams should be drawn wherever necessary.***
5) ***Use of a non-programmable calculator is allowed.***
6) ***Assume suitable data, if necessary and clearly state it.***

SECTION - I

Q1) For the following system of equations, find x,y,z using SOR, LUdecomposition, and Gauss Seidel method. w = 1.1

$$x + y + z = 8$$

$$2x + 3y + z = 17$$

$$x - y = -z$$ **[25]**

Q2) Solve the following system of equations by Newton Raphson method and iterative method.

$$x^2 y + \cos(xy) = 54$$

$$\sinh(x^2y) + xy = \cos y$$ **[25]**

Q3) Solve $y' = x^2y + \cos(xy) + 4$, $y(1) = 2$, using Heun, RK -4 and Adam Moulton predictor corrector method. **[25]**

SECTION - II

Q4) Given a 1 D reservoir. Find the pressures in the interior of the reservoir, if the pressures are at 50 psi for one well and 3000 psi at the other well, both at each boundary. Length of the reservoir are 400 ft. Assume delx = 100 ft. Solve by explicit, crank-nicolson and implicit method. Only set up the matrix.**[25]**

Q5) Derive the IMPES method for BLACK Oil reservoir. **[25]**

Q6) Write a detailed Essay on output for Reservoir Simulation. **[25]**

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1530

[3865]-45
M.E. (Mechanical Engineering)
Weapons, Design & Heat Power
NUMERICAL METHODS AND COMPUTATIONAL TECHNIQUES
(Old 1994 & Revised 2002 Courses)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Assume suitable data, if required.***
3) ***Figures to the right (in square brackets) indicate full marks.***
4) ***Use of a calculator is allowed.***

SECTION - I

Q1) Consider the function

$f(x) = x^4 + 2x^2$

Integrate this function from $x = 1.8$ to $x = 2.6$ with a step size $h = 0.1$

a) Using Trapezoidal rule **[6]**

b) Using Simpson's one-third rule. **[6]**

c) Compare both methods against the exact solution. **[4]**

Q2) The volume V of liquid in a spherical tank of radius r is related to the depth h of the liquid by

$$V = \frac{1}{3}\pi h^2 (3r - h)$$

a) Determine h given $r = 1.2\ m$ and $V = 0.8\ m^3$ **[12]**

b) Repeat the same for $r = 1.25\ m$ **[4]**

x	2	4	6	7	10	11
y	1.1	1.6	2.1	3.4	4	5

Q3) The following data was gathered to determine the relationship between two variables x and y.

a) Fit a straight line to the data, for y as a function of x. **[12]**

b) Use the same to determine y at $x = 8$. **[4]**

P.T.O.

Q4) Consider one dimensional transient conduction in a rod of 1m length, given by

$$\frac{\partial T}{\partial t} = \alpha \frac{\partial^2 T}{\partial x^2}.$$

The boundary and initial conditions are

- T = 20 at $t = 0$ (initial condition)
- T = 0 at $x = 0$ (boundary condition)
- T = 90 at $x = 1$ (boundary condition)

Choose $\delta x = 0.25$m and $\delta t = 0.02s$. Take $\alpha = 1 m^2/s$.

a) Using the explicit method, advance by two time steps and determine the temperature field at $t = 0.04s$. **[12]**

b) Form the equations for the implicit scheme for one time step. The solution is not required. **[6]**

SECTION - II

Q5) Solve the following system using Gaussian elemination

$$4x_1 - x_2 + 2x_3 = 8.75$$
$$x_1 - 3x_2 + x_3 = 5.15$$
$$-x_1 + 2x_2 - 4x_3 = -9.8$$ **[16]**

Q6) a) Derive the (first order) backward and (second order) central finite difference approximations to the first derivative, along with the leading error term. **[9]**

b) Consider $f(x) = 2x^4$. Taking $\delta x = 0.01$, determine the forward and central difference approximations to the derivative at $x = 1$. Compare against the exact solution. **[7]**

Q7) The velocity of a falling object (like a parachute) can be modelled as

$$\frac{dv}{dt} = g - \frac{C_d}{m} v^2,$$

Where m is the mass and C_d the drag coefficient.

The initial condition is $\upsilon = 0$ at $t = 0$.

Determine the velocity after 2 seconds, for a 60kg object with a drag coefficient of 0.2 $\frac{kg}{m}$:

a) Using Forward Euler with $\delta t = 0.5$s. **[6]**

b) Using Fourth Order Runge Kutta with $\delta t = 1$s. **[12]**

Q8) Consider steady state conduction given by the Laplace equation in a square of 1m length. The boundary conditions are as follows:

- T = 115 for $y = 0,\ 0 \leq x \leq 1$
- T = 70 for $y = 1,\ 0 \leq x \leq 1$
- T = 180 for $x = 0,\ 0 \leq y \leq 1$
- T = 260 for $x = 1,\ 0 \leq y \leq 1$

With $\delta x = \delta y = \frac{1}{3}$,

a) Form the equations at the interior nodes. **[8]**

b) Carry out 2 cycles of iteration. **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1536

[3865]-486

M.E. (Mech.) (Heat Power Engg.)

ADVANCED HEAT TRANSFER

(502108) (2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive the generalized differential equation in cylindrical coordinates for a solid cylinder of anisotropic materials. Find the temperature distribution in a long hollow cylinder using the simplified form of the generalized differential equation. List the assumption made. **[10]**

b) Explain the concept of Thermal resistance, Contact resistance, Overall heat transfer coefficient and critical radius of insulation. **[8]**

Q2) a) Explain the importance of unsteady state heat transfer problems. What is a lumped capacity problem? Differentiate clearly between Nusselt number and Biot number. **[6]**

b) Discuss the numerical formulation of one dimensional fin problem. State the differential equation and boundary conditions. Illustrate the solution procedure by a suitable example for finding the temperature distribution. **[10]**

P.T.O.

Q3) Write notes on : (Any Three) **[16]**

a) Solution procedure for solving 2D, 3D unsteady state problems.

b) Analytical solution of Steady state 2D heat conduction problems in Cartesian coordinates.

c) Reynolds and Chilton-Colburn analogies.

d) Navier-Stokes equations.

Q4) a) Discuss the solution procedure of Laminar flow heat transfer in a circular pipe. **[8]**

b) For the steady flow through a circular pipe, the velocity and temperature profiles are found to be parabolic. Show that the Nusselt number for this flow is 6. **[8]**

SECTION - II

Q5) Explain : **[18]**

a) Natural convection in enclosed spaces and their correlations.

b) Physical significance of Rayleigh number.

c) Natural convection flow patterns from cooled vertical plate, horizontal cylinder and heated horizontal plate.

d) Velocity and temperature profiles in natural convection from a heated vertical plate.

e) Mixed convection problems.

f) Free convection within parallel plate channels.

Q6) a) Calculate the heat transfer coefficient during the Laminar film condensation of pure stationary and saturated vapour at Ts an isothermal vertical plate at Tw. Define film Reynolds number and explain its significance. **[10]**

b) Explain Regimes of forced convection boiling inside a tube and variation of heat transfer coefficient. **[6]**

Q7) a) What is a radiation shield? List its applications using Network method, show that N shields will reduce the heat flux by a factor of N + 1. **[10]**

b) Write notes on : **[6]**

i) Multimode heat transfer problems.

ii) Gaseous emission and absorption.

Q8) Write notes on (Any Four) : **[16]**

a) Cooling load of electronic equipments.

b) Ablative cooling.

c) High speed cooling.

d) Design of chip carrier.

e) Conduction cooling methods.

f) Cooling of personal computers.

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1537

[3865]-464

M.E. (Civil/Structures)

THEORY OF PLATES AND SHELLS

(501408) (2008 Course)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non programmable electronic calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Differentiate between : **[10]**

i) Thin and Thick plate bending.

ii) Beam and Plate analysis.

b) A square plate with 350 mm sides and 8 mm thickness is subjected to uniformly distributed pure couple of 400 Nm on all the edges. If the plate is simply supported on its four corners, find the lateral displacement at the midpoints of the edges. Take E = 210 GPa and $\nu = 0.3$. **[15]**

Q2) a) Differentiate between Navier's and Levy's theories for analysis of thin rectangular plate in bending. **[6]**

b) Using Levy's method, obtain the expression for lateral displacement of a rectangular plate simply supported on edges, of sides a × b under a uniformly distributed load 'q' per unit area. **[19]**

Q3) A circular clamped plate of radius 'a' is subjected to axisymmetric triangular loading of intensity zero at the center and q_0 at the edge. Develop from first principles, expression for maximum deflection. **[25]**

P.T.O.

SECTION - II

Q4) a) A thin conical shell tank carries water upto a height 'd' from the vertex. It is supported at the top edge by a ring beam. Derive the expression for the membrane stresses N_θ and N_φ in the shell. Also find the locations of the maximum values of stress resultants, with their magnitude. **[20]**

b) What are the limitations of the membrane theory in the analysis of shells? **[5]**

Q5) a) Derive the expressions for displacements in symmetrically loaded shell having the form of a surface of revolution. **[12]**

b) A semicircular thin cylindrical shell roof of uniform thickness has length L and radius R. It is simply supported along the straight edges and free along the curved edges. Derive the expressions for the stress resultants N_x, N_φ and $N_{x\theta}$ considering its self weight only. **[13]**

Q6) Analyze a cylindrical tank of uniform thickness filled with liquid using bending theory for shells for axisymmetric loading. The tank is open at the top and rigidly fixed at the bottom. **[25]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1538

[3865]-412

M.E. (Civil) (Construction & Management)

CONSTRUCTION CONTRACTS ADMINISTRATION & MANAGEMENT

(501108) (2008 Course)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator ad steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare and contrast following types of contracts, with suitable examples. **[10]**

i) Lump sum and Item rate.

ii) B.O.T. and EPC

b) Explain provisions made in any 4 general conditions of contract of the MOS and PI document. **[8]**

Q2) Explain various causes for construction claims, their effects on the project performance, preventive and remedial measures associated. **[6+4+3+3]**

Q3) a) Explain the weighted point score method of tender evaluation in detail, with an example. **[12]**

b) Explain how evaluated bid price of a tenderer's financial bid is determined. **[4]**

Q4) a) Explain CIDC-SIAC institutionalized arbitration process in detail.**[8]**

b) Explain advantages of DRB over other dispute resolution measures.**[8]**

P.T.O.

SECTION - II

Q5) Describe in detail obligations, duties and responsibilities under "Red Book" conditions of FIDIC contract documents. Contract is an item rate contract.

a) The Contractor. **[8]**

b) The Engineer. **[8]**

Q6) a) Name various reasons/situations under which an Employer/Client is entitled to terminate a contract in an item rate (Red Book) project. **[8]**

b) In an application of Interim Payment (Contract Clause 14 - Contract price and payment), which are the heads/categories, the Contractor can include in project costs and various deductions etc. What is the meaning of minimum amount of interim payment certificate? Explain with an example. **[8]**

Q7) a) Explain the basic steps in formation of a contract as per the Indian Contract Act (1872). **[6]**

b) Explain consequences of breach as per the ICA (1872) with suitable examples. **[6]**

c) Explain valid excuses for non-performance as per the ICA (1872) with suitable examples. **[4]**

Q8) Explain in brief provisions made/meaning of the following under FIDIC conditions with respect to –

a) Distinguish between Mobilisation Advance and Secured Advance. Give some examples. When and how many times it can be paid. **[2]**

b) What is the meaning of Interim retention, limit of retention and release of retention? Under what circumstances and for what purpose retention amount can be utilized by an Employer/Client? **[3]**

c) Name various types of Insurances, which are required to be taken by the Contractor. Which items of works it covers? If Contractor fails to take insurance covers, what is the provision under FIDIC? **[4]**

d) Enumerate various Tender documents and Contract documents in order of priority. **[4]**

e) Who is the Third Party under the Contract? Give some examples. How is its liability paid under the terms of the contract? **[2]**

f) What is the purpose of Tender drawings, Working drawings, "As Built" drawings. By whom and when are the above drawings prepared? **[3]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1539

[3865]-202

M.E. (Computer)

ADVANCED DATABASE MANAGEMENT SYSTEMS

(Theory) (2002 Revised Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss characteristics, concepts, advantages, technology and applications of Databases. **[8]**

b) Explain following concepts in the context of databases. **[8]**

i) Distributed databases : applications, architecture.

ii) Various Parallel databases concepts (Hint : Partitioning, joins).

Q2) Give good example queries for any system of your own choice for the following cases (queries can be in plain English or SQL whichever appropriate). **[16]**

State your assumptions clearly.

a) An SQL query with table schemas shown and query results shown too.

b) A query in English involving maps ie. Geographic data.

c) A two table query in SQL.

d) Any operation involving multi dimensional data.

Q3) With examples and neat diagrams if relevant explain. **[16]**

a) Decision tree in context of data mining and its application.

b) Database architecture.

c) Database commit rollback.

d) Classes and objects.

P.T.O.

Q4) Write short notes on Any Three : **[18]**

a) SQL.

b) Data mining.

c) Geographic information systems.

d) Information explosion ie. large volumes of data.

e) Database applications in airlines/air travel/airports.

SECTION - II

Q5) Write short notes on Any Three : **[18]**

a) ORACLE databases.

b) Data warehouses (Hint : concept, need, multi dimensional data, operations etc.)

c) ER Model, its notation and importance.

d) Database applications in sports.

e) Database storage aspects (Hint : files, indexes, buffering, storage media, performance retrieval etc.)

Q6) a) With your own examples FROM Bank Domain illustrate. **[8]**

i) An example table schemas for savings account application.

ii) An example XML file/data for customers in a bank.

b) Explain what you understand by (with examples) **[8]**

i) Data mining queries and applications.

ii) Target Data for WWW Search engines, how search works and search results relevance.

Q7) a) Discuss various Security issues, needs, threats, security measures in context of E-SHOPPING. **[8]**

b) Write in brief about : **[8]**

i) Applications of databases in Universities/Colleges.

ii) SELECT query in SQL.

Q8) What do you understand by following concepts? **[16]**

a) Performance and optimization of queries.

b) Database schemas, tables, data types.

c) Inheritance (in object oriented approach).

d) Locks and concurrency control.

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Total No. of Questions : 10] **[Total No. of Pages : 3**

P1540

[3865]-61

M.E. (Mechanical - Design Engineering)

DESIGN ENGINEERING

(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of pocket non programmable electronic calculator is allowed.***

SECTION - I

Q1) a) Explain "Jump Phenomenon" in cam system and derive an equation for the limiting angular speed of the cam to avoid cam jump. **[9]**

b) Derive the expressions for 3-4-5 polynomial cam for displacement, velocity, acceleration and jerk. Sketch the curves for the same. **[9]**

Q2) a) Derive expression for torsional stiffness of a torsion spring. **[8]**

b) A steel Belleville spring has h/t = 1.5 and b/a = 2. The thickness is 4.7 mm. For a load of 11500 N, find the value of maximum stress when the spring is compressed flat. **[8]**

Q3) a) What do you understand from the term MTBF? **[2]**

b) Explain the procedure that may be followed to improve reliability of product. **[6]**

c) What is reliability? Prove reliability with respect to time *t* as

$$R(t) = \exp\left[-\int_{o}^{t} h(t)dt\right].$$ **[8]**

P.T.O.

Q4) a) Write in short about creep resistance alloy steel. **[6]**

b) For an alloy steel the following creep rate is observed at 850°C stress S_1 = 21 MPa, creep rate = 0.127% per 1000 hrs. stress S_2 = 27.5 MPa, creep rate = 0.635% per 1000 hours. Determine the creep rate per 1000 hrs. for stress value of 12.5 MPa using both exponential & hyperbolic laws of creep. Which of the method a designer will prefer? Why? **[10]**

Q5) Write short notes on Any Two : **[16]**

a) Concept of True stress and True strain.

b) Cam design considering elasticity of parts.

c) Sequential Analysis and Stress Relaxations.

d) Spiral bevel gears.

SECTION - II

Q6) a) Explain Optimisation method using geometric programming. **[8]**

b) Develop the design procedure for a torsion bar subjected to combined bending and torsion for minimum weight by Johnson's method of optimisation. **[8]**

Q7) a) A Novikov gear has a module of 8 mm & has 17 teeth. The driven gear has 35 teeth. What is the gear width desired so that a contact ratio of 2 : 1 is ensured. Sketch the teeth profile and differentiate between single line and two line of action profiles.

Assume the helix angle of 20°. **[12]**

b) Explain the term 'peaking' & 'topping' as applied to gears. **[6]**

Q8) a) Explain the fracture mechanics approach for estimation of residual life of a component. What do you understand by critical stress intensity factor? **[6]**

b) Find the stress intensity factor for a cracked beam in pure bending. For the geometrics of this specimen stress intensity factor is given as

$$K_{ic} = \sigma\sqrt{\pi a}\ f(g)$$

Where f(g) = $1.125 - 1.42\ a(a/b) + 7.38(a/b)^2 - 13.08(a/b)^3 + 24.0(a/b)^4$

Where the beam is having width of 30 mm & crack length of 5.93 mm at its edge. The beam is subjected to a pure bending moment of 275 Nm of Magnitude. **[10]**

Q9) a) Derive the rule of mixture for the modulus of elasticity of a fiber reinforced composite when a stress is applied along the axis of the fibers. **[8]**

b) A glass fiber reinforced polystyrene contains 40% volume of parallel fibers. Estimate the Young's Modulus of the composite in a longitudinal direction of the fibers Young's Modulus for glass 72 GN/m^2 and that of polystyrene is 2.88 GN/m^2. If volume contains are increased to 45% what will be the effect on the properties of composite material.**[8]**

Q10) Write a short note on the following : **[16]**

a) Hypothesis testing and significance level.

b) Safe life & fail safe life.

c) Spiral bevel gears.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1541

[3865]-46

M.E. (Mechanical Engg.) (Heat Power)

ADVANCED FLUID MECHANICS

(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Assume suitable data, if required.***
2) ***Figures to the right indicate full marks.***
3) ***Use of logarithmic tables, slide rule and electronic pocket calculator is allowed.***
4) ***Answer any THREE questions from each section.***

SECTION - I

Q1) a) List any 2 assumptions of the boundary layer theory. **[2]**

b) Assuming a linear velocity profile within the boundary layer, determine the boundary layer thickness δ as a function of x. **[10]**

c) Derive the expression for the skin friction coefficient C_f for the same linear velocity profile. **[5]**

Q2) For compressible flows :

a) Derive expressions for $\frac{T_0}{T}$ and $\frac{p_0}{p}$, where T_0 and p_0 are the stagnation temperature and pressure respectively. **[4]**

b) Derive Bernoulli's equation for compressible flows. **[12]**

Q3) a) What are the first order Forward and Backward difference expressions for $\frac{\partial u}{\partial x}$? **[2]**

b) List the steps in solving

$u_t + au_x = 0$

using the McCormack method, where 'a' is a constant. What is the stability criterion? **[5]**

P.T.O.

c) Apply the McCormack method for the quasi one-dimensional flow in a nozzle. Show how density and velocity are updated. **[9]**

Q4) Consider the fully developed flow between two parallel plates, separated by a distance *h*, inclined at an angle θ to the horizontal. The bottom plate is stationary, while the top is moving with a speed U. Determine :

a) The velocity profile. **[10]**

b) Wall Shear Stress. **[3]**

c) Pressure Gradient which will produce zero wall shear stress. **[4]**

SECTION - II

Q5) a) Derive the continuity equation in cartesian coordinates for two dimensional compressible flow. **[12]**

b) Let the velocity field be given by

$\vec{v} = x^2 y\vec{i} - 2xy\vec{j}$

Is this a possible case of incompressible flow? **[4]**

Q6) a) Derive the expression for the substantial derivative $\frac{Du}{Dt}$. **[8]**

b) Using the substantial derivative expression (or otherwise), derive the Euler (inviscid momentum) equation in the *x*-direction. **[8]**

Q7) a) Deduce the Navier-Stokes equation for one dimensional unsteady flow. **[5]**

b) Let $\psi = x^2 - y^2$. Is this a case of irrotational flow? If so, find the velocity potential ϕ and the velocity components at (1, 2). **[8]**

c) Find the pressure difference between the points (1, 2) and (3, 0). Assume density (ρ) = 1. **[4]**

Q8) a) A pipe of 300 mm diameter conveying 0.5 m^3 per sec. of water undergoes a 30 degree turn in the horizontal plane. Find the resultant force, if the pressures at the inlet and outlet are 25 kPa and 20 kPa respectively. **[9]**

b) Water is flowing a variable diameter pipe. The diameter at section 1 is 30cm and it is 20cm at section 2. The rate of flow is 30 ltrs per second. Section 1 is 6m above the datum and section 2 is 4m above. If the pressure at section 1 is 3 bar, find the pressure at section 2. **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1542

[3865]-2

M.E. (Civil) (Construction & Management)

CONSTRUCTION EQUIPMENT AND MANAGEMENT

(2002 Course)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Question 1 and 5 are compulsory. Out of remaining solve any two questions from each section.***
2) ***Numbers to the right indicates full marks.***
3) ***Neat figures are drawn wherever required.***
4) ***Answers to each section must be written in separate answer books.***
5) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) a) Explain various parts of scraper and state its advantages & limitations over other earthmoving equipments. **[5]**

b) Explain one typical cycle of a scraper explaining various factors affecting it. **[5]**

c) Determine cycle time for a scraper with 15 m^3 heaped capacity which is used to haul material from a pit to a fill 3 km away. The average haul speed will be 15 kmph and the average return speed will be 25 kmph. Assume 100 m is required to both accelerate and decelerate at an average speed of 8 kmph. The operating efficiency will be equal to 50 min-hours. It will take 1.2 minute to load this scraper. Also calculate total time required to excavate and haul 1000 m^3 of earth. Assume swell factor as 1.2. Also, state the number of scrapers required if the work is to be completed within 2 days. **[8]**

Q2) Write in detail, working of following equipment. **[16]**

a) Pneumatic tyred roller.

b) Steel drum roller.

c) Sheep foot roller.

d) Grid or mesh roller.

Draw labeled sketch of each.

P.T.O.

Q3) a) What are the advantages and limitations of a precast prestressed concrete piles? **[6]**

b) What are the advantages of cast in situ piles over precast piles? State various types of cast in situ piles. Describe Franki piles in detail with neat diagram & explain sequence of operation. **[10]**

Q4) a) What is meant by rating of a crane? Explain various factors affecting it. Explain rigging operation of a crane in detail. **[8]**

b) Draw a neat labeled sketch of a tower crane. Explain one cycle of it. Also, explain the jumping tower crane and its uses in construction. **[8]**

SECTION - II

Q5) For tunneling work of 2 km length, first one km the tunneling crew has come across heavy ground water seepage in fractured rock. Name various techniques and machineries used. Name and explain in details the function of each in the following. **[18]**

a) Control of dewatering.

b) Strengthening of fractured rock formations by
i) Rock bolting ii) Shotcreting iii) Grouting

c) Concrete lining techniques.

Q6) a) Name different types of crushers used in aggregate crushing plant. Show a plan of an aggregate crushing plant producing 20 mm, 10 mm aggregates, sand and grit. Explain the sequence and reasons of using the crushers. **[8]**

b) Draw cross section of concrete road. Explain the complete sequence of operation while constructing concrete road. **[8]**

Q7) Write detailed notes on any two of following : **[16]**

a) Slip form technique.

b) Replacement decisions of equipment.

c) Concrete pumps.

Q8) a) Compare prefabricated technique with cast in situ construction. **[6]**

b) Explain the sequence of operation for prestressed concrete pipes manufactured by Indian Hume pipes. Draw a neat plan showing casting yard, stacking yard, etc. **[10]**

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Total No. of Questions : 12] **[Total No. of Pages : 3**

P1543

[3865]-753

M.E. (IT)

SOFTWARE ENGINEERING METHODOLOGIES

(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answers to the two sections should be written in separate answer books.***
2) ***From Section I answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and From Section II answer Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) In the Rational Unified Process (RUP), what are the important work products? List down importance of each work product in brief. **[16]**

OR

Q2) a) Explain in detail the **Extreme Programming**, agile type software process model. **[8]**

b) State one application for using the RAD and spiral software process model and justify for the selection of the model. **[8]**

Q3) a) **Read the following description of the system and answer the questions given below :**

An organization has many employees. Every year, the organization implements a performance assessment cycle. The cycle is enabled on 1st April of every year. Every manager sets expectations for her/his subordinate employees. It is open to set the expectations for one month. Each employee is expected to fulfill the expectations. System sends an automatic reminder if the expectations are not set within one month. As a next step, the filling up of the self appraisal form is enabled on 1st Jan. of next calendar year. The self appraisal form has a list of expectations [which are set for that employee]. Every employee must give self rating in the range of 0 to 5 for each expectation [0 means 'Expectation not met' and 5 means 'Expectation completely met']. Once completed, the self appraisal form is submitted to the reviewer.

P.T.O.

Reviewer adds his ratings for each expectation in the subordinates' appraisal form. If the rating given by the employee and the reviewer differs by more than 2 points then reviewer needs to add justification against rating. The reviewer submits the reviewed appraisal forms to Assessor [Second level reviewer]. The Assessor adds an overall (consolidated) rating to every appraisal form. If Assessor does not get convinced about the reviewer's ratings, then he can send it back for reconsideration [only once]. Once completed, Assessor submits the appraisals to the HR department. The HR department normalizes the ratings, updates findings. HR then processes the increments and promotions for the organization. After this step System conveys the findings to respective employee.

i) Identify the actors in the system. **[4]**

ii) Identify the use cases for each actor and draw use case diagram for the system, using applicable notations from UML 2.0. **[6]**

b) Write the relevance of any one of following diagrams with the context of UML 2.0. **[6]**

i) Interaction overview diagram.

ii) Composite structure diagram.

OR

Q4) a) Use the same system details as described in Q. 3 a) and draw a detailed activity diagram using all applicable notations from UML 2.0. **[8]**

b) What is OCL? What is the relevance of the keywords **invariant, context, forall and self** in the context of OCL? **[8]**

Q5) a) Explain the meaning of composite state, region, transition, shallow history in the context of state diagram of UML 2.0. **[8]**

b) Use the same system details as described in Q 3 a) and identify the classes from the system. Describe each class in detail using UML 2.0 notation. **[10]**

OR

Q6) a) In the context of sequence diagram what is ref, alt, opt, par? Explain in brief. **[8]**

b) Write a short note on UML metamodel. **[6]**

c) Illustrate, how do you show object flow in an activity diagram. **[4]**

SECTION - II

Q7) a) Explain the design concepts modularity and loose coupling. **[8]**

b) Illustrate, the relationships present among various classes with appropriate examples. **[10]**

OR

Q8) a) Explain the call and return architecture in detail. **[5]**

b) Explain the layered architecture in detail. **[5]**

c) Explain data design and interface design elements in brief. **[8]**

Q9) a) What is integration testing? **[2]**

b) Compare various types of integration testing. **[8]**

c) What is validation testing? Explain in brief. **[6]**

OR

Q10) a) What is unit and integration testing from the perspective of object orientation? Explain. **[8]**

b) What is control testing? Explain in brief. **[8]**

Q11) a) Explain Ishikawa's seven tools for quality in brief. **[10]**

b) Explain any one project estimation technique which estimates size, cost and effort of the project. **[6]**

OR

Q12) a) Explain software debugging. **[8]**

b) State the salient features of process assessment model CMMI. **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 4**

P1544

[3865] - 732

M.E. (Petroleum Engineering)

PETROLEUM RESERVOIR MANAGEMENT

(512102) (2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Assume additional data if necessary.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Name and describe the rock properties and reservoir characteristics that would be necessary to estimate original hydrocarbons in place. Define the 'recovery factor' of oil and gas. **[10]**

b) Explain following terms: **[15]**

i) Net thickness and gross thickness of a formation.

ii) Effective permeability and relative permeability.

iii) Dynamic reservoir model and earth model.

OR

Q2) a) Following steps have been carried out during exploration and development of oil and gas field taken on a lease of 25 years.

i) 2 D geophysical survey has been performed in an unexplored region of a petroleum basin. Possible existence of a medium size field is indicated.

ii) An exploratory well is drilled which has yielded 500 BOPD and some gas.

iii) A second well is drilled at 600 m from the first well. Initial production is 200 BOPD.

What rock properties are most likely in above three? What would be the reason for large variation in production rate? What would be the plausible recommendation for the development of the reservoir? Would the expectations be any different if field encountered is small in size than expected? **[15]**

P.T.O.

b) A plot of annual production against time for an asset indicates that production will continue for 17 more years before reaching an economic limit of 1,750 bbl/year. The line of extrapolation passes through 15,000 bbl for the last year of available data. However, production data shows that the actual production for that year was 14,300 bbl and that some downtime had been experienced.

Calculate the recovery (current reserves), which can be expected over the next 17 years before the production reaches the economic limit of 1,750 bbl/year assuming

i) h = 0 and

ii) h = 0.5.

What would be the value of the reservoir if the oil price is $ 50/barrel throughout the tenure of project? **[10]**

Q3) a) How is reservoir heterogeneity recognized at different scales of observation. **[15]**

b) The table given below shows porosity values as per increasing depth in a vertical well.

Sr.No	Depth, m	Porosity, ϕ, (%)
1	2040	9.35
2	2041	10.2
3	2042	7.30
4	2043	6
5	2044	6.50
6	2045	5.8
7	2046	6.25

Generate semi-variogram for porosity as a function of lag distance. Interpret the graph using behavior of different parameters like sill, range, nugget value etc. **[10]**

OR

Q4) a) Write a detailed note on permeability correlation developed as based on pore and grain properties. **[15]**

b) How do three decline curve methods differ from each other. **[10]**

SECTION - II

Q5) a) What are the field challenges for the development of reservoir management plan for mature field? **[15]**

b) Consider three reservoirs at various depths and locations having following rock and fluid properties. With limited resources which of the three reservoirs should be water flooded first, all other factors being the same? Explain why?

i) Depth 1500m. Permeability; 20-30 md. Oil gravity: 23° API. Onshore location.

ii) Depth 2500m. Permeability; 14-18 md. Oil gravity: 28° API. Onshore location.

iii) Depth 3500m. Permeability; 10-500 md. Oil gravity: 31° API. Offshore location.

List all other factors that should be gathered before making final decision. **[10]**

OR

Q6) The objective is to develop a large gas complex in an optimized manner that maximizes value of the petroleum asset. The resources and constraint typical of offshore gas field development projects are described as follows:

a) There are three main gas reservoirs (OGIS = 1.25 tcf) and a satellite well.

b) Reservoirs are developed from offshore platforms, each costing between $ 100 and $ 150 million. Each platform has several slots for producing wells. Drilling cost is between $ 10 and $ 20 million per well.

c) Gas is transported via pipelines 12 to 15 km long. Capacity of surface facility is 200 MMscfd. The minimum delivery pressure is 900 psi.

d) There is a penalty for non delivery of contract gas volume. Compressors will be deployed to boost reservoir performance whenever necessary.

Develop various development scenarios, both traditional and economic. Compare them. **[25]**

Q7) a) Write a detailed note on Petroleum Fiscal System. **[10]**

b) A detailed account of production history along with cost incurred during the project span is given in the following table. Oil price is assumed to be $ 55/bbl throughout the tenure of the project.

All values for costs are in million dollars, and Oil production in millions of barrels annually.

Table: Economic evaluation data for the project

Year	Oil production MM bbl/year	Capital cost ($MM)	Operation cost ($MM)	Production cost ($MM)
1	0	15.125	------	------
2	0	60.750	------	------
3	5.6	120.50	4.345	12.225
4	11.2	3.975	10.900	22.260
5	5.6	------	19.500	12.982
6	2.1		12.500	5.200
7	1.05	------	11.500	2.765
8	1.2	------	12.500	2.450
9	2.7	------	9.500	5.910
10	1.9	------	9.500	4.505
11	0.9	------	9.500	2.500
12	0.6	------	9.500	1.750
13	0.2	12.300	8.250	0.590

Using above data, prepare a detailed spreadsheet showing gross profit, royalty, net revenue, yearly total expenditure and net profit per year. Royalty is 10% per year on annual production, which has to be paid with the beginning of commercial production. Income tax is 30% of net profit. **[15]**

OR

Q8) a) Describe the factors that must be considered in the selection process of potentially applicable enhanced oil recovery process for a given field. What are preferred oil viscosity ranges and depth limitations for applying different EOR methods? **[15]**

b) Write notes on **any two** of the following: **[10]**

i) Role of horizontal wells in increasing reservoir recovery.

ii) History matching.

iii) Formation Damage.

iv) Tight reservoirs.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1545

[3865] - 663

M.E. (Computer and Computer Networks)

EMERGING TRENDS IN COMPUTER ARCHITECTURE

(510102) (2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State and explain in brief the basic issues that must be addressed by symmetric multiprocessors. Also explain how these issues are addressed in CC-NUMA systems. **[8]**

b) Explain the memory channel interconnect used in Digital Trucluster. **[8]**

Q2) a) Describe the metrics used to assess the performance of a network or a system interconnect. **[8]**

b) What is Myrinet? Describe its capabilities and limitations to support cluster-computing applications. **[8]**

Q3) a) State the various mechanisms used for synchronization. Also explain the low-level synchronization primitives. **[8]**

b) Explain the LogP communication model and discuss how it can be used to identify communication bottlenecks. **[8]**

Q4) Write short notes on: **[18]**

a) Architecture for massively parallel processors.

b) ATM cell switching.

c) Transmission Control Protocol (TCP)

P.T.O.

SECTION - II

Q5) a) Explain in brief the importance of data availability and discuss how the availability can be maintained in following situations: **[8]**

i) Failure of I/O server.

ii) Failure of disk subsystem.

b) Compare the storage area network and system area network. **[4]**

c) Discuss the advantages and disadvantages of network attached storage. **[4]**

Q6) a) Explain the sneha-samuham model for grid computing. **[8]**

b) Discuss the advantages of grid computing over conventional systems. **[4]**

c) Explain in brief the intragrid and intergrid models for grid architecture. **[4]**

Q7) a) Describe the support available in highperformance FORTRAN for data parallelism. **[6]**

b) Explain various communication modes used in message-passing systems. **[5]**

c) Explain how the static as well as dynamic parallelism is supported in PVM. **[5]**

Q8) Write short notes on: **[18]**

a) 'Fabric topology' used in SAN.

b) Web services for grid computing.

c) Data parallel model (for parallel programming).

Total No. of Questions : 10] **[Total No. of Pages : 3**

P1546

[3865] - 513

M.E. (Mechanical) Mechatronics

MECHANICAL & ELECTRONIC MEASUREMENTS

(2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer three questions from Section - I and three questions from Section - II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Attempt Any Two of following.

a) A Thermometer is used for the range of 200ºC to 400ºC and it is stated that its accuracy is one quarter of 1 percent. What does it means in terms of temperature? **[8]**

b) Explain "Resolution" and "Least Count" with suitable examples. **[8]**

c) A Bridge circuit has $R_1 = R_2 = R_3 = R_4 = 120\ \Omega$ and 10 V supply. When 3½ digit DVM of 200 mV range is used as null detector, find the resistance resolution for measurement of R_4. **[8]**

Q2) Attempt Any Two of following.

a) Find the accuracy of flow process if transducer transfer function is 10 mV(m^3/s) ± 1.5% and signal conditioning transfer function is 2 mA/mV±0.05%. **[8]**

b) The 14 oz weights are measured on precision scale. The results are as follows. **[8]**

1.08, 1.03, 0.96, 0.95,1.04, 1.01, 0.98, 0.99, 1.05, 1.08, 0.97, 1.00, 0.98, 1.01

Calculate 95% confidence interval for population mean.

c) Compare "Accuracy" and "Precision" with suitable examples. **[8]**

P.T.O.

Q3) Attempt Any Two of following.

a) Discuss "Traceability" and its requirements. **[8]**

b) Explain AC and DC bridges used in instrumentation. **[8]**

c) A measurement of Temperature using a sensor tat outputs 6.5 mV/ºC must measure to 100ºC. A 6 bit ADC with a 10 V reference is used. **[8]**

i) Develop a circuit to interface the sensor and ADC.

ii) Find Temperature resolution.

Q4) a) Explain Op-Amp configured as Voltage to Current converter with a neat figure. Discuss any one application of such converter. **[8]**

b) Explain Primary standards and Secondary standards of calibration for mechanical measurements. **[8]**

Q5) Attempt Any Three of following.

a) Explain Successive Approximation method used in ADC. **[6]**

b) A sensor resistance changes linearly from 100 Ω to 180 Ω as temperature changes from 20ºC to 120ºC. Find a linear equation relating to resistance and temperature. **[6]**

c) Define Mean, Mode, Deviation, Variance and Probability of error with respect to Mechanical and Electronic Measurements. **[6]**

d) A power supply has an internal resistance of 10 Ω and internal voltage of 50 V. Calculate the power which will be delivered to external loads of 5 Ω and 20 Ω. **[6]**

SECTION - II

Q6) Attempt Any Two of following.

a) Explain LVDT used for displacement with respect to construction, working and two applications. **[8]**

b) Compare Thermocouple, Thermisters, and RTDs based on Principle of working, linearity, range and precision. **[8]**

c) Explain with a neat block diagram, time compression analyzer. Also draw sample input and corresponding output signal. Write your comment by comparing these two signals. **[8]**

Q7) Attempt any two of following.

a) Explain the use of Strain gauges as Load cells with respect to construction, Whetstone's bridge arrangement and bridge offset voltage. **[8]**

b) Draw the block diagram of spectrum analyzer and explain three important features. **[8]**

c) A SS pressure sensor that outputs 25 mV/kPa for pressure variation of 0 to 25 kPa is used as level measurement of a liquid with density of 1.3 kg/m. What voltage output is expected for level variation of 0.2 m. **[8]**

Q8) Attempt any two of following.

a) A simple load cell consisting of Aluminum post of 2.5 cm radius. With 4 strain gauges in bridge with bridge input voltage as 2 V and $R_1 = R_2 = R_G = 120\ \Omega$. With Gauge Factor of 2.13, find the variation of bridge offset voltage for load of 22240 N. **[8]**

b) Write a short note on Logic Analyser with respect to Block diagram, triggering method and two applications of it. **[8]**

c) Explain in brief two techniques to achieve EMC. **[8]**

Q9) Attempt any two of following.

a) Describe six important features of Digital Storage Oscilloscope and their relevance in Electronic and Mechanical Measurement. **[8]**

b) Discuss in brief two techniques of EMI measurement. **[8]**

c) Explain the principle of Hall Effect. A Hall effect transducer is used to measure a magnetic field of 5000G. A 2 mm slab of Bismuth is used with 2 mm slab of Bismuth is used with 3 A current ($K_H = -1(10^3)$V/A.G. Calculate the voltage output of the device. **[8]**

Q10) Attempt any two of the following.

a) Explain with a neat sketch McLead Gauge used in low pressure measurement. **[9]**

b) Draw block diagram of spectrum analyzer and explain working in brief. **[9]**

c) A LVDT has maximum core motion of 1.5 cm with a linearity of 0.3 over the range. The transfer function is 23.8 mV/mm. If used as to track work piece motion from -1.2 to +1.4 cm, what is expected voltage output? What is uncertainty in position determination due to non linearity. **[9]**

Total No. of Questions : 10] **[Total No. of Pages : 4**

[3865] - 496

P1547

M.E. (Mechanical Engineering) (Design Engineering)

ADVANCED STRESS ANALYSIS

(502202) (2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

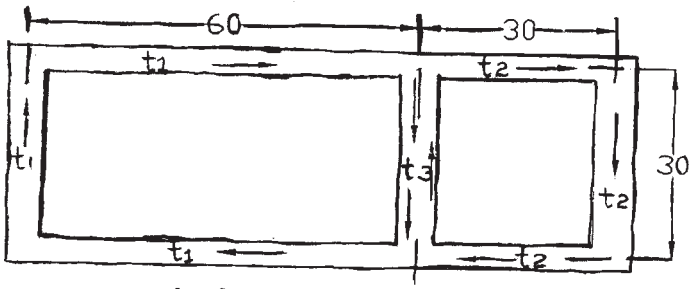
1) ***Answer any three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Square bracketed figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule and non-programmable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) The Airy's stress function for the stress distribution under knife edge on the boundary of infinite solid is given in polar coordinates by $\Phi = \frac{Pr}{\pi}\theta Sin\theta$, where P is uniformly distributed load per unit length of edge. Determine values of σ_r, σ_θ, and $\tau_{r\theta}$. Hence prove that the resultant of forces integrated along any semi circular path around the edge is equal to 'P'. **[10]**

b) Derive from first principles the compatibility equation for plane stress condition with body forces. **[6]**

Q2) a) Fig.I-1 shows a two cell tubular section whose wall thickness are t_1=3 mm, t_2=6 mm and t_3 = 4mm. For an applied torque of 540 N-m, determine the shear flow and angle of twist per meter length. Take Modulus of Rigidity as 80 GPa. **[10]**



t 1 = 3 mm, t 2 = 6 mm, t 3 = 4 mm
All dimensions in mm
Fig. I -1

b) Give the procedure to analyze a thin rectangular section conduit subjected to a torque 'T'. **[6]**

P.T.O.

Q3) Determine the intensities of principal stresses in flat steel disc of uniform thickness having a diameter of 1 m and rotating at 2400 rpm. What will be the stresses if the disc has central hole of 0.2 m diameter? Take Poisson's ratio = 0.333 and density (ρ) = 7850 kg/m^3. **[16]**

Q4) State the assumptions made in solutions of problems in contact stresses. Derive from fundamentals the expression for contact stresses between two rollers having axis parallel to each other under compressive load. How this relation is used to find contact stresses between two spur gears and then to find the wear strength of mating gear teeth? **[16]**

Q5) Write notes on any THREE. **[18]**

a) Rayleigh Ritz method.

b) Membrane Analogy.

c) Mohr's circle for three dimensional stresses.

d) Torsion of non circular shaft.

SECTION - II

Q6) a) For a three element rectangular rosette the strain observations made with gauges mounted on steel specimen are;

$\varepsilon_A = 400 \times 10^{-6}$ mm/mm

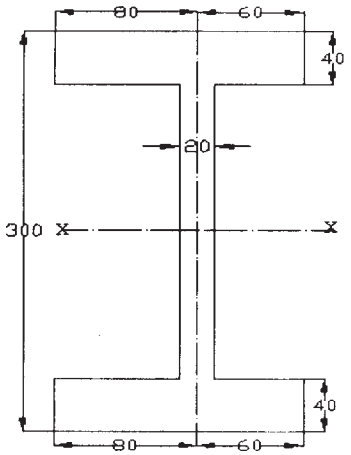
$\varepsilon_B = -200 \times 10^{-6}$ mm/mm

$\varepsilon_C = 200 \times 10^{-6}$ mm/mm

Determine principal strains, principal stresses and their directions. Take Modulus of Elasticity as 210 GPa and Poisson's ratio 0.29 for steel. **[10]**

b) Discuss the basic difference between plain polariscope and circular polariscope with respect to construction and operation. How these are useful for measurement of stresses in the given photoelastic component? **[6]**

Q7) a) Derive an expression and locate shear centre of the section of beam shown in Fig. II-1 **[10]**



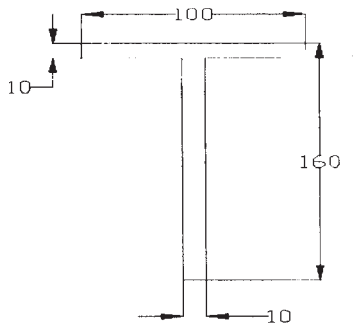
All dimensions in mm
Fig- II- 1

b) Explain the term shear centre and its importance in engineering applications. **[6]**

Q8) a) Derive fundamental equation for bending of rectangular plate with uniform loading clamped at edges with usual notations. **[10]**

b) A long thick steel tube having internal diameter 150 mm is subjected to an external pressure of 20 MPa. The allowable compressive and tensile stresses for the tube material are 160 MPa and 100 MPa respectively. Determine the outer diameter of the tube by maximum principle stress theory. **[6]**

Q9) a) What is importance of shape factor? Obtain shape factor for "T" section beam of dimensions 100 x 160 x 10 mm as shown in Fig. II-2. **[10]**



All dimensions in mm
Fig- II- 2

b) Explain the fracture mechanics approach for estimation of residual life of a component. What is critical stress intensity factor? **[6]**

Q10) Write short notes on any THREE. **[18]**

a) Stress Intensity Factor and Stress Concentration Factor.

b) Brittle Coating Method.

c) Bending of Circular Plate.

d) Tardy's Method.

Total No. of Questions : 8] **[Total No. of Pages : 6**

P1548

[3865] - 476

M.E. (Mech.-Heat Power)

ADVANCED THERMODYNAMICS

(2008 Course) (502102)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain:- **[12]**

i) Isothermal compressibility (α) and coeff. of volume expansion (β).

ii) Maxwell-Relations.

iii) Ideal and Real gas behaviour.

b) Draw "P-T" diagram for the substance: **[4]**

i) Which expands on freezing.

ii) Which contracts on freezing.

Q2) a) A cylinder of volume 0.1 m^3 contains 7-kg ethane at a pressure of 70 bar (7000kPa) using compressibility chart, find the temperature of ethane in the cylinder.

For Ethane:- T_c = 305.4 K; P_c = 4.884 MPa.

You may use the chart (by using pseudo-volume) **[7]**

b) 100 kg per hour of steam is throttled from 1.5 MPa & 0.96 dry to a pressure of 1 bar. Find the temperature after throttling. Also find the Irreversibility in kW. Is the process Reversible? **[9]**

P.T.O.

Q3) a) Starting from "T.ds" equations, derive the relation $(C_p - C_u) = \left(\frac{T.\vartheta.\beta^2}{\alpha} \right)$, where notations carry usual meanings.

Mention any two conclusions from the above relation. **[10]**

b) Explain in brief:- **[6]**

i) Helmholtz and Gibb's function.

ii) Law of degradation of energy.

Q4) a) 8 kg of Iron ingot at 820ºC (820 deg.cent.) is dropped into an oil bath at 75ºC, containing 30 kg of oil. Determine the net change in entropy when the system reaches a common temperature. Take sp.heat of iron as 400J/kg.K & that of oil as 1.9 kJ/kg.K. Also find loss of availability when the surroundings are at 30ºC **[10]**

b) Write short notes on:- **[8]**

i) Inversion curve.

ii) Law of corresponding states.

SECTION - II

Q5) a) Determine the Adiabatic Flame temperature when gaseous n-octane $[C_8H_{18}(g)]$; reacts with 100% excess air at constant pressure in a steady flow process. Reactants are at standard state.

You may use the tables given at the end. **[12]**

b) What is law of mass action? Explain. **[4]**

Q6) Write short notes (on any three):- **[18]**

a) Langrangian multipliers.

b) Bose-Einstein statistics.

c) Fermi-Dirac statistics

d) Gibb's phase rule.

Q7) a) NO, which dissociates according to the equation,

$NO \rightleftharpoons \frac{1}{2} N_2 + \frac{1}{2} O_2$.

Show that at equilibrium,

$$K = \frac{1}{2}\left(\frac{\epsilon_e}{1-\epsilon_e}\right).$$

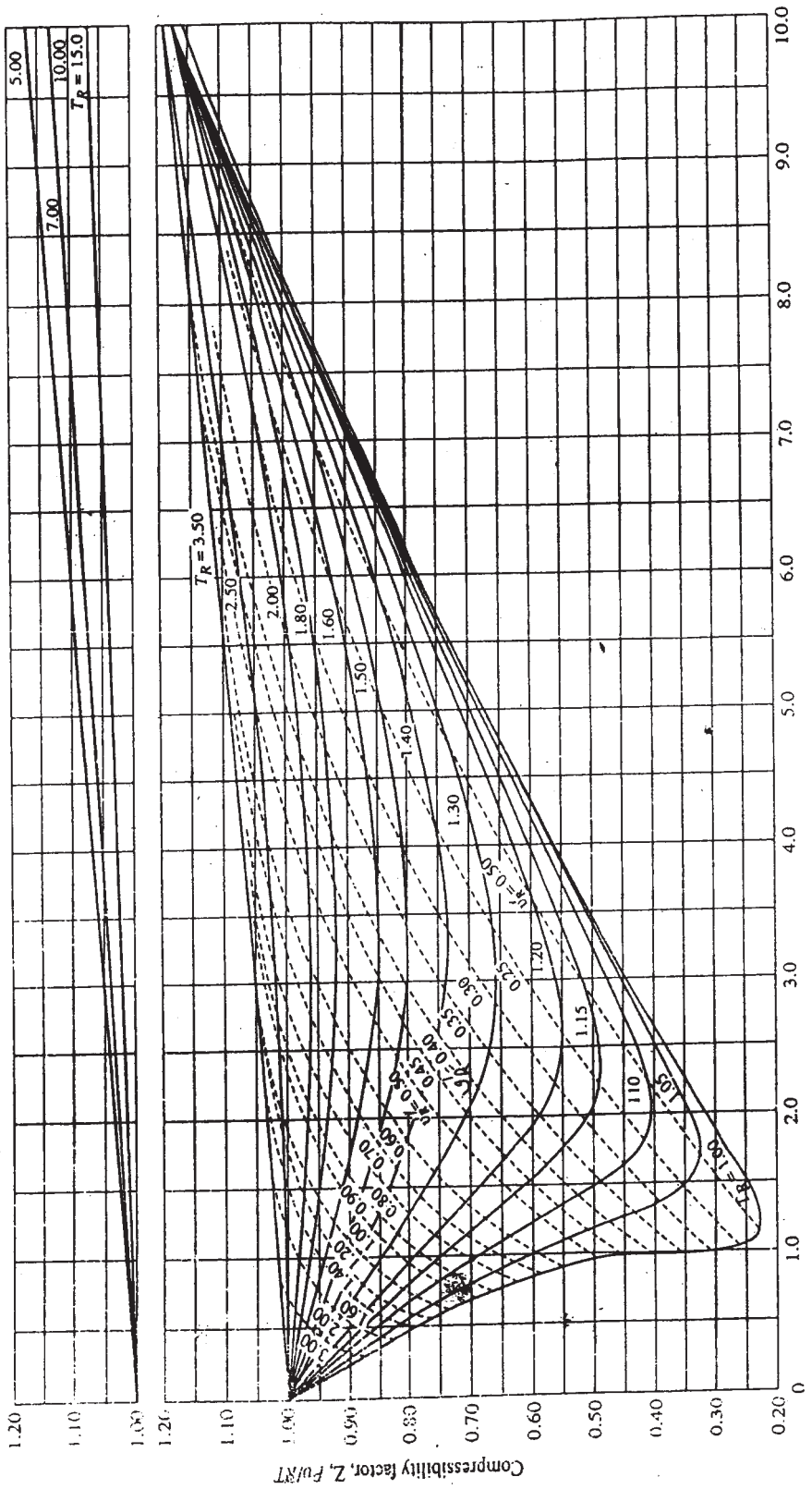
Where notations carry usual meanings. **[10]**

b) Write a short note on fugacity and activity. **[6]**

Q8) a) Show that at the triple point, Gibb's function will have the same value in all the three phases of water. At triple point the enthalpy & entropy of ice are - 333.3 kJ/kg and –1.22 kJ/kg.K, respectively. **[6]**

b) An insulated chamber is divided into two compartments by a thin partition. Each compartment sizes are 0.125 m^3 and 0.1 m^3 respectively. Larger compartment contains oxygen at 350 kPa and 40ºC. While the smaller one contains Nitrogen at 700 kPa and 100ºC. The partition is removed and gases are allowed to mix. Calculate sp.gas constant C_V & final temperature of mixture.

Take C_V for oxygen & Nitrogen as 0.65 and 0.743 kJ/kg.K. respectively. **[10]**



- Fig Q.2 - *Compressibility chart, low pressure range* -

- TABLE-I -

TABLE I - *Enthalpy of Formation, Gibbs Function of Formation, and Absolute Entropy of Various Substances at 25°C, 1 atm. pressure*

Substance	Molecular Weight, M	$\bar{h}_f^0$ kJ/kg mol	$\bar{g}_f^0$ kJ/kg mol	s^0 kJ/kg mol K
CO(g)	28.011	− 110529	− 137150	197.653
CO_2(g)	44.001	− 393522	− 394374	213.795
H_2O(g)	18.015	− 241827	− 228583	188.833
H_2O(l)	18.015	− 285838	− 237178	70.049
CH_4(g)	16.043	− 74873	− 50751	186.256
C_2H_2(g)	26.038	+ 226731	+ 209234	200.958
C_2H_4(g)	28.054	+ 52283	+ 68207	219.548
C_2H_6(g)	30.070	− 84667	− 32777	229.602
C_3H_8(g)	44.097	− 103847	− 23316	270.019
C_4H_{10}(g)	58.124	− 126148	− 16914	310.227
C_8H_{18}(g)	114.23	− 208447	+ 16859	466.835
C_8H_{18}(l)	114.23	− 249952	+ 6940	360.896

TABLE-II

Enthalpy of Formation at 25°C, Ideal Gas Enthalpy, and Absolute Entropy at 0.1 MPa (1 bar) Pressure

	Nitrogen, Diatomic (N_2) $(\bar{h}^\circ_f)_{298}$ = 0 kJ/kmol M = 28.013		*Oxygen, Diatomic* (O_2) $(\bar{h}^\circ_f)_{298}$ = 0 kJ/kmol M = 31.999	
Temp. K	$(\bar{h}^\circ - \bar{h}^\circ_{298})$ kJ/kmol	$\bar{s}^\circ$ kJ/kmol K	$(\bar{h}^\circ - \bar{h}^\circ_{298})$ kJ/kmol K	$\bar{s}^\circ$ kJ/kmol K
0	−8669	0	−8682	0
100	−5770	159.813	−5778	173.306
200	−2858	179.988	−2866	193.486
298	0	191.611	0	205.142
300	54	191.791	54	205.322
400	2971	200.180	3029	213.874
500	5912	206.740	6088	220.698
600	8891	212.175	9247	226.455
700	11937	216.866	12502	231.272
800	15046	221.016	15841	235.924
900	18221	224.757	19246	239.936
1000	21406	288.167	22707	243.585
1100	24757	231.309	26217	246.928
1200	28108	234.225	29765	250.016
1300	31501	236.941	33351	252.886
1400	34936	239.484	36966	255.564
1500	38405	241.878	40610	258.078
1600	41903	244.137	44279	260.446
1700	45430	246.275	47970	262.685
1800	48982	248.304	51689	264.810
1900	52551	250.237	55434	266.835
2000	56141	252.078	59199	268.764

– TABLE-III –

Temp. K	Carbon Dioxide (CO_2) $(\bar{h}^\circ_f)_{298} = -393522$ kJ/kmol, M = 44.01 (CO_2) $(\bar{h}^\circ - \bar{h}^\circ_{298})$ kJ/kmol	$\bar{s}^\circ$ kJ/kmol K	Carbon Monoxide (CO) $(\bar{h}^\circ_f)_{298} = -110529$ kJ/kmol, M = 28.01 (CO) $(\bar{h}^\circ - \bar{h}^\circ_{298})$ kJ/kmol	$\bar{s}^\circ$ kJ/kmol K
0	– 9364	0	– 8669	0
100	– 6456	179.109	– 5770	165.850
200	– 3414	199.975	– 2858	186.025
298	0	213.795	0	197.653
300	67	214.025	54	197.833
400	4008	225.334	2975	206.234
500	8314	234.924	5929	212.828
600	12916	243.309	8941	218.313
700	17765	250.773	12021	223.062
800	22815	257.517	15175	227.271
900	28041	263.668	18397	231.006
1000	33405	269.325	21686	234.531
1100	38894	274.555	25033	237.719
1200	44484	279.417	28426	240.673
1300	50158	283.956	31865	243.426
1400	55907	288.216	35338	245.999
1500	61714	292.224	38848	248.421
1600	67580	296.010	42384	250.702
1700	73492	299.592	45940	252.861
1800	79442	302.993	49522	254.907
1900	85429	306.232	53124	256.852
2000	91450	309.320	56739	258.710

– TABLE-IV –

Temp. K	Water (H_2O) $(\bar{h}^\circ_f)_{298} = -241827$ kJ/kmol, M = 18.015 $(\bar{h}^\circ - \bar{h}^\circ_{298})$ kJ/kmol	$\bar{s}^\circ$ kJ/kmol K	Hydrogen, Diatomic (H_2) $(\bar{h}^\circ_f)_{298} = 0$ kJ/kmol, M = 2.016 $(\bar{h}^\circ - \bar{h}^\circ_{298})$ kJ/kmol	$\bar{s}^\circ$ kJ/kmol K
0	– 9904	0	– 8468	0
100	– 6615	152.390	– 5293	102.145
200	– 3280	175.486	– 2770	119.437
298	0	188.833	0	130.684
300	63	189.038	54	130.864
400	3452	198.783	2958	139.215
500	6920	206.523	5883	145.738
600	10498	213.037	8812	151.077
700	14184	218.719	11749	155.608
800	17991	223.803	14703	159.549
900	21924	228.430	17682	163.060
1000	25978	232.706	20686	166.223
1100	30167	236.694	23723	169.118
1200	34476	240.443	26794	171.792
1300	38903	243.986	29907	174.281
1400	43447	247.350	33062	176.620
1500	48095	250.560	36267	178.833
1600	52844	253.622	39522	180.929
1700	57685	256.559	42815	182.929
1800	62609	259.372	46150	184.833
1900	67613	262.078	49522	186.657
2000	72689	264.681	52932	188.406

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1549

[3865] - 217

M.E. (Petroleum Engineering)

HORIZONTAL AND MULTILATERAL DRILLING

(2002 Course) (512102)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Question numbers, One and Five are Compulsory. Out of the remaining, solve two questions from Section - I and two questions from Section - II***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, and electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss casing design in detail considering, material selection and biaxial loading. **[9]**

b) Find tentative 9-5/8 inch casing shoe depth; using, following well data. **[9]**

Depth-(metre)	Formation pressure in, M.W.E	Formation fracture gradient in, M.W.E.
500	1.05	1.2
1300	1.05	1.3
2250	1.15	1.72
2500	1.30	1.9
2900	1.52	2.16
3000	1.60	2.20
3150	1.80	2.22
3400	1.90	2.23
4000	1.91	2.30

Q2) a) Explain geometrical planning of type - I profile in detail. **[8]**

b) Find length of L-80 casing pipe to order : using, following data: **[8]**

Kick off depth = 1000 ft, measured depth = 7348 ft and deviation = 40º

Vertical depth	Grade
0 to 2400 ft	L-80
2400 to 4900 ft	K-55
4900 to 6200 ft	L-80

P.T.O.

Q3) a) Write function and working of different sensors used in MWD tool. **[8]**

b) Discuss any one case study related to multilateral drilling on the basis of type, design, junction design and completion in brief. **[8]**

Q4) a) Discuss different types of horizontal wells and their completion technique, in brief. **[8]**

b) Write short notes on, **[8]**

i) Whipstock

ii) Skin factor

SECTION - II

Q5) Explain primary cementation with suitable sketch. Calculate the slurry weight, if, slurry consists of class G cement, 35% sand, 0.5% retarder and 46% water. Class G cement weighs 94 lb/sack, absolute volume = 3.60 gal/sack, absolute volume of sand = 0.0456 gal/sack and water weight = 8.33 ppg. Basis is one sack of class G cement. **[18]**

Q6) Discuss energy balance in hydraulics system and determine the pressure at the bottom of the drill string if, frictional pressure loss in the drill string is, 1450 psi, the flow rate is, 400 gpm, the mud density is, 12 ppg & well depth is, 10,000 ft. The internal diameter of the drill collar at the bottom of the drill string is 2.5" and the pressure delivered by the pump is 3,000 psi. **[16]**

Q7) Write short notes on, **[16]**

a) Under balance drilling.

b) Torque & drag in horizontal drilling.

Q8) a) Discuss, balance tangential survey method' in detail. **[8]**

b) Write short note on: **[8]**

i) Mud circulation system of a drilling rig.

ii) Bottom hole assemblies for directional well.

Total No. of Questions : 6] **[Total No. of Pages : 3**

P1551

[3865]-165
M.E. (Electrical) (Control Systems)
OPTIMIZATION TECHNIQUES AND OPTIMAL CONTROL
(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables and electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define 'unimodal function'. State its properties. **[5]**

b) Draw flow chart and explain Fibonacci Search method for one dimentional optimization problem. **[8]**

c) Locate the minimum point of the function, $f(x) = 1.5x - 3x^2 + 2$ in the interval (0, 1) within an accuracy of ± 0.05 by using Fibonacci Search method. **[12]**

Q2) a) Draw flow chart and explain the algorithm for the steepest descent method of unconstrained optimization. **[10]**

b) Use Steepest Descent method or Fletcher - Reeves conjugate gradient method to minimize the function $f(x_1, x_2) = x_2 - x_1 + 2x_2^2 + 2x_1x_2 + x_1^2$ with the starting point $x_1 = 0.75$ and $x_2 = -0.25$. Give the calculations for two iterations only. **[15]**

Q3) a) State the general Linear Programming Problem in the standard form and explain the terms : **[9]**

i) Basic solution.
ii) Basic feasible solution.
iii) Optimal solution.

P.T.O.

b) Explain with flow chart the 'Simplex Method' used in solving Linear Programming Problem. **[10]**

c) Explain Bellman's Optimality principle. State merits and demerits of Dynamic Programming. **[6]**

SECTION - II

Q4) a) Derive the 'Euler - Lagrange Equation' from the fundamental principles. **[8]**

b) Find the extremal for the functional

$$J(x) = \int_0^3 (2\dot{x}^2 - 3x^2)dt$$

which satisfies the boundary conditions:

$x(0) = 0$ and $x(3) = 2$ **[10]**

c) State and explain the "Transversality Condition". **[7]**

Q5) a) State and explain the state regulator problem and show that for an infinite-time state regulator problem, the performance index is

$$J = \frac{1}{2}\int_0^\infty \left[x^T(t)Qx(t) + u^T(t)Ru(t)\right]dt$$

with usual notations. **[10]**

b) A linear time-invariant control system is given by

$$\dot{x}(t) = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix} x(t) + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u(t)$$

i) Find the optimal control law which minimizes the performance index

$$J = \frac{1}{2}\int_0^\infty \left[x^T(t)Qx(t) + u^T(t)Ru(t)\right]dt$$

Assume $Q = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ and $R = 1$.

ii) Test whether the regulator closed-loop system with above optimal control law is asymptotically stable. **[15]**

Q6) Attempt any three of the following :

a) State and explain Pontryagin's Minimum Principle and outline the procedure for solving optimal control problem using Pontryagin's minimum principle. **[9]**

b) Define Hamiltonian. Derive the state, co-state and control equations. **[8]**

c) Explain any one method for the numerical solution of reduced order 'Matrix Riccati Equation'. **[8]**

d) Explain with block diagram the time-optimal Bang-bang Control System. **[8]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1552

[3865]-47

M.E. (Mechanical) Design & Heat Power Engineering
INSTRUMENTATION & AUTOMATIC CONTROL
(2002 Revised Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Assume suitable data, if necessary.***
4) ***Numbers to right side of question indicate marks.***

SECTION - I

Q1) a) Explain transfer function & its importance. **[8]**

b) Obtain the overall transfer function of system shown in fig.1. **[8]**

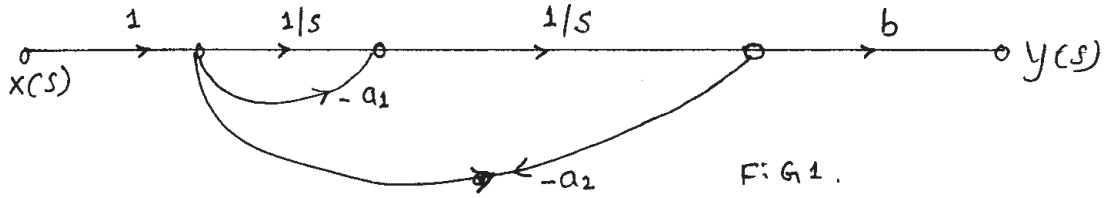


FIG 1.

Q2) a) Discuss different sources of error in measurement. **[8]**

b) Discuss with the help of block diagram of generalised measurement system. **[8]**

Q3) a) Explain the architecture of a PLC system. **[10]**

b) Draw a ladder diagram for a batch water heating system. The control system has two push buttons. The start push button is normally open (NO) type and NC contacts are provided for sensing high level and low level of water. **[8]**

Q4) a) Explain with examples of following system. **[8]**

i) Feedforward control system.
ii) Feedback control system.

b) Explain hydraulic P+I+D controller. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain the construction & working of ultrasonic flow meter. **[8]**

b) Compare step input response of first order and second order system. **[8]**

Q6) a) Explain how the torque can be measured on a rotating shaft. **[8]**

b) Explain various elements of signal conditioning system. **[8]**

Q7) a) Explain the principle, working of ultra low pressure measuring device. **[8]**

b) Explain various controls used in boiler. **[8]**

Q8) Write short notes on any 3 : **[18]**

a) Hot-wire anemometer.

b) Installation of thermocouples.

c) A|D convertor.

d) Strain gauge materials.

e) Electronic controllers.

Total No. of Questions : 8] **[Total No. of Pages :2**

P1553

[3865]-8
M.E.Civil (Const & Mgnt)
PROFESSIONAL PRACTICES IN CONSTRUCTION
(2002 Course)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) What are various types of contracts? Compare and contrast them w.r.t. **[18]**

a) Formation.

b) Suitability.

c) Special features.

Q2) What are pre-qualifications in a tender? Why are they specified? How are tenderers scrutinized for the prequalification? Explain the procedure with an example. **[16]**

Q3) Compare MOS & PI conditions with FIDIC (Red Book) document for the following: **[16]**

a) EMD & SD.

b) Advances.

c) Interim Bills/R.A bills.

d) Final Bill.

Q4) Explain the details of **[16]**

a) 3 bid system.

b) Ring or cartel formation and its detection.

c) Comparitive statement.

d) Evaluated bid price (EBP).

P.T.O.

SECTION - II

Q5) With reference to the Indian contract Act (1872) explain **[18]**

a) Valid contract-formation sequence.

b) Excuses for non-performance, acceptable in the contract, with suitable examples.

c) Consequences of breach of contract.

Q6) With reference to the Indian Arbitration Act (1996) explain **[16]**

a) Why arbitration is a semi-judicial process.

b) Speaking and non-speaking awards.

c) Grounds for challenge of award.

d) Procedure for hearing the dispute.

Q7) With reference to the Dispute Adjudication Board (DAB) explain **[16]**

a) Advantages of DAB.

b) Formation and replacement process of board.

c) Role of chairman.

d) Mode of payment to board members and the total cost on (DAB).

Q8) Explain the details of: **[16]**

a) Reasons for construction claims.

b) Various FIDIC documents.

c) CIDC - SIAC Institutionalized Arbitration.

d) Differences between mediation and conciliation.

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Total No. of Questions : 6] **[Total No. of Pages : 4**

P1554

[3865]-12

M.E. (Civil) (Const. & Mgmt.)

HUMAN RESOURCE DEVELOPMENT IN CONSTRUCTION

(2002 Course) (Elective - I)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Highlight the historical progress of the HRD and HRM and with examples, explain the efforts you would take as an HR manager to develop. **[10]**

i) Masons.
ii) Watchman.
iii) Site supervisor.
iv) Site engineer.
v) Project manager.

b) Elaborate the HR objectives set by NTPC and explain the various efforts taken by their top management to achieve these objectives. **[4]**

c) What qualities are required to become a good HR manager? Explain.**[4]**

Q2) As a result conducting the training needs assessment of site engineers executing nuclear power projects, on behalf of the contractor, the following findings emerged.

a) 70% of the personnel were not proficient in understanding the intricacies associated with such projects and 40% of theses personnel did not have any field experience associated with such execution.

b) 30% personnel were unable to interprete the working drawings properly.

P.T.O.

c) The execution required preparation of "Mockups" for very special items and getting them approved by the client, but no engineer was exposed to such a system, in their previous work experience.

d) 80% engineers were very good in execution of a specified work through use of a method control statement, nevertheless they lacked the co-ordination skills with various agencies involved.

e) 50% personnel were very poor in reporting systematically and promptly and hence the planning department was frequently under pressure.

f) 25% staff were not conversant with the use of latest construction materials, technique and machineries.

g) Site documentation was proper in general, but was not in accordance with the ISO 9001 : 2000 procedures.

h) 15% engineers were unable to use existing soft wares related to procurement, billing and MIS.

i) 65% of the staff faced a linguistic communication problem while dealing with the sub-contractors, labours and vendors because of multi-linguistic communications required.

j) Safety policies, procedures and techniques were not being implemented effectively on the site.

The client-contractor relationships were strained due to the above scenario. Also the progress of the site was very slow. As a result, the interim billing of the contractor was drastically affected. The total number of site engineers associated were 20. The average yearly package of each engineer was Rs.4 lackhs. The project packages, together value Rs.3000 corores, expected to be completed within a period of 36 calendar months. You are the HR manager of the contracting firm. Design and develop a cost effective, training programme, taking due consideration of the various requirement of the training programs, traines and the trainees, in order to generate profit and credit worthiness from the site execution team. Make relevant, necessary assumptions. Also prepare a feedback form for evaluating the training given. **[16]**

Q3) a) Explain with examples, the various skills required by construction project leaders. Explain how the relative importance index is worked out. **[6]**

b) Explain the 3 leadership styles with proper examples. Which style is the best? Why? **[10]**

SECTION - II

Q4) a) Explain competency mapping w.r.t. **[10]**

i) Concept.
ii) Advantages.
iii) Overall process.
iv) Benchmarking requirements for any one generic or functional competency.

b) Explain with examples, how the human resource function and the project quality get inter-related. How would you build the quality aspects in a HR programme? **[6]**

Q5) a) It was decided to evaluate the functional competencies of the project managers working company for the following functions.

i) Project Management (PM).
ii) Cost Management (CM).
iii) Contracts Management (CTM).
iv) ISO Systems Management (ISOM).

On a 10 point scale, the required proficiences for each of the above functions were benchmarked as follows.

i) PM - 10
ii) CM - 8
iii) CTM - 7
iv) ISOM - 9

As a result of the 360º feedback appraisal system, the following data was generated as regards a particular project managers available proficiency.

Function	Self Appraisal	Appraisal by General Manager	Appraisal by works managers				Appraisal by Peer group			Appraisal by project controller
			1	2	3	4	1	2	3	
PM	6	6	5.5	6	4	6	5	9	5.5	7
CM	7	6	6.5	6	4	7	6	9	7	6
CTM	8	7	7.5	9	4	8.5	7	8	7.5	7
ISOM	6	5.5	6	7	4	5.5	7	9	5	6

Your are the HR manager. Study the above 360° feedback carefully; and determine the (AP) for each function. Determine the gaps, suggest developmental programme for the project manager. Also try to analyse the possibilities of the human relations between the various personnel. Make your comments, based on certain assumptions, perceptions. Justify your action plan. **[12]**

b) Draft the charter for benchmarking the responsibilities of either **[6]**

i) Site engineer of an infrastructure project.

OR

ii) Faculty member at senior lecturer level associated with civil engineering. Make relevant assumptions.

Q6) a) With examples, explain the basic principles of learning. When, during any training programme there are variety of learners, what strategy you would adopt? **[6]**

b) You represent the Board of Governors of a MNC associated with construction of infrastructure projects. Draft a **[6]**

i) Balanced Score Card and

ii) Personal Score Card for, evaluating performance of the Managing Director of the company. Assume relevant data.

c) Explain the procedure of training needs assessment and its importance in HRM. **[4]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1555

[3865]-17

M.E. (Civil) (Const. & Mgmt.)

TQM AND MIS IN CONSTRUCTION

(2002 Course) (Elective)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain PDCA cycle with an example. **[4]**

b) Explain QFD with an example. **[4]**

c) Explain capabilities of PRRT software. **[5]**

d) Discuss problems in implementation of TQM programs. **[5]**

Q2) a) Classify the construction defects and explain each one with appropriate examples. **[12]**

b) Explain TQM philosophy with an example. **[4]**

Q3) a) Explain eight ISO 9001:2000 principles with examples. **[8]**

b) Explain audit process of ISO 9001:2000 in detail. **[8]**

Q4) a) Discuss various reasons for poor quality of a construction project and suggest recommendations to ellimate these causes. **[10]**

b) Explain quality circles and their role in TQM programs. **[6]**

P.T.O.

SECTION - II

Q5) What is MIS? On a major const. project which are the various information sub-systems which the management has to maintain? What are advantages of MIS? Explain the above sub-systems with a flow diagram each. **[18]**

Q6) With reference to the IT standards explain the following :

a) Measurement and documentary standards. **[8]**

b) Procedure of conformity assessment as well as accreditation. **[8]**

Q7) You are the project controller for various construction sites. You intend to create a database wherin you want to keep all the different projects controlled by you. The database should have various electronically maintained files related to time, cost, quality, safety, construction disputes etc. Explain how you can make use of MS Office, MS Excel and MS Access as well as MS Project programs to create the database, operate and maintain it effectively. Consider 3 projects with suitable assumptions and explain the above. Draw diagrams appearing on the computer screen. **[16]**

Q8) What is ERP? Which are the various modules under ERP suited to construction organisations? Discuss advantages and limitations of ERP.**[16]**

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Total No. of Questions : 9] **[Total No. of Pages : 2**

P1557

[3865]-22
M.E. (Civil) (Hydraulics)
IRRIGATION & DRAINAGE
(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Describe the different water storage zones, with reference to soil-water relationship. **[8]**

b) What are the different soil-moisture constants? Explain each of them briefly. **[8]**

Q2) a) Differentiate clearly between actual evapotranspiration and potential evapotranspiration. **[6]**

b) What do you understand by 'Consumptive Use'? Briefly explain the factors affecting the consumptive use. **[6]**

c) Using the data given below, determine after how many days you will order irrigation for the crop in order to ensure healthy growth of the said crop: **[6]**

i) Field capacity of soil = 28%
ii) Permanent wilting point = 10%
iii) Soil density = 1320 kg/m^3
iv) Effective depth of root zone of the crop = 700 mm
v) Daily consumptive use of water for the crop = 12 mm
vi) Percentage of readily available moisture = 80%.

P.T.O.

Q3) a) What are the causes of salinity and alkalinity of soils? How are such soils reclaimed? **[8]**

b) Explain soil erosion. What are its causes? **[8]**

Q4) a) What is the general concept of drip irrigation? State the various elements of drip irrigation system. **[8]**

b) Explain the advantages and disadvantages of drip irrigation. **[8]**

Q5) Explain the following : **[16]**

a) Relative equilibrium states of water storage zones;

b) Soil conservation;

c) Flow of water in saturated and unsaturated soils;

d) Evaporation and transpiration.

SECTION - II

Q6) a) With the help of a neat sketch, explain layout of a sprinkler irrigation scheme. Show all the components and state their functions. **[8]**

b) Enlist the design steps of sprinkler system. **[8]**

Q7) a) Enlist the design steps of – **[8]**

i) Rising main

ii) Distribution system of lift irrigation system.

b) Discuss the advantages and limitations of lift irrigation system. **[8]**

Q8) a) With the help of different parameters, explain the concept of command area development. **[8]**

b) With help of sketches, explain the difference between modules and escapes. **[8]**

Q9) Write short notes (Any Three) : **[18]**

a) Onfarm structures.

b) Warabandi scheme.

c) Gravity outlet and pump outlet.

d) Land drainage - Need and measures.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1558

[3865]-29

M.E. (Civil) (Hydraulic Engg.)

OPEN CHANNEL HYDRAULICS

(501302) (2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answer 3 questions from Section I and 3 questions from Section II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Uniform flow occurs in a 6 m wide rectangular channel with a depth of 2.5 m. The bed slope is 0.004 and roughness coefficient n = 0.02 compute the rise in the channel bed by way of a hump in order to obtain critical flow. In case the critical depth is to be obtained without raising the channel bed but by constricting it, what would be the width in constricted portion. **[10]**

b) Sketch and explain depth-discharge diagram for varying specific energy. **[6]**

Q2) a) Energy loss due to jump is 7 m and Froude Number after the jump is 0.16 compute discharge, initial depth of the jump and power lost per meter width of the channel. **[8]**

b) Define hydraulic jump. Give classification and practical applications of the jump. **[8]**

Q3) a) Explain Ven Tc chow method of GVF computation. **[10]**

b) A wide rectangular channel carries a discharge of 4 $m^3/s/m$ with a bed slope of 0.0005. If the depth of flow at a section is 4.5 m, how far u/s or d/s, the flow depth would be within 10% of normal depth? Use step method with two steps. Take n = 0.03 **[8]**

P.T.O.

Q4) a) Derive differential equation of a spatially varied flow. **[8]**

b) Explain concept of control point in spatially varied flow. **[8]**

SECTION - II

Q5) a) Derive the equation of motion for GVUF in a channel having lateral outflow 'q' per unit length. **[10]**

b) What is meant by positive & negative surge? Sketch & explain, positive surge moving downstream and negative surge moving upstream. **[8]**

Q6) a) Explain the method of determining the Muskingham parameters *k* & *x* of a reach from a pair of observed inflow & outflow hydrograph. **[8]**

b) What is a flood routing? Explain method of characteristics of flood routing. **[8]**

Q7) a) A rectangular channel carries a flow with a velocity of 0.6 m/s & depth of 1.5 m. If the discharge is abruptly increased trebled by a sudden lifting of a gate on the upstream, estimate the height of a resulting surge. **[8]**

b) A rectangular channel 3 m wide has a flow of 3.5 m^3/s with a velocity of 0.75 m/s. If a sudden release of additional flow at the upstream end of the channel causes depth to rise by 50%, determine the new flow rate. **[8]**

Q8) Write short notes on any two : **[16]**

a) Dam break problem.

b) Equation of motion of stratified flow.

c) Classification of waves.

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Q3) a) Solve the boundary value problem $y'' - x = 0$, $y(0) = 0$, $y'(1) = -1/2$ using Rayleigh-Ritz method. **[12]**

b) Using Galerkin technique, solve the boundary value problem defined by
$y'' + y = -x \qquad 0 < x < 1$
$y(0) = 0 = y(1)$,taking two equal subintervals. **[13]**

SECTION - II

Q4) a) Explain the advantages of FEM over other methods of analysis. **[5]**

b) Derive stiffness matrix for the displacement of any point $p(x, y)$ having displacements u, v. **[10]**

c) Discretise the simply supported beam loaded with uniformly distributed load into finite element model (modes and elements). Show that nodal forces, boundary, conditions. Show size of stiffness matrix for your F.E. model. **[10]**

Q5) a) Explain Rayleigh-Ritz methods of analysis. **[10]**

b) Explain with suitable example and sketch plane stress, plane strain Axisymmetric problems. **[9]**

c) Derive shape function using natural co-ordinates for one-dimensional problem. **[6]**

Q6) a) Derive strain-displacement relation from basic principles. **[10]**

b) Derive shape function for quadri lateral element. **[15]**

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1559

[3865]-30
M.E. (Civil-Structures)
NUMERICAL METHODS AND FINITE ELEMENT STRUCTURAL ANALYSIS
(2002 Course) (Old)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Solve the following set of differential equations. **[13]**

$$\frac{dy_1}{dx} = -0.5y_1 \qquad \frac{dy_2}{dx} = 4 - 0.3y_2 - 0.1y_1$$

At $x = 0$ $y_1 = 4$, $y_2 = 6$ $h = 0.5$

Using Runge Kutta fourth order method. Find y_1 and y_2 at $x = 1$.

b) Using power method, determine the largest eigen value and corresponding eigen vector of the given matrix. **[12]**

$$\begin{bmatrix} 3.56 & -1.78 & 0 \\ -1.78 & 3.56 & -1.78 \\ 0 & -1.78 & 3.56 \end{bmatrix}$$

Q2) a) Solve the following partial differential equation using Crank-Nicholson method. $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ subject to initial and boundary conditions given by

At $x = 0$ and $x = 3$ $u = 0$ for all t.

At $t = 0$, $u = x^2$ for $0 < x < 3$. **[13]**

b) Solve the equation $\nabla^2 u = -10\ (x^2 + y^2 + 10)$ over the square domain with sides $x = 0 = y$, and $x = 3 = y$. With $u = 0$ on boundary and mesh length 1. **[12]**

P.T.O.

Total No. of Questions : 6] **[Total No. of Pages : 3**

P1561

[3865]-35
M.E. (Civil Structures)
ADVANCED DESIGN OF STEEL STRUCTURES
(2003 Course)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in two separate answer books.***
3) ***Neat diagrams should be drawn wherever necessary.***
4) ***Assume suitable data if required and state it clearly.***
5) ***Your answers will be valued as a whole.***
6) ***Use of IS.800, 875, 1915, 1161, hand book of steel sections is allowed.***
7) ***Use of non-programmable pocket calculator is allowed.***

SECTION - I

Q1) a) Draw the schematic arrangement of a through type truss girder railway bridge showing main vertical trusses, floor system, bottom lateral bracing, top lateral bracing, portal bracing and sway bracing. **[6]**

b) Explain why end bearings are provided in steel bridges. Draw neat sketch showing different types of bearings used in bridges. **[10]**

c) Welded girder is connected to column, using ISWB 350 @ 56.9kg/m beam to ISSC 250@ 85.56kg/m column. Design welded connection to carry 80kNm bending moment, 95kN shear force. **[9]**

Q2) a) Define stiffened, unstiffened, multi stiffened element of light gauge element. **[6]**

b) A hat section of 100mm × 80mm × 4mm with 25mm lip is used as concentrically loaded column. The effective length of column is 3.1m. Find allowable load taken by column, fy = 235 MPa. **[9]**

c) Explain concept of effective width for simply supported plate in case of small moments acting on it. **[10]**

P.T.O.

Q3) A deck type 'N' truss bridge is having 8 equal panels of 5m each with depth of the truss as 5m. For a bridge dead load and live intensities are 24kN/m & 40kN/m respectively. Draw influence line diagrams for members meeting at second top panel point from left end of truss. Hence design top chord section impact factor is 0.37. **[25]**

SECTION - II

Q4) R.C.C. flooring consists of 650mm thick slab, over which 100m tar coat is laid width of flooring, is 12.5m and is simply supported on pillars of 12m height density of tar coat is 17kN/m^3. Design the formwork using steel tubular sections. Use permissible stresses for tubular sections as given in table.1. Use usual I.S. recommendation for design of formwork. **[25]**

Q5) a) Find shape factor for 'T' section having both flange width and depth equal to 100mm. The thickness of flange and web is 10mm. **[5]**

b) Explain with suitable example complete, over complete and partial collapse condition. **[5]**

c) Design uniform I section for rectangular portal frame ABCDEF with base A & F hinged. Vertical columns AB & AF are 5.5m. in height and horizontal beam is 16m. The frame carries horizontal load of 10kN at B towards C & two vertical loads of 40kN each at C & D on beam BCDE so that BC = CD = DE = 5.5m. Use load factor = 1.7 and σ_y = 250MPa. **[15]**

Q6) a) What are various load resisting systems used for multistoried building frames? Illustrate with neat sketch. **[6]**

b) State upper bound, lower bound and uniqueness theorems of plastic analysis. **[6]**

c) Write a note on length of plastic hinge. **[6]**

d) Draw neat sketches of rigid connections. **[7]**

i) Beam to beam welded connection.
ii) Beam to column welded connection.

Show various possible arrangements for rigid connections.

Table 1

GRADEWISE PERMISSIBLE STRESSES (IN N/mm²)IN TUBE SECTIONS

SLENDERNESS RATIO λ	GRADE Yst 22	GRADE Yst 25	GRADE Yst 32
	IN COMPRESSION (AXIAL)		
0	125	150	190
10	122	145	182
20	118	140	175
30	113	135	168
40	109	130	161
50	105	126	154
60	100	121	147
70	97	116	138
80	93	109	126
90	88	100	113
100	81	91	99
110	75	81	87
120	67	72	76
130	60	64	67
140	54	57	58
150	49	50	52
160	43	44	45
170	38	40	40
180	34	35	35
190	30	31	32
200	27	28	28
210	24	25	25
220	22	23	23
230	20	20	21
240	18	19	19
250	16	17	17
300	11	11	11
350	7	7	7
	IN BENDING TENSION AND COMPRESSION		
	140	170	205
	IN AXIAL TENSION		
	125	150	190
	IN SHEAR		
	90	110	135
	IN BEARING		
	170	190	250

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1562

[3865]-39

M.E. (Civil-Structures)

NON LINEAR ANALYSIS OF STRUCTURES

(Elective - I) (2002 Course)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***
4) ***Use of non programmable calculator and stability coefficient table is permitted.***

SECTION - I

Q1) a) Explain the term non linear behaviour of structure. What are its types, illustrate with suitable example? **[10]**

b) Write step by step procedure to find approximate solution for moment-curvature non-linear analysis of beam. **[15]**

Q2) a) Derive relation for strain energies developed due to stretching and bending of an isotropic plate. **[15]**

b) Derive load-deflection relation for non-linear analysis of rectangular plate. Assume approximate function for displacement. **[10]**

Q3) a) Explain with neat sketch the nonlinear behaviour of member BC of portal frame ABCD. When axial force is applied to member BC. Refer Fig. 1. **[10]**

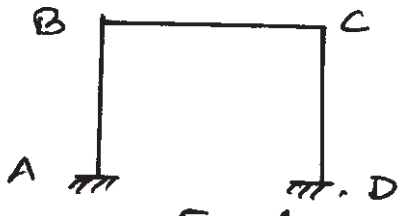

Fig : 1

b) Obtain collapse mechanism for a beam fixed at one end loaded with distributed load throughout its span and supported by a prop at other end. **[15]**

P.T.O.

SECTION - II

Q4) a) Differentiate the load deflection curve for members of elastic frame subjected to axial loads and members subjected to non axial loads. **[10]**

b) Derive the stiffness matrix for a member of rigid jointed plane frame subjected to axial loads, bending moments and shear at its ends. Member AB undergoes axial deformation u, sway *v*, rotations θ_A & θ_B. **[15]**

Q5) a) Explain nonlinear behaviour of two dimensional frame beyond elastic limit. **[8]**

b) Explain step by step method of elastic plastic analysis of propped cantilever loaded with point load at $\frac{L}{4}$ from prop. **[17]**

Q6) The rigidly jointed equilateral triangular frame is subjected to vertical force P acting upwards at A and reactions at B & C are $P/2$ downwards, resulting in creating tension in members AB & AC. Member BC is in compression. Calculate resulting secondary moments at A, B, C when P = 44.480 kN properties of members are **[25]**

For member	AC & BC	For AB
a) Cross-sectional area	322.6 mm^2	258.1 mm^2
b) Length	539 mm	762 mm
c) Moment of Inertia	4207 mm^4	4620 mm^4
d) EI/L	1.588×10^{-3} kNm	1.255×10^{-2} kNm

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1563

[3865]-44

M.E. (Civil / Structures)

ADVANCES IN CONCRETE COMPOSITES

(Elective - II) (2002 Course)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Classify and discuss various fibers used in concrete composites. **[15]**

b) State and explain the parameters affecting the fiber interaction with the matrix. **[5]**

c) Explain the stress-strain behaviour of composite with less than 2% fiber content by volume. **[5]**

Q2) a) Explain the concept of strong bittle fibers in ductile matrix and strong fibers in brittle matrix. **[15]**

b) What do you understand by flexural toughness? Explain flexural toughness of FRC. **[5]**

c) Compare metallic fibers with polymetric fibers. **[5]**

Q3) a) Write on laser homographic inter terometry test set up to obtain the crack propagation at different loading stages on the composites. **[15]**

b) Explain the drop weight method to evaluate impact resistance of FRC. **[5]**

c) Explain the shrinkage behavior of steel fiber reinforced concrete. **[5]**

P.T.O.

SECTION - II

Q4) a) Write in details on fatigue loading test set up and draw typical S–N curve for concrete composites. **[15]**

b) Give the different applications of fiber reinforced shotcrete **[5]**

c) State and explain two basic processes used for fabricating GFRC. **[5]**

Q5) a) Discuss various non-linear fracture mechanics models. **[15]**

b) State and explain the engineering properties of slurry infiltrated fiber concrete (SIFCON). **[5]**

c) Briefly describe the applications of GFRC. **[5]**

Q6) a) Explain spray-up fabrication processes used for fabricating Glass Fiber Reinforced Concrete (GFRC). **[7]**

b) Enlist and explain various quality control tests of GFRC. **[8]**

c) Write a note on Alkali-Resistant glass-fiber. **[5]**

d) Describe the various workability tests for freshly prepared FRC. **[5]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1565

[3865]-51
M.E. (Mech.) (Heat Power Engg.)
ADVANCED HEAT TRANSFER
(2002 Course) (502104)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) A spherical shaped orange (K = 0.22W/m-K) 100mm in diameter under goes ripening process and generates 5000W/m^3 of heat. If the external surface of the orange is at 8ºC, determine :

a) Temperature at the centre of the orange.
b) Rate of heat flow from outer surface of orange.

Derive the expression you use from the generalized form of the differential equation. **[16]**

Q2) a) Discuss the variation of thermal conductivity with temperature for metallic and non-metallic solids, liquids and gases. **[8]**

b) Find the heat flux and temperature distribution in an infinite slab of thickness b whose thermal conductivity varies linearly with temperature in the form.

$K = K_0 (1 + CT)$ where K_0 and C are constants. Sketch the temperature distribution when C is +ve, C is – ve and C = 0. **[8]**

Q3) Write notes on (any four) : **[16]**

a) Grober and Heisler's charts.
b) Nusselt, Biot and fourier numbers.
c) Schmidt plot.
d) Graphical method for heat conduction problem.
e) Critical radius of insulation.

P.T.O.

Q4) Attempt any two : **[18]**

a) State and explain Navier-Stokes equations.
b) Derive differential equation of heat convection in cartesian coordinates.
c) Dimensional analysis of forced convection problem.
d) Correlations for forced convection heat transfer problems.

SECTION - II

Q5) a) Explain the flow patterns under natural convection from : **[8]**

i) Heated horizontal cylinder.
ii) Upper surface of a heated horizontal plate.
iii) Lower surface of a heated horizontal plate.
iv) Cooled vertical plate.

b) Show from the first principles : **[4]**

$$\text{Grashof number} = \frac{\text{Inertia force} \times \text{Buoyancy force}}{(\text{Viscous force})^2}$$

c) Formulate the problem by Integral method of natural convection from heated vertical plate. **[6]**

Q6) Write notes on : **[16]**

a) Natural convection correlation for heated vertical plate and heated horizontal cylinder.
b) Ablasion heat transfer problem.
c) Fluidized bed heat transfer.
d) Heat pipe applications.

Q7) a) Discuss the following film condensation problems : **[8]**

i) Condensation on vertical plate.
ii) Condensation on inclined plate.
iii) Condensation on horizontal cylinder.
iv) Condensation inside the tubes.

b) What is the difference between pool boiling and forced convection boiling? Explain the flow regimes of forced convection boiling. **[8]**

Q8) a) State and explain Planck's law and hence derive Wien's law. Estimate the surface temperature of sun, assuming it to be a black body and it emits maximum radiation at 0.5μm wavelength. **[8]**

b) Write notes on (any two) : **[8]**

i) Radiation from gases and vapours.
ii) Electrical net-work method for radiation problems.
iii) Shape factor.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1567

[3865]-59
M.E. (Mech.) (Heat Power)
GAS TURBINES
(2002 Course) (502110) (Elective - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the working of a closed cycle gas turbine plant with a schematic diagram and T-S chart. List its advantages and disadvantages. **[8]**

b) List the applications of Gas Turbines and explain with a neat sketch the working of a modern combined cycle power plant. **[10]**

Q2) a) Estimate the actual thermal efficiency and power output of the gas turbine plant working with following conditions : **[8]**

i) Temperature limits : 300K and 900K.
ii) Pressures 1 bar and 4 bar.
iii) Isentropic efficiency of compressor = 0.8.
iv) Isentropic efficiency of turbine = 0.85.
v) Fuel consumption and its CV = 1kg/s and 42000 $\frac{kJ}{kg}$. Assume r = 1.4.

b) Explain the working of open cycle gas turbine with intercooling and regeneration with schematic layout and T-S chart. **[8]**

Q3) a) Discuss the effect of operating variables on thermal efficiency of gas turbine. **[8]**

b) Give comparison between centrifugal and axial flow compressors. **[8]**

P.T.O.

Q4) Explain : **[16]**

a) Dimensionless parameters of centrifugal compressors.

b) Chocking and stalling.

c) Losses in axial flow compressors.

SECTION - II

Q5) Discuss with neat sketches the different types of combustion chambers used in open cycle gas turbines. Explain the postulates of combustion mechanism and steps involved in combustion process. Explain the terms combustion intensity and combustion efficiency. **[16]**

Q6) a) Define degree of reaction of a gas turbine stage. Explain the working of zero degree reaction stage and 50% reaction stage with help of h-s diagrams. Draw the velocity $\triangle s$ for 50% reaction stage. **[10]**

b) Define utilization factor for a 50% reaction stage and derive expression for its maximum value. **[8]**

Q7) a) Define gas turbine blades. What are the forces acting on them? Discuss the factors to be considered in selection of blade materials and materials used in practice. **[8]**

b) Discuss the blade manufacturing techniques and blade fixing arrangements. **[8]**

Q8) Write notes on (any four) : **[16]**

a) Component matching.

b) Fuels for gas turbines.

c) Environmental issues arising from gas turbines.

d) Atmospheric jet engines.

e) Fuel system for gas turbines.

Total No. of Questions : 10] **[Total No. of Pages : 3**

P1568

[3865]-64
M.E. (Mech.) Design Engineering
MACHINE STRESS ANALYSIS
(Old & Revised 2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non-programmable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive an equillibrium equation and compatibility equation in cartesian co-ordinate system. State the assumptions mode. **[12]**

b) Give examples for use of polar-coordinate in different types of stress analysis. **[4]**

Q2) A cantilever of 'I' section 3 m long carries a load of 2 kN at the free end and 3 kN it's middle. Line of 2 kN is passing through the centriod of the section and inclined at an angle of 30° to the vertical. The line of application of load 3 kN is also passing through the centriod but inclined at 45° to the vertical axis on the other side of load 2 kN. 'I' section has two flanges of 12 cm × 2 cm and web is of 16 cm × 1 cm dimensions.

Determine the resulting bending stresses at the corners. **[16]**

Q3) a) A thin walled 800 mm long member has a cross section as shown in the fig. 01.

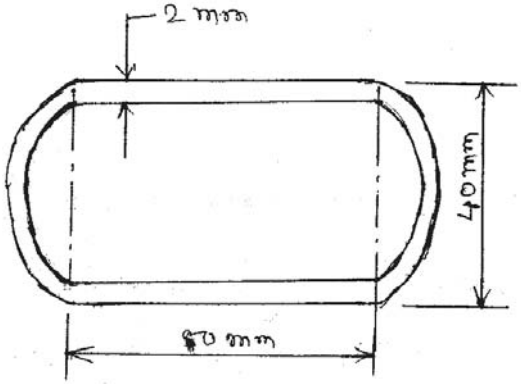


Fig No - 01

P.T.O.

Determine :

i) Maximum torque if the angle carried by the section is limited to 4°.

ii) Maximum stress induced for the maximum torque.
(Take G = 82 GPa) **[10]**

b) Differentiate between Kelvin's fluid flow analogy and prandtl's membrane analogy. What are the limitations of these methods for evaluation of torsional stresses. **[6]**

Q4) What are the different methods of determining the deflection of beam.

A cantilever beam of uniform cross-section is loaded by concentrated load at it's tip. Determine the deflection under the point of application of the load by using Castigligno's theorem. **[16]**

Q5) Write short note on : **[18]**

a) Airy stress function and it's significance.

b) Brittle coating method.

c) Rayleigh Ritz method.

SECTION - II

Q6) a) Compare semiconductor strain gauge with metal strain gauges. **[4]**

b) Explain the terms ISO clinics and ISO chromatics. Discuss the advantages and limitations of photoelastic method of stress analysis with suitable examples. **[8]**

c) Explain following terms used in photoelastic analysis. **[4]**

i) Dark field polariscope.

ii) Birefringement material.

Q7) What are the assumptions mode in solution of contact stress problems. Derive an equation for contact stresses between two rollers under compressive load. **[16]**

Q8) a) Explain the significance of following terms : **[6]**

i) Shape factor.

ii) Plastic hinge.

b) A beam of 'I' section with top and bottom flanges 8 cm × 1.2 cm and web portion 7.6 cm × 1 cm dimension. Find the shape factor for the beam. **[10]**

Q9) Derive an equation for bursting pressure of a tube in terms of inner and outer radious. State the assumptions mode. **[16]**

Q10) Write short note on : **[18]**

a) Use of FEM for solution of plane stress problem.

b) Machine frame, it's rigidity and stresses.

c) Strain rosettes and it's use in stress analysis.

Total No. of Questions : 10] **[Total No. of Pages : 3**

P1569

[3865]-66
M.E. (Mechanical-Design Engineering)
MECHANICAL VIBRATIONS
(2002 Revised Course) (502202)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of non programmable pocket calculator is allowed.***

SECTION - I

Q1) a) Derive the condition for the existance of sub harmonics in a non-linear system. **[8]**

b) Differentiate between linear and non linear system for their behaviour and analysis. **[8]**

Q2) a) Derive an expression for finding natural frequency of undamped free vibration of a three rigid Rotor system using Holzer method. **[8]**

b) Find by Holzer's method the natural frequency of the torsional system shown in fig.1 when the left end is fixed. **[9]**

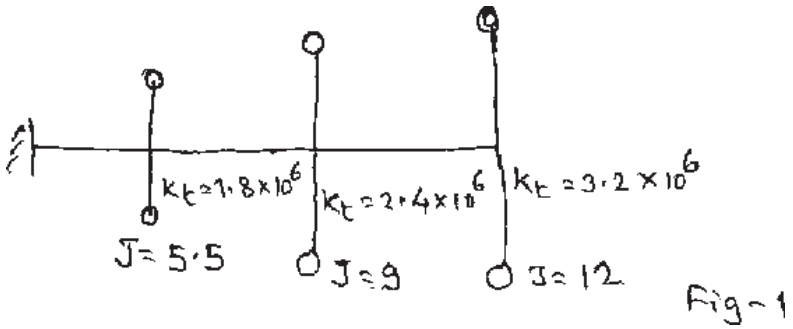
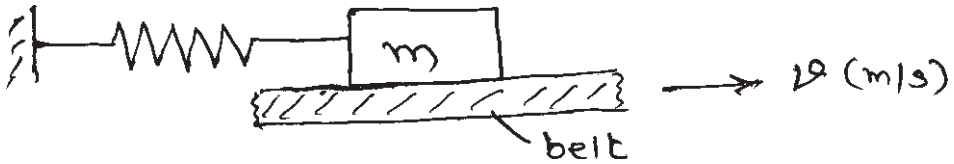


Fig-1

P.T.O.

Q3) a) What are self excited vibrations. **[5]**

b) A mass 'm' is placed over a moving belt as shown in fig.2. Show that the increase in amplitude per cycle of oscillation is given by $\Delta(x) = \frac{2\,'g'\,(\mu_{kr} - \mu_{kl})}{wn^2}$ where 'g' is gravitational acceleration m/s^2; μ_{kr} is coefficient of kinetic friction while moving right. μ_{kl} is coefficient of kinetic friction while moving left; w_n is natural frequency of the system. **[12]**



Q4) Develop a computer programme for finding fundamental frequency of a multidegree freedom system using stodola method. **[16]**

OR

a) Show that autocorrelation of a rectangular pulse of base τ and height A is a triangle of base 2τ and height A^2. **[6]**

b) A random signal is found to have a constant spectral density S (f) = 0.002mm^2/cps between 25cps and 2000cps. Outside this range, the spectral density is zero. Determine the standard deviation and the rms value, if the mean value is 1.84mm plot this result. **[10]**

Q5) Write short notes on (any two) : **[16]**

a) Jump phenomenon.

b) Centrifugal pendulum.

c) System approach for shock analysis.

d) Narrow band and wide band random processes.

e) Pertubation Techniques.

SECTION - II

Q6) Derive the expressions for the Impulse Response Function and frequency response function for a spring, mass, damper system having single degree of freedom. Prove that they form a pair of Fourier Transform. Hence find the response to a step function force excitation. **[18]**

Q7) a) From the first principles explain the working of a tuned dynamic absorber. Bring out its limitations and hence explain the introduction of damping. **[8]**

b) A machine is considered as a mass of 10kg placed on a spring of stiffness 10000N/m. Design an absorber so that the machine can run from 290 to 310rpm without excessive vibrations. **[8]**

Q8) A triple pendulum consists of three identical simple pendulums each of mass 'm' and length L. Find the natural frequencies and mode shapes through Lagrange's equations. Suggest initial displacement and velocity so that the pendulums vibrate in second mode only. **[16]**

Q9) A three rotor system consists of rotors of moment of inertia 5, 10, 5kgm^2. Section of the shaft in between the first and second rotor has a torsional stiffness of 8000Nm/radian. And the same stiffness between other two rotors. Find the natural frequencies and corresponding mode shapes through the method of matrix iteration, sketch the mode shapes. **[16]**

Q10) a) Explain the expansion theorm. How the concept of orthogonality is used to find the participation of each mode? **[8]**

b) Explain stiffness, flexibility, damping and inertia influence coefficients and relate them to system differential equations. **[8]**

OR

Write short notes on any two : **[16]**

a) Static and dynamic coupling.

b) Discretised models of bar.

c) Beat phenomenon.

d) Stiffness and inertial influence coefficients.

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Total No. of Questions : 10] **[Total No. of Pages : 2**

P1570

[3865]-69
M.E. (Mechanical) (Design Engineering)
ROBOTICS
(2002 Course) (Elective - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Attempt any three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use non-programmable electronic calculators is allowed.***

SECTION - I

Q1) a) Explain the role of Robot in Automation. **[8]**

b) Explain the construction & work volumes for Jointed arm configuration and polar configuration robot. **[8]**

Q2) a) Explain the joints used in construction of robots. **[8]**

b) Explain the procedure of forward and inverse kinematics. **[8]**

Q3) a) A robot has the link parameters are as shown in table. Using D-H transformation find the position of gripper w.r.t. base following the intermediate steps. **[8]**

i	α_{i-1}	a_{i-1}	d_i	θ
1	0^o	0	0	90^o
2	90^o	5	0	0^o
3	0^o	0	4	45^o

b) Write a short note on Homogeneous Transformation. **[8]**

Q4) a) Explain the applications of Robots in Manufacturing. **[8]**

b) Explain selection considerations of Gripper. **[8]**

Q5) Write short notes on any three: **[18]**

a) Construction & working of Stepper Motor.

b) SCARA Robot.

P.T.O.

c) Drive systems for robot.

d) Dynamic properties of Robots.

e) Singularities of Mechanism.

SECTION - II

Q6) a) A robot joint is required to reach 70^{o} from 35^{o} taking a total time of 5 seconds. Obtain the cubic polynomial fit and sketch the trajectory. **[8]**

b) Explain general considerations in Trajectory planning. **[8]**

Q7) a) In a problem of image processing the image has intensity values in pixels as per grid below:– **[8]**

14	13	12	13	14	14	14	14
15	17	19	19	19	19	17	15
16	19	21	21	21	21	20	16
15	19	21	22	22	21	20	15
14	19	21	21	21	21	20	14
14	19	21	22	23	21	20	14
13	20	20	20	20	20	20	13
14	13	12	13	14	14	14	14

Construct the histogram and obtain the Threshold value and convert the picture in to black and white image.

b) Explain Proximity sensors used in robot applications. **[8]**

Q8) a) Explain the applications of Machine Vision in Robotics. **[8]**

b) State and explain various Motion commands and interlocking commands used in VAL programming. **[8]**

Q9) a) Explain capabilities and limitations of Leadthrough Programming method. **[8]**

b) Discuss various motion interpolations in robot programming. **[8]**

Q10) Write short notes on any three: **[18]**

a) Degeneracy and Dexterity.

b) Force and Torque sensors in robotics.

c) Remote Center Compliance.

d) Sampling and Quantization in Image processing.

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Total No. of Questions : 10] **[Total No. of Pages : 3**

P1571

[3865]-71
M.E. (Mechanical) (Design Engineering)
COMPUTER AIDED DESIGN
(Revised 2002 Course) (Elective - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Given the two lines are L1 and L2. The end points for line L1 are P1(3,4,7) and P2(5,6,1). The end points for line L2 are P3(1,5,–2) and P4(2,9,0).

i) Find the equations of the lines. Show the parametrization directions.
ii) Are the two lines parallel or perpendicular?
iii) Find the coordinates of the intersection. **[10]**

b) Compare CORE and GKS graphics standards. State the various graphics standards available. **[6]**

Q2) a) Describe the IGES methodology. **[6]**

b) A triangle PQR with vertices P(0, 0), Q(4, 0), and R(0, 3) is to be subjected to following two transformation in order : **[10]**

i) Translation through 6 and 3 units along X and Y direction; and
ii) Rotation through 45° about the new position of point R.

Determine :

I) The concatenated transformation matrix.
II) The new position of triangle.

Q3) a) Describe the method of data communication in serial and parallel modes. **[6]**

b) Find the concatenated transformation matrix and co-ordinates of triangle ABC with vertices A(3, 3), B(9, 3) and C(3, 7) when it is scaled by Sx = 2 and Sy = 2 about point P(5, 4). **[10]**

P.T.O.

Q4) a) Explain semiautomatic and fully automatic method of mesh generation. **[6]**

b) Given a point P(1, 3, 5) find :

i) Transformed point P* if P is translated by d = 2i + 3j – 4k and then rotated by 30° about the Z axis.

ii) Same as in (i) but point P is rotated first, and then translated.

iii) Is the final point P* the same in both (i) and (ii)? Explain your answer. **[10]**

Q5) a) Explain following data exchange formats. **[6]**

i) Shape based format.

ii) Product data based formats.

b) What is Local and Global Coordinate system? For 1-D spar element derive the relationship between local and global coordinate system. **[6]**

c) Explain Discrete and Continuous system simulation by taking example of each. **[6]**

SECTION - II

Q6) a) Outline what is meant by non-manifold modeling and suggest where this approach may be appropriate? **[8]**

b) Summarized the characteristics of B-spline curve that are useful in design. **[8]**

Q7) a) Describe the procedure to find the center of a circle that is tangent to two known lines with a given radius. **[8]**

b) Discuss the Problem Modeling and Boundary Conditions for the following cases : **[8]**

i) A cylinder of infinite length subjected to external pressure.

ii) Belleville spring.

Q8) a) Describe the importance of curve and surface modeling in computer aided graphics and design. **[8]**

b) Derive an expression for stiffness matrix of a Truss element. **[8]**

Q9) a) Consider a thin tapered plate with 6 inches width at top and 3 inches width at bottom having a length of 24 inches and uniform thickness of 1 inch. The material of the plate is steel having Young's modulus $E = 30 \times 10^6$ psi and weight density 0.28 lb/in^3. In addition to its self weight, the plate is subjected to point load P = 100 lb at its midpoint.

i) Model the plate with two finite elements.
ii) Using elimination approach, solve for the global displacement vector.
iii) Evaluate stress in each element.

Determine the reaction force at support. **[10]**

b) Explain activity scanning approach used in simulation with suitable example. **[6]**

Q10) Short notes (any three) : **[18]**

a) Software development and documentation.

b) Network Topologies.

c) Accuracy of Finite Element Solution.

d) Data exchange translators.

e) Boundary Representation.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1572

[3865]-687
M.E. (E&T/C) (Instrumentation & Microwave)
ADVANCED DIGITAL SIGNAL PROCESSING
(Revised 2008 Courses)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections must be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pockets calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the following: **[8]**

i) Deterministic signals.

ii) Random process.

iii) Stationary random process.

iv) Mean ergodic process.

b) Explain the use of DFT in linear filtering. **[4]**

c) Explain the time domain sampling of analog signals. **[4]**

Q2) a)Give the singal $x(n) = a^n u(n), |a| < 1$ **[8]**

i) Determine the spectum X (w)

ii) The spectrum $x(n)$ is applied.

to a decimator that reduces the rate by a factor of 2. Determine the output spectrum.

b) Explain multi stage implementation of sampling rate conversion. **[8]**

Q3) a) What is system modelling and identification? **[4]**

b) Explain system ikenfification based on an All - pole (AR) system and pole - zero (ARMA) system model. **[12]**

P.T.O.

Q4) Write short notes on (any three) **[16]**

a) Decimation by a fact of D.

b) Polyphase filter structures.

c) Kalman filter.

d) Music algorithm.

SECTION - II

Q5) a) With a suitable example explain how to find cyclomatic complexity? **[8]**

b) Explain how software cost estimation is done? **[8]**

Q6) a) What is Extreme Programming? Explain. **[8]**

b) What is meant by formal methods? Why formal methods have not been widely used? **[8]**

Q7) a) Explain software process improvement. **[8]**

b) Explain in detail Risk management. **[8]**

Q8) Write short notes on:

a) Critical system validation.

b) Adaptive software development.

c) Object constraint language.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1572

[3865] - 100

M.E. (E & T/C) (Instrumentation & Microwave)

ADVANCED DIGITAL SIGNAL PROCESSING

(Revised Course 2002) (504102)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the following **[8]**

i) Deterministic signals

ii) Random process

iii) Stationary random process

iv) Mean ergodic process

b) Explain the use of DFT in linear filtering. **[4]**

c) Explain the time domain sampling of analog signals. **[4]**

Q2) a) Given the signal $x(n) = a^n u(n)$, $|a| < 1$ **[8]**

i) Determine the spectrum X(w)

ii) The spectrum $x(n)$ is applied to a decimator that reduces the rate by a factor of 2. Determine the output spectrum.

b) Explain multistage implementation of sampling rate conversion. **[8]**

Q3) a) What is system modelling and identification? **[4]**

b) Explain system identification based on an All-pole (AR) system and pole-Zero (ARMA) system model. **[12]**

P.T.O.

Q4) Write short notes on (any three): **[18]**

a) Decimation by a factor D

b) Polyphase filter structures

c) Kalman filter

d) Music algorithm

SECTION - II

Q5) a) Explain Levinson Durbin algorithm. **[10]**

b) Explain any four properties of the linear prediction error filter. **[6]**

Q6) a) Explain AR lattice structure. **[6]**

b) Explain how Wiener filter can be used for filtering and prediction. **[10]**

Q7) a) Explain the difference between parametric and non parametric method of power spectrum estimation. **[6]**

b) Explain any two methods of non parametric estimation. **[10]**

Q8) Write short notes on (any three) **[18]**

a) Parametric power spectrum estimation.

b) Architecture of DSP processors.

c) Subband coding of speech signals.

d) Filtering of long data sequence.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1573

[3865]-105
M.E. (E & T/C) (Instrumentation)
HIGH PERFORMANCE NETWORKS
(Revised 2004 Course) (504109) (Elective - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare Distributed and Centralized data networks. **[8]**

b) Explain the various design issues to be considered while designing the Network. **[8]**

Q2) a) Describe the various QoS parameters for VoIP. **[8]**

b) Explain the system architecture of VoIP. **[8]**

Q3) a) Explain the RAID standards implied for data servers. **[8]**

b) Explain NFS and DAFS network storage systems. **[8]**

Q4) Write short notes on any three : **[18]**

a) PSTN-IP Network Architecture.

b) SAN.

c) IP telephoney.

d) H.323 protocol stack.

SECTION - II

Q5) a) Describe the system architecture of wireless communication system. **[8]**

b) Explain the significance of data in support of network design. Also briefly explain the importance of Node placement and Node size while determining the network topology. **[8]**

P.T.O.

Q6) a) Explain with an example the LZ77 compression and decompression algorithm. **[8]**

b) Explain the application of compression and decompression algorithms in High Performance Networks. **[8]**

Q7) a) Explain how 2D-DCT can be used in image compression techniques. What is the optimal size of the image block and why? **[8]**

b) What are wavelets? Explain the use of wavelets in the compression and decompression techniques. **[8]**

Q8) a) What are the requirements of Public key Cryptography? Explain any one Public Key Encryption algorithm. **[8]**

b) What are the issues of key sharing in Public Key Cryptography? **[4]**

c) Enlist various block cryptographic algorithms. Which is the best? Justify your answer. **[6]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1574

[3865] - 120

M.E. (E & TC) (Microwave)

MULTIPLE ACCESS COMMUNICATION SYSTEM

(2004 Course) (504206)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Assume suitable data, if necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of calculator is allowed.***

SECTION - I

Q1) a) State and explain the different types of satellite orbits. **[8]**

b) Explain multiple access techniques in detail. **[8]**

Q2) a) State different types of interferences and discuss how to reduce these interferences. **[8]**

b) State and explain Kepler's law of orbital motion. **[8]**

Q3) a) Explain the Doppler shift and its effects on satellite communication. **[8]**

b) Explain handoff mechanisms in a cellular system. **[8]**

Q4) a) Explain CDMA system. **[8]**

b) Write a note on spacecraft technology. **[10]**

P.T.O.

SECTION - II

Q5) a) Explain the need of cell splitting. Discuss various ways of cell splitting. **[8]**

b) Explain the interfaces in GSM. **[8]**

Q6) Explain GSM architecture in detail with the help of a neat block diagram. **[16]**

Q7) a) Discuss the following parameters with reference to mobile communication systems. **[8]**

i) Frequency reuse.

ii) Blocking probability.

b) Describe the modulation technique used in GSM. **[8]**

Q8) a) Write a note on teletraffic. **[6]**

b) Discuss cordless telephone system in detail. **[12]**

SECTION - II

Q4) a) Describe in detail operating principal of TRAPATT diode. **[13]**

b) A BJT is encapsulated in a plastic housing and mounted on a heat sink with $R_\theta = 3.75°$ C/W. Under this condition the total power dissipation is suppose to be 20Wat an ambient temperature of 20ºC. What rating has the engineer to choose for the BJT casing if the maximum junction temperature should not exceed 175ºC? **[12]**

Q5) a) Draw linear diode model. A conventional Si-based pn diode is operated at 300º k and has the electrical parameters as : $\tau_T = 500$ ps, $Is = 5 \times 10^{-15}$ A, $Rs = 1.5\ \Omega$, $n = 1.16$. The dc operating conditions are chosen such that $I_Q = 50$ mA. Find

i) The impedance response of the diode in the frequency range 10MHz to 1GHz.

ii) Impedance behavior in the same frequency range. **[17]**

b) Focus on unilateral design approach for microwave amplifier. **[8]**

Q6) a) AMESFET operates at 5.7GHz has the Sparameters as : $S11 = 0.5 \angle -60°$, $S12 = 0.02 \angle 0°$, $S21 = 6.5 \angle 115°$ and $S22 = 0.6 \angle -35°$.

Determine :

i) If the circuit is uncondionally stable.

ii) Find the maximum power gain under optimal choice of the reflection coefficients, assuming unilateral design (S12 = 0). **[13]**

b) Write detail notes on microwave mixers and oscillators. **[12]**

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1575

[3865]-123
M.E. (E & TC) (Microwave Engg.)
RF AND MICROWAVE CIRCUIT DESIGN
(2004 Course) (504204)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any two questions from each section.***
2) ***Figures to the right indicates full marks.***
3) ***Assume suitable data, whenever necessary.***

SECTION - I

Q1) a) Derive an expression for standing wave ratio for transmission line. **[13]**

b) Write detail notes on high frequency resistors, inductors and capacitors. **[12]**

Q2) a) A load impedance $Z_l = (30 + J\,60)\ \Omega$ is connected to a 50 Ω transmission line of 2cm length and operated at 2GHz. By using impedance transformation process find the input impedance Z_{in} under the assumption that the phase velocity is 50% of the speed of light. **[13]**

b) Explain in detail scattering parameters and signal flow graph for the analysis of RF circuit. **[12]**

Q3) a) An N = 3 Chebyshev band pass filter is to be designed with a 3 dB passband ripple for a communication link. The center frequency is 3 GHz and the filter has to meet a bandwidth requirement of 20%. The filter has to de inserted into a 50 Ω characteristic line impedance. Find the inductive and capacitive elements and plot the attenuation response in the frequency range of 1 to 4 GHz. **[17]**

b) Draw a table for Kuroda's identity and prove the four identities from table. **[8]**

P.T.O.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1576

[3865]-126
M.E. (E & TC) (Microwave)
MACHINE VISION AND PATTERN ANALYSIS
(2004 Course) (504207)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Assume suitable data, if necessary.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the steps taken to convert an analog image into a digital one. Also write about spatial resolution and gray level resolution. **[8]**

b) Explain the terms : **[8]**

i) Adjacency.
ii) Connectivity.
iii) Region.
iv) Boundary.

Q2) a) Explain what is mask processing. Discuss any one mask processing technique for enhancing an image. **[8]**

b) Describe histogram equalization and state its application. **[8]**

Q3) a) What is image restoration? Discuss image restoration in presence of spatial noise with the help of suitable technique. **[8]**

b) Write an algorithm for calculating a threshold T automatically. **[8]**

Q4) a) Explain region splitting and region merging. **[10]**

b) Explain any two operators for detecting edges. **[8]**

SECTION - II

Q5) a) Derive chain codes for 4 connectivity and 8 connectivity using a suitable example. **[8]**

b) Explain any two boundary descriptors. **[8]**

P.T.O.

Q6) a) Explain the terms : **[8]**

i) Pattern.
ii) Class.
iii) Features.
iv) Feature space.

b) Discuss how texture is explained with the help of moments. **[8]**

Q7) a) Explain multispectral image enhancement. **[8]**

b) Explain the need of radiometric correction in satellite image processing. **[8]**

Q8) a) Discuss pattern recognition using statistical methods. **[9]**

b) Explain how neural networks are used for object recognition. **[9]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1577

[3865]-129

M.E. (E & T/C) (Microwave)

CONTINUOUS SPEECH PROCESSING

(504208) (Revised Course 2002)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the source filter model of speech. **[8]**

b) Explain the following terms of speech – **[4]**

i) Phonemes.

ii) Morphemes.

iii) Syllable.

iv) Prosody.

c) Explain the difference between vowels & consonants. **[4]**

Q2) a) Explain the text to speech conversion process with the help of block diagram. **[10]**

b) Explain with the help of neat diagram the speaker recognition system. **[8]**

Q3) a) Explain the following terms w.r.t. speech. **[6]**

i) MFCC.

ii) Ceptrum.

iii) Bark Scale.

b) Explain voice processing software with the help of diagram. **[10]**

P.T.O.

Q4) a) Explain how neural network approach can be used for speech recognition. Explain LVQ neural network approach used for speech recognition. **[10]**

b) Explain acoustic echo cancellation used for speech. **[6]**

SECTION - II

Q5) a) Explain what is spectrum distance measures for speech recognition. **[3]**

b) Explain smooth group delay analysis and its application to isolated word recognition. **[8]**

c) Explain the steps in LPC analysis. **[5]**

Q6) a) What is speech enhancement? **[4]**

b) Explain the various techniques used for improving the quality of degraded speech. **[8]**

c) Explain the following terms : **[4]**

i) AMDF.

ii) Zero Crossing.

Q7) a) Explain what is HMM. **[4]**

b) Explain how HMM can be used for speech recognition. **[6]**

c) Explain any one issue of HMM related to speech recognition. **[6]**

Q8) Write short notes on any three : **[18]**

a) Auditory nerve representation of speech.

b) Dynamic programming based speech recognition.

c) Quality assessment of coded speech.

d) Speech production model.

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1578

[3865]-136
M.E. (VLSI and Embedded System)
ASIC DESIGN AND MODELLING
(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write a VHDL code for a half adder using data flow modeling method. Draw the RTL schematic for the same. **[8]**

b) What methods are used to validate a logic synthesis results with its purpose. Differentiate between logic simulation and logic synthesis. **[8]**

Q2) a) Write a short note with neat diagram on clock skew analysis. **[8]**

b) Describe the objectives of routing. Explain with neat diagram hee algorithm for area routing. **[8]**

Q3) Write a short note on : **[18]**

a) Zero-slack algorithm.

b) IP cores.

SECTION - II

Q4) a) Derive and plot the graph for finding probability of fault coverage using random testing method. **[8]**

b) Explain in detail memory BIST insertion design for test technique. **[8]**

Q5) Write a short note on (any two) : **[18]**

a) ASIC design flow.

b) Path sensitization.

c) Built in logic block observer.

P.T.O.

Q6) a) Classify semi-custom ASIC. Explain and differentiate between channeled gate-array die and channellers gate-array die. **[8]**

b) Find a test set to find the coverage of various stuck at '1' faults by sequential method. Calculate fault coverage of fig.<1>. **[8]**

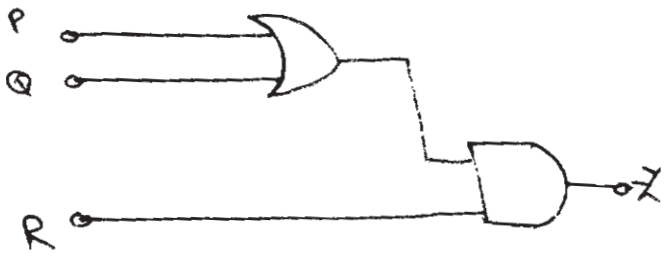

Fig <1>

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Q6) a) Explain the use of signatures as a boundary descriptor. Draw signatures for a circle and a square. **[9]**

b) Explain the process of thining the boundary using skeleton. **[5]**

c) Explain fourier descriptors and it's applications. **[4]**

Q7) a) Explain the use of minimum distance classifier for object recognition. **[8]**

b) Explain Bayes classifier. **[8]**

Q8) a) Explain the meaning of convex hull for shape representation. **[8]**

b) Explain snake growing algorithm for image understanding. **[8]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1580

[3865]-146
M.E. (Electronics) (Digital System)
IMAGE PROCESSING AND PATTERN RECOGNITION
(2002 Revised Course) (Elective - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Figures to the right indicate full marks.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Answer any three questions from each section.***
4) ***Assume suitable data, if required.***
5) ***Use of scientific calculator is allowed.***

SECTION - I

Q1) a) Explain run length coding with the help of simple example. Explain pyramidal and quadtree data structure. **[8]**

b) Explain the filtering of an image with efficient median filtering. Explain different gray scale transformations. **[8]**

Q2) a) Explain the use of Laplacian operator for edge detection. Explain how zero crossing of the second derivative can detect the edges. What is the advantage of using zero crossing. **[9]**

b) Explain in detail canny edge detector. State 3 criteria to which the optimality of the detector is related. **[9]**

Q3) a) Explain histogram equalization method. Compare local and global histogram equalization. **[8]**

b) Explain unsharp masking and high boost filtering. **[8]**

Q4) a) Explain how threshold is selected using pdfs of the different regions in an image. Explain adaptive thresholding. **[8]**

b) Explain use of region splitting and merging. **[8]**

SECTION - II

Q5) a) Explain chain coding for boundary representation using 4 and 8 neighbour code. **[8]**

b) Explain polynomial approximation for boundary representation. **[8]**

P.T.O.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1581

[3865]-152
M.E. (Electronics) (Computer)
EMBEDDED SYSTEM & SOFTWARE
(2002 Revised Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use suitable data if required.***
5) ***Use of scientific calculator is allowed.***

SECTION - I

Q1) a) Explain different data structures used in 'C'. **[8]**

b) What are important features of 'C' programming environment. **[8]**

Q2) a) Draw architectural diagram of 8051 microcontroller & explain function of each block. **[8]**

b) Explain interrupt structure in Motorola 68 HC 11 processor. **[8]**

Q3) a) Draw the architecture of typical Texas DSP. What are the facilities specially useful for real time processing. **[10]**

b) Compare RISC and CISC architectures. **[8]**

Q4) a) Explain facilities of any simulator for embedded controller. **[8]**

b) Explain different essential features required for a debugger. **[8]**

SECTION - II

Q5) a) Explain ISA protocol. Explain how data transaction is done in ISA. **[8]**

b) Draw the block schematic for a CAN controller. Explain its important features. **[8]**

P.T.O.

Q6) a) Explain IEEE 802.11 standard for wireless communication. Explain the frame format in IEEE 802.11. **[10]**

b) What is ASIC? Explain typical steps in the process of ASIC development. **[8]**

Q7) a) Explain features of verilog environment. How to simulate a code in verilog? **[8]**

b) What are essential requirements of RTOS? **[8]**

Q8) a) Compare V_x Works with RTXST. **[8]**

b) For a typical application, draw block schematic for an embedded control system. **[8]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1582

[3865] - 160

M.E. (Computer) (Electronics Engineering)

HIGH PERFORMANCE COMPUTER NETWORKS

(Revised 2002 Course) (Elective - I)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the RSA algorithm popularly used to encrypt the given plaintext and decrypt the ciphertext. Comment on choice of the parameters used. **[10]**

b) Let p = 3 and q = 11, n = 33, z = 20, d = 7 and e = 3. Compute Public and Private keys. Show the ciphertext C of the plaintext P "19", Also show the sender's and receiver's computation. **[8]**

Q2) a) Discuss major network design issues. **[10]**

b) Discuss the data that is needed in support of network design. **[6]**

Q3) a) Draw a block diagram to provide structural overview of the network design tool and explain its components with their role. **[6]**

b) What do you meant by security attacks and security services? With a neat diagram explain the model for network security. **[10]**

Q4) a) Draw a block diagram showing various components that allow automatic key distribution for connection oriented protocol. Also describe the sequence of actions/events. **[8]**

b) Write a note on X.509 authentication service. **[8]**

P.T.O.

SECTION - II

Q5) a) Draw a neat block diagram showing composite reference model for VOIP/PSTN access and explain. **[8]**

b) Explain the call signaling methods used in H.323 protocol. **[8]**

Q6) a) With a neat diagram explain the architecture of a SAN. **[8]**

b) Explain in detail the fiber Channel SAN. **[8]**

Q7) a) Explain in brief the protocol stack used in IEEE 802.11 standard for wireless communication. **[10]**

b) Why the CSMA/CD protocol can not be utilized by the wireless networks. **[6]**

Q8) Write short notes on (any three): **[18]**

a) IP Quality of service for Voice.

b) RAID 0 + 1/RAID 10.

c) Run-length Encoding.

d) Lossy Compression.

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1583

[3865]-167
M.E. (Electrical) (Control System)
NONLINEAR CONTROL SYSTEM
(Revised 2002 Course) (503103)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain with neat sketches the peculiar characteristics which are unique to the nonlinear control cystem. **[9]**

b) Compare the nonlinear control system with the linear control system. **[8]**

c) How are the nonlinearities classified? Give examples of each type of nonlinearity. **[8]**

Q2) a) Compare in details, Isocline method and Delta method of constructing a phase plane trajectory. **[8]**

b) Consider the system described by :

$$\frac{d^2x}{dt^2} + 0.4\frac{dx}{dt} - 3x = 0$$

Evaluate a trajectory for initial conditions.

$$\frac{dx}{dt} = 0 \qquad x = 1$$

[9]

c) Classify various singular points for non autonomous system and discuss their significance. **[8]**

P.T.O.

Q3) a) Derive describing function for Backlash. **[8]**

b) In a unity feed back control system ON-Off relay is connected in cascade with forward path transfer function.

$$G(s) = \frac{Y}{s(s+2)}$$

Comment on stability of the system and determine the frequency, limit cycle if it exists. **[17]**

SECTION - II

Q4) a) Derive describing function for relay with dead zone. **[9]**

b) Explain **[16]**

i) Popov method.

ii) Circle criterion.

Q5) a) Check positive definiteness of scalar function in qudratic form. **[7]**

$$V(x) = 2x_1^2 - x_1x_2 + 2x_2^2 + 3x_3^2 + 5x_2x_3 + 4x_3x_1$$

b) For linear time invariant system $\frac{dx}{dt} = Ax$, derive the expression $A^TP + PA = -Q$ where P & Q are square, symmetric, positive definite matrices. **[10]**

c) Explain : **[8]**

i) Positive definite.

ii) Positive semidefinite.

iii) Negative definite.

iv) Negative semidefinite.

Q6) a) What is adaptive control system? Discuss the design of nonlinear adaptive system. **[9]**

b) Explain stability in the sense of Liapunov method. **[8]**

c) Explain the method of plotting phase plane trajectory by isocline method. **[8]**

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Q6) Explain the concept of pole placement via state variable feedback. Obtain the state feedback gain matrix for the system with state model. **[25]**

$$x(k+1)=\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -0.5 & -0.2 & 1.1 \end{bmatrix} x(k)+\begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u\ (k)$$

y (k) = [0 1 0] x (k)

such that the system will exhibit deadbeat response to any initial state.

c) Determine impulse response and step response of the system described by a difference equation $y(n) - y(n-1) + 0.16y(n-2) = r(n)$. Assume zero initial conditions. **[11]**

Q3) a) Explain Jury stability test in detail. **[9]**

b) Obtain the range of K for the stability of system shown in fig.1. using Jury stability test and bilinear transformation. **[16]**

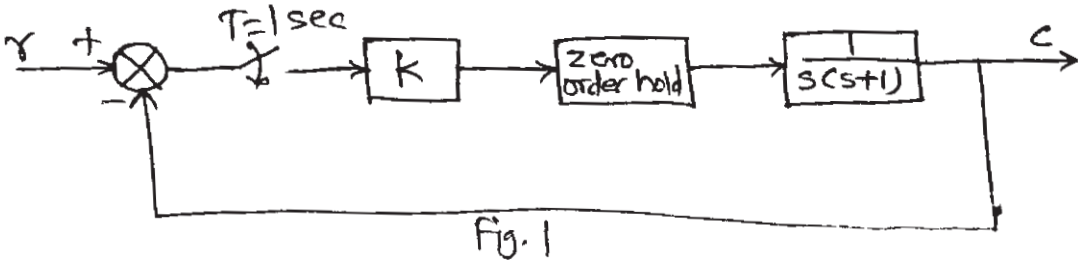

Fig. 1

SECTION - II

Q4) Obtain discrete state transition matrix of state model **[25]**

$$x(k+1) = \begin{bmatrix} 0 & 1 \\ -0.16 & -1 \end{bmatrix} x(k)$$

by

a) Z transform method.

b) Similarity transformations.

c) Caley Hamilton theorem.

Q5) a) Develop a digital control system for temperature control. Explain each block in detail. **[10]**

b) Define the terms state controllability, state observability. Investigate the state controllability and state observability of a system with state model.

$$x(k+1) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -0.12 & -0.01 & 1 \end{bmatrix} x(k) + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(k)$$

$y(k) = [0.5 \quad 1 \quad 0]\, x(k)$. **[15]**

Total No. of Questions : 6] **[Total No. of Pages : 3**

P1584

[3865]-169
M.E. (Electrical) (Control Systems)
DIGITAL CONTROL SYSTEM
(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Check for linearity, time invariance, causality and stability of the following systems : **[16]**

i) $y(n) = n\,x(n)$.

ii) $y(n) = e^{x(n)}$.

iii) $y(n) = \sin[x(n)]$.

iv) $y(n) = \sum_{k=0}^{n} x(k)$.

b) State and explain sampling theorem. Also explain concept of aliasing. **[9]**

Q2) a) Obtain z transform of the following functions. **[6]**

i) $H(s) = \dfrac{s+5}{s^2+5s+6}$.

ii) $h(n) = \{1, 0, 0\ 1, 1, 2, 1, 4\}$
$\uparrow$

b) Obtain inverse z transform of the following functions. **[8]**

i) $H(z) = \log(1 + az^{-1})$ $\quad |z| > |a|$

ii) $H(z) = \dfrac{1}{1-1.5z^{-1}+0.5z^{-2}}$ $\quad |z| > |1|$.

P.T.O.

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1585

[3865]-170
M.E. (Electrical) (Control Systems)
COMPUTER METHODS IN CONTROL SYSTEMS
(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables and electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the various steps involved in the solution of a problem using computer. **[6]**

b) Develop an algorithm and the flow chart for digital computer solution of a polynomial equation by Regula-Falsi method. **[9]**

c) Obtain the root of a equation, $f(x) = x^3 - 3x^2 + 2x + 7 = 0$ using Regula-Falsi method. **[10]**

Q2) a) Give an algorithm and draw the flow chart for Gauss-Jordon elimination method for solving a set of linear algebraic simultaneous equations. **[10]**

b) Outline the procedure for finding the inverse of a square matrix using above method. **[5]**

c) Solve the following system of simultaneous equations by Gauss-Seidel iteration method. **[10]**

$$2x_1 - x_2 + x_3 = 4$$
$$x_1 + 2x_2 + 3x_3 = 7$$
$$x_1 + 3x_2 - 2x_3 = 5$$

Q3) a) Draw flow chart and give the algorithm for modified Euler's method for the solution of ordinary differential equation. **[10]**

P.T.O.

b) Use modified Euler's method to solve the differential equation : **[15]**

$$\frac{dy}{dx} - 2x - y^2 = 0$$

and find the value of y at $x = 0.15$; Given at $x = 0$ $y(0) = 1$;
Assume $h = 0.05$.

SECTION - II

Q4) a) For the given square matrix 'A', explain and give the flow chart of the Leverrier-Fadeeva method of generating a characteristic polynomial. Using this method find the eigenvalues of the matrix. **[15]**

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 6 & -11 & 6 \end{bmatrix}$$

b) Explain any one method for finding the largest eigenvalue and the corresponding eigenvector of a square matrix. **[10]**

Q5) a) Give an algorithm and draw the flow chart of the computer method for obtaining the root-locus of a closed-loop control system. Compare this method with classical approach for obtaining root-locus. **[15]**

b) Explain the computer method for obtaining the steady state and transient response of a linear closed-loop control system to a unit step input. **[10]**

Q6) Attempt any three of the following :

a) Discuss the various singular points in phase-plane trajectory. Explain with an example the computer method for simulation of non-linear control system using phase-plane method. **[9]**

b) Explain clearly the simulation of non-linear control system containing saturation non-linearity by using Describing Function method. **[8]**

c) Explain any one method of determining the state transition matrix 'e^{At}'. Give its algorithm. **[8]**

d) Explain with neat diagrams the working of P, PI and PID controller. **[8]**

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SECTION - II

Q4) a) From the complete block diagram of load frequency control of single area system, explain steady state analysis for

i) $\Delta P_C = 0$.
ii) $\Delta P_D = 0$.
iii) $\Delta P_C = \Delta P_D$.

Draw steady state frequency characteristic with change in the load. **[12]**

b) Explain the two area optimal load frequency control. With block diagram, explain state space model of two area control. **[13]**

Q5) a) What is Supervisory Control and Data Acquisition (SCADA) system? With a block diagram, explain main components of SCADA system and their functions. **[13]**

b) State the methods of data transmission and different modes of communication. **[6]**

c) Describe application of SCADA in context with any power system problem. **[6]**

Q6) a) Explain the importance of reactive power control in the power system. Discuss various methods of reactive power control. **[13]**

b) Explain various types of interchanges of power and energy. **[12]**

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1587

[3865]-179

M.E. (Electrical) Power Systems

POWER SYSTEM OPERATION AND CONTROL

(Revised Course 2002)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the optimal generation scheduling. State the effect of transmission losses on the optimal scheduling of power plants. Derive the exact coordination equation. Express transmission loss as a function of generator powers through B coefficients. Derive the solution for P_{Gi} and explain its iterative procedure. **[13]**

b) What are the loss coefficients? Explain the method of calculating loss coefficients by assuming current distribution factor. Derive the general formula and state assumptions made. **[12]**

Q2) a) What is unit commitment? Explain the constraints on unit commitment. **[13]**

b) Explain dynamic programming method of unit commitment. **[12]**

Q3) Explain the following (any two) : **[25]**

a) Hydro thermal scheduling.

b) Reliability considerations in unit commitment and Patton's security function.

c) Economic dispatch by Gradient method and Newton's method.

P.T.O.

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1588

[3865]-180

M.E. (Electrical) (Power System)

HIGH VOLTAGE POWER TRANSMISSION

(503204) (2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any <u>TWO</u> questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary and state clearly the same.***
5) ***Use of pocket electronic calculator is allowed.***

SECTION - I

Q1) a) Discuss the advantages and disadvantages of hvdc transmission system over HVAC transmission system. **[15]**

b) A 3-phase, 6 pulse, hvdc bridge inverter has a commutating reactance of 150Ω. The current and the voltage on d.c. side are 1100A and 275 kV respectively. The a.c. line voltage is 342 kV. Calculate the extinction angle (r) and overlap angle (μ). **[10]**

Q2) a) A hvdc link has the following parameters. R_{line} = 2Ω; X_{kr} = 50Ω; X_{ki} = 49Ω.

The a.c. line voltage at the rectifier terminals is 325 kV when delivering 450 MW at 340 kV dc. The inverter operates with an extinction angle of 21°. Calculate : **[15]**

i) delay angle (α) of the rectifier;

ii) the a.c. line current and power factor at the rectifier terminals; and

iii) the a.c. line current, voltage and power factor at the inverter terminals.

b) Discuss the complete characteristics of a hvdc converter. Draw sketches wherever necessary. **[10]**

P.T.O.

Q3) Write short notes on any THREE of the following :

a) Ground return in hvdc system, its advantages and disadvantages; **[8]**

b) Harmonics in hvdc systems; **[8]**

c) Protection in hvdc systems; and **[9]**

d) Features of control in hvdc systems. **[8]**

SECTION - II

Q4) a) Discuss the effects of corona on EHVAC transmission line w.r.t. the following : **[12]**

i) power loss;

ii) audible noise;

iii) radio interference.

b) Discuss the effects of high voltage electric field on humans, animals and plants. **[13]**

Q5) a) State and explain the reasons for overvoltages in EHVAC transmission lines. What measures are taken to minimise the effects of overvoltages? **[13]**

b) Discuss the principles of insulation co-ordination in A.C. transmission system. Explain how the effect of pollution is taken into account.**[12]**

Q6) Write short notes on the following :

a) Lightning arresters and their characteristics; **[8]**

b) Static reactive compensating systems; **[8]**

c) Voltage control using synchronous condensers. **[9]**

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Total No. of Questions : 6] **[Total No. of Pages : 3**

P1589

[3865]-181
M.E. (Electrical) (Power System)
POWER SYSTEM DYNAMICS
(Revised 2002 Course) (503207)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answer to each section should be written on separate answer book.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary and state clearly the same.***
5) ***Use of pocket electronic calculator is allowed.***

SECTION - I

Q1) a) An alternator is connected to an infinite bus through a network represented by ABCD parameters. Obtain the expressions for the maximum power delivered by the generator and the angle δ at which this occurs. Determine also the expressions for the maximum electric power received at the terminals of infinite bus and the corresponding angle δ at which this occurs. **[12]**

b) An alternator of reactance 1.5 p.u. is connected to an infinite bus (v = 1 p.u.) through a reactance of 0.5 p.u. The no-load voltage of the alternator is 1.1p.u. and the inertia constant H is 5MW-S per MVA. All per unit values are expressed on the same base. Calculate the frequency of oscillations set up when the alternator operates at a load angle of 60º and is subjected to a small disturbance. The system frequency is 50HZ. Derive the formula used, if any. **[13]**

Q2) a) Explain the equal area criterion. State its applications. **[12]**

b) A cylindrical rotor alternator is delivering power of 1p.u. to an infinite bus through a transformer of reactance 0.1p.u, and a double-circuit transmission line with 0.45 p.u. reactance for each circuit. All reactances in p.u. are given to a base of machine rating. The transient reactance of the alternator is 0.15 p.u. A 3-phase short-circuit occurs in the middle of one of the transmission circuits and the fault is cleared for δ_C = 50º. Determine whether the system will be stable or not, assuming that the source voltage has remained with no change. If the system is stable, determine the maximum swing angle. **[13]**

P.T.O.

Q3) a) Derive an equivalent swing equation for an interconnection of two finite machines with inertia constants M_1 and M_2 and which have angles δ_1 and δ_2. Show that the equations for such a case are exactly equivalent to that of a single finite machine of inertia $M = \left(\frac{M_1 M_2}{M_1 + M_2} \right)$ with angle $\delta_{12} = \delta_1 - \delta_2$ connected to an infinite bus. **[12]**

b) An alternator with $|E_1| = 1.35$ p.u. and $x_1 = j\ 0.8$ p.u. feeds power to another machine with $|E_2| = E$ p.u and $x_2 = j0.6$ p.u. The two machines are connected by a transmission line whose π - equivalent circuit parameters are $x_e = j\ 1$ p.u and $x_s = x_r = -j\ 5$ p.u. Determine the steady state power limit for the two-machine system and the terminal voltages of each machine under these conditions. **[13]**

SECTION - II

Q4) a) Define the transient stability of a power system. Explain at least five measures that are adopted to improve the transient stability of the power system in practice. **[15]**

b) Discuss the causes for voltage instability in a power system. State and explain the measures taken to avoid the same. **[10]**

Q5) a) A 50Hz alternator is delivering a real power of 0.65 p.u. at 0.85 p.f. lagging to the infinite bus through a transformer with a leakage reactance of 0.2 p.u. and a double circuit transmission line with reactance of 0.3 p.u. per circuit. The alternator has the following data : H = 9.14 MJ/MVA; $x'd = 0.3$ p.u; damping coefficient, D = 0.138 p.u. For a small disturbance of $\Delta\delta = 8^o$, obtain the expressions for $\Delta\delta$ and $\Delta\omega$ as a function of time. **[15]**

b) Using the modified Euler's method. Solve the differential equation $\frac{d\delta}{dt} = t^2 - \delta$ given that $\delta_0 = \frac{\pi}{6}$ radian at $t = 0$ and determine the value of δ when t = 0.15 sec. Take $h = 0.05$ sec. **[10]**

Q6) a) An alternator is capable of developing a maximum power of 450MW/phase. It is operating with a power angle, $\delta = 10^o$. By how much the input shaft power be increased suddenly without loss of stability? Assume that P_{emax} remains constant. **[10]**

b) In a 50Hz SMIB system, the alternator supplies 1 p.u. current at 0.9 lagging to the infinite bus whose voltage is at 1 p.u. The constants of the alternator in p.u. are : H = 2.5; $X_d = 1.15$; $X'_d = 0.37$; $X'_q = X_q = 0.75$. Derive the P-δ curve with saliency and determine P for $\delta = 27.5^o$. Assume that infinite bus has negligible Thevinin's reactance. **[10]**

c) Discuss the effect of saturation on steady state stability of a synchronous machine. **[5]**

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1590

[3865]-182

M.E. (Electrical) (Power System)

SPECIAL TOPICS IN HIGH VOLTAGE ENGINEERING

(503210 (a)) (2002 Course) (Elective)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Discuss breakdown process in liquid insulating materials. What is stressed oil volume theory and how does it explain breakdown in large volumes of commercial liquid dielectrics?

What are the factors that influence conduction in commercial liquid dielectrics? **[16]**

b) What is thermal breakdown in solid dielectrics, and how is it practically more significant than other mechanisms? **[9]**

Q2) a) Describe, with a neat sketch, the working of a Van de Graaff Generator. What are the factors that limit the maximum voltage obtained? **[16]**

b) What is the principle of operation of resonant transformer? How is it advantageous over the cascade connected transformers? **[9]**

Q3) Write short notes on —

a) Marx circuit arrangement used for multistage impulse generators. **[9]**

b) Effect of series inductance on switching impulse waveshape produced in laboratory. **[8]**

c) Circuit arrangements for producing lightning current waveforms in laboratory. **[8]**

P.T.O.

SECTION - II

Q4) With reference to layout and operation of high voltage test setup, discuss the following :

a) Common test facilities available in high voltage laboratories. **[8]**

b) Criteria used in selecting the ratings of the testing equipment for high voltage laboratories. **[8]**

c) Typical grounding system used for high voltage laboratories. **[9]**

Q5) a) Explain power supply and safety circuits commonly used in high voltage laboratory. **[13]**

b) Discuss auxilliary facilities for large test set ups in high voltage laboratory. **[12]**

Q6) Write short notes on :

a) Comparative tracking index measurement. **[8]**

b) Radio interference and its measurement. **[8]**

c) Artificial pollution tests on high voltage insulators. **[9]**

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Total No. of Questions : 10] **[Total No. of Pages : 2**

P1591

[3865]-189
M.E. (Production)
HARD & SOFT AUTOMATION
(Revised 2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer three questions from Section I and three questions from Section II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Your answer will be valued as a whole.***
7) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
8) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain Geneva Mechanism in brief. Also explain the terms cycle time and process time. **[8]**

b) Differentiate clearly between Hard Automation and Soft Automation. **[8]**

Q2) a) What are the methods obtaining low cost hard automation in a dedicated transfer line. **[8]**

b) Explain in detail Transfer Line Monitoring System. **[8]**

Q3) a) Discuss the functioning of motor type relay for stopping the motion of a slide after a predetermined time. **[8]**

b) What is PFA analysis and how it can be used with Muther's classification? **[8]**

Q4) a) What is "In travel control system" used in Industrial Automation. **[8]**

b) Explain clearly the difference between productivity and flexibility. **[8]**

P.T.O.

Q5) Write short notes on (Any three) : **[18]**

a) Routh Hurwitz Criterion.

b) Guidance Technology used in AGV.

c) Resumption policy and Discard policy in Markov Chain Model.

d) Cellular manufacturing & formation of cell through GT.

e) Heuristic Algorithm.

SECTION - II

Q6) a) Explain in brief "Generalized feed back system". **[8]**

b) Distinguish clearly between FMM, FMC and FMS. **[8]**

Q7) a) Explain the salient features of "Agile Manufacturing System". **[8]**

b) What are different governing factors affecting tool exchange rule. **[8]**

Q8) a) Explain Petri-Nets with their applications. **[8]**

b) Explain in brief "Adaptive Control System". **[8]**

Q9) a) What are the different types of cameras used in Robot Vision System? Explain. **[8]**

b) Explain different techniques used for on line inspection. **[8]**

Q10) Write short notes on (Any Three) : **[18]**

a) Relays used in automation.

b) Robot Grippers.

c) Image Processing from pixel data.

d) WCM-World Class Manufacturing.

e) CRAFT.

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Total No. of Questions : 10] **[Total No. of Pages : 4**

P1592

[3865]-191
M.E. (Production)
ROBOTICS AND ITS INDUSTRIAL APPLICATIONS
(Revised 2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable electronic calculator is allowed.***

SECTION - I

Q1) a) What methods of path motion are used in industrial robots? **[6]**

b) What kind of configurations are appropriate for : **[6]**

i) Spray Painting.
ii) Arc Welding.
iii) Inserting a peg into a hole.

c) Explain the following terms : **[4]**

i) Work Envelop.
ii) Accuracy.
iii) Repeatability.
iv) Control Resolution.

Q2) a) Illustrate a robot gripper which is **[6]**

i) cam operated.
ii) gear operated.
iii) lever (links) operated.

b) A box weighing 1kN is to be gripped as shown in Fig. 3 using friction against two opposing fingers. Assume coefficient of friction $\mu = 0.22$. The centre of gripping does not coincide with the centre of gravity of box. Find clamping force assuming a factor of safety 1.6. **[10]**

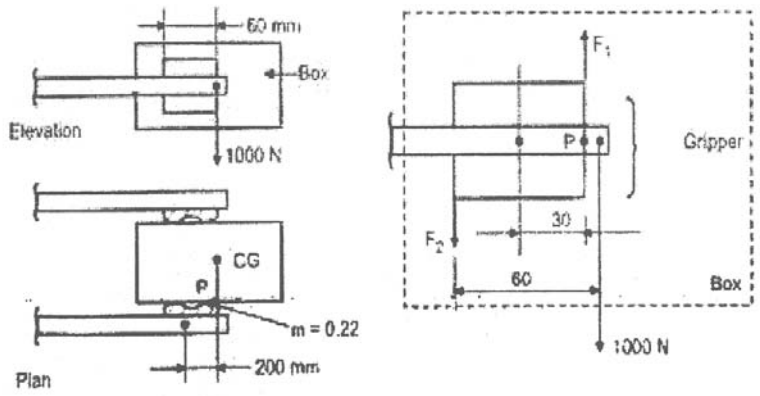


Fig. 3

Q3) a) Sketch a pneumatic circuit to control different motions of **[8]**

i) cylindrical coordinate robot.

ii) cartesian coordinate robot.

b) An object and a vision system are related below : **[8]**

$$^{camera}T_{object} = \begin{bmatrix} 0 & 1 & 0 & 15 \\ -1 & 0 & 0 & -5 \\ 0 & 0 & 1 & 25 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

The object is rotated 90° about its own z-axis, then it is translated by 10 units along its new x-axis. Determine the relation between vision system and the displaced object. Further if the camera is turned by 90° about its own y-axis, what will be the transformation matrix of the displaced object with respect to the rotated camera?

Q4) a) What are the advantages and disadvantages of stepper motor over dc motor? A stepper motor is used to drive a linear axis of robot. The motor is connected to a screwed shaft having a double start thread of pitch 2.5 mm. The resolution desired for the controlled motion is 0.5 mm. **[10]**

Determine :

i) The step angle that is required on the motion to obtain the resolution.

ii) Pulse rate required to drive the axes if the velocity is 80 mm/s.

b) What is meant by Blending Scheme? In the trajectory of path of the Robot the maximum available angular acceleration for Servo motor is found to be 40°/sec^2. Final and initial Joint angle are $\theta_f = 70^o$ and

$\theta_0 = 20^o$. Total time t_f = T = 2.5 sec. Find the Blending time. Find out θ corresponding to $t = t_{blend}$. Show that for successful completion of the job, the acceleration of the servo motor. **[6]**

$$\alpha \geq \frac{4(\theta_f - \theta_0)}{T^2}$$

Q5) Write short notes on three : **[18]**

a) Adhesive Grippers.

b) Safety measures in Robotics.

c) SCARA Robots.

d) Economics in robots.

e) CCD Camera.

SECTION - II

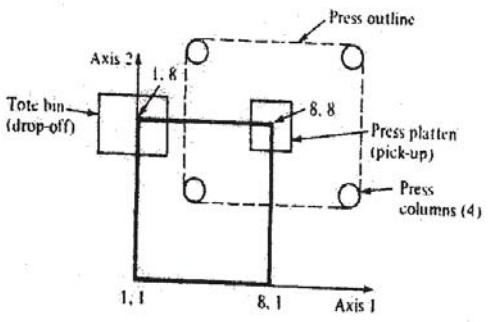
Q6) a) Discuss the basic robot programming language structure and explain the related motion control commands. **[8]**

b) List important robot programming languages. Discuss the development of robot programming languages from "AL" to "Inform II". **[8]**

Q7) a) A video voltage signal is to be digitized by an A/D converter. The maximum voltage range is + 15V. The A/D converter has 6 bit capacity. Determine the number of quantizing levels, the quantization level spacing and quantization error. Also indicate how the voltage signal might be expressed in binary form. Compare the answer with one obtained for an A/D converter of only 4-bit capacity. **[8]**

b) Explain with illustration the performance of an actuator as a automation component. **[8]**

Q8) a) Write a program to perform unloading of a press using move, wait, signal and delay commands for the following layout. **[8]**



b) The following data represents a 8 X 8 array of pixels. Each element in the array indicates the gray level value of the pixel. **[10]**

10	17	19	17	19	17	19	12
13	17	19	18	19	19	18	13
14	15	11	19	19	15	10	14
13	10	11	20	20	11	11	13
12	12	12	20	21	12	11	12
11	12	12	19	19	12	10	12
12	18	18	18	19	18	20	11
12	19	19	18	19	20	22	12

i) Construct a histogram for the array and an appropriate threshold value to use to separate black from white.

ii) Obtain the hidden alphabet image, by converting the picture into black and white image.

Q9) a) Explain Slip-type tactile sensor and range sensor. **[8]**

b) Explain interfacing of robot with PC. **[8]**

Q10) a) What are proximity sensors, explain any of them with suitable illustration. **[8]**

b) Describe how tactile sensors operate. What is the difference between tactile sensing and touch sensing? **[8]**

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Total No. of Questions : 10] **[Total No. of Pages : 3**

P1593

[3865]-192
M.E. (Production)
ADVANCE MACHINE TOOL DESIGN
(Revised Course 2002) (511103)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non-programmable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Give an overview of modern trends in the design of machine tools. **[8]**

b) Discuss the procedure for selecting the best ray diagram in design of speed gear box? **[8]**

Q2) a) Design and draw the head stock gear box for a turret lathe with the following data :

i) Maximum spindle speed = 1000 rpm
ii) Minimum spindle speed = 30 rpm
iii) No. of speed = 12
iv) Power of motor = 7.5 kW
v) Speed of the motor = 1440 rpm

Draw optimum ray diagram and sketch the layout of gearbox and connection to motor. Show that the percentage variations of speeds are within the limits. **[12]**

b) Explain Stepless regulation of speed. **[6]**

Q3) a) Explain with suitable example how rigidity can be improved in an existing machine tool? **[8]**

b) Analyze the different forces acting on arbor of a horizontal milling machine and explain the design procedure. **[8]**

P.T.O.

Q4) a) Show the different arrangements of ribs and stiffeners in box type structure of machine tool. Which type of stiffness arrangement provides significant improvements in bending and torsional stiffness of box type structure. **[8]**

b) Explain graphically the optimum design criterion for selection of mild steel and cast iron as material for machine tool structures, based on strength and rigidity. **[8]**

Q5) a) Show that the rigidity of the hydro-dynamically lubricated slides is always less than that of hydro-static slide way. **[8]**

b) Calculate the average pressure, maximum shearing stress and pitch error in the lead screw of a lathe. Given :

Outer diameter	70 mm
Pitch	10 mm
Effective diameter	65 mm
Length of nut	100 mm
P_z	150 kgf
P_y	50 kgf
P_x	45 kgf
Coefficient of sliding friction between the carriage and guideways	0.2
Weight of the carriage	50 kgf

The lead screw has standard, single-start acme thread. **[8]**

SECTION - II

Q6) a) Sketch and explain unit supports and spindle ends in a high speed machine tools? **[6]**

b) Why it is essential to preload the bearings of spindle mountage? **[6]**

c) Explain the working principle of recirculating ball screw used in modern machine tools. **[6]**

Q7) a) Sketch a typical lathe spindle unit using antifriction bearing. Explain how the axial and radial loads are resisted. **[8]**

b) Give the comparative evaluation of hydrostatic and hydrodynamic bearings in machine tools. **[8]**

Q8) a) What do you mean by regenerative chatter and what are the remedies for minimizing effect of chatter in machine tool? **[8]**

b) Outline the different elements in hydraulic power pack used in machine tools. **[8]**

Q9) a) With the help of schematic diagram explain the working principle of adaptive control system in CNC machines. **[8]**

b) State the advantages and limitations of hydraulic devices and hydraulic control system in machine tools? **[8]**

Q10) a) With the help of sketches explain the special constructional features of CNC machine tool. **[8]**

b) What are the important considerations for retrofitting of a lathe? **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1594

[3865]-193
M.E. (Production)
CIM AND ADVANCED MANUFACTURING PROCESSES
(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any three questions from section-I and three questions from section-II.***
2) ***Use separate answer books for each section.***
3) ***Use of calculator, std. data table is allowed.***
4) ***Assume suitable data if required.***

SECTION - I

Q1) a) What is FMS? How it is implemented in engineering industries? Explain different layouts in FMS. **[8]**

b) Explain CAT. How correlate it with CAM? **[8]**

Q2) a) Explain any two engineering module for MRP-II. **[8]**

b) Explain various functions of AGV? What are the equipments and accessories commonly used in AGV guidance and control? **[8]**

Q3) a) Discuss the main elements of CIMS and its evolution. **[8]**

b) What is meant by CAE? Compare it with CIMS and list advantages of both of them. **[8]**

Q4) Write a short note on : **[18]**

a) CAPP.

b) MRP-I.

c) Use of computer at shop floor activities.

SECTION - II

Q5) a) Explain with neat sketch USM along with its process parameters. **[8]**

b) Explain different CKTS used in EDM for spark initiation. **[8]**

P.T.O.

Q6) a) Explain the process of PLASMA machining? State the relationship between surface speed and MRR in PLASMA arc machining. **[8]**

b) Explain different factors affecting 'high speed machining'. **[8]**

Q7) a) Discuss the concept of lean manufacturing. **[8]**

b) Explain with neat sketch a steriolithography RP technique. **[8]**

Q8) Write a short note on : **[18]**

a) Agile manufacturing.

b) Water jet machining.

c) ATC.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1596 **[3865]-196**

M.E. (Production)

HUMAN FACTORS IN DESIGN AND MANUFACTURING

(Elective - I) (Revised 2002 Course)

Time : 3 Hours] [***Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Write short note on : **[18]**

a) MRP-I

b) Manpower planning

c) Job allocation.

Q2) a) Explain various factors that affect transportation cost and efficiency in supply chain. **[8]**

b) Explain various material handling system used in warehouse. **[8]**

Q3) a) Explain the economic and service benefits of warehouses in supply chain. **[8]**

b) Explain the various pillars of lean manufacturing. **[8]**

Q4) a) Explain 'world-class manufacturing'. State the various tools and techniques. **[8]**

b) Explain the role of technological advancement in product life cycle. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain principles of auditory display. **[10]**

b) Explain the effect of working condition on human performance. **[6]**

Q6) a) Explain the principles of seat design. **[10]**

b) Explain the term WBGT and BB. **[6]**

Q7) a) Explain different kinds of fatigue. **[10]**

b) Explain 'Heat stress index' and 'Wind chill index'. **[6]**

Q8) a) Explain various measures of physiological function. **[10]**

b) Explain principles of arrangement of the components at workplace. **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1597

[3865]-197
M.E. (Production)
PRECISION ENGINEERING
(Revised Course 2002) (Elective - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non-programmable electronic pocket calculator and statistical tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the essential differences between linear measurement and circular dividing. **[8]**

b) Use a diagram to describe the operating principle of either an optical or a mechanical type of comparator. Derive an expression for the magnification of system which you describe. **[8]**

Q2) a) Illustrate with suitable example the purpose of using the interchangeability assembly concept in manufacturing. **[8]**

b) Hole $60^{+0.027}$ mm is assembled with shaft $60^{+0.035}_{+0.018}$ mm using selective assembly after dividing the tolerance zones into three groups. Find out the tolerance of the fit without and with selective assembly. **[8]**

Q3) a) Make an optical diagram of a projector, showing how the relative positions of the screen, projection lens and object, affect the magnification and definitions of the image. **[8]**

b) Describe with a suitable example the concept of form factor and bearing area curves in relation to surface roughness. **[8]**

P.T.O.

Q4) Write short notes on (**any three**) : **[18]**

a) Laser interferometers.

b) Tool Maker's Microscope.

c) Universal dividing head.

d) Co-ordinate Measurement Machine (CMM).

SECTION - II

Q5) a) State the principles which govern the design of limit gauges giving examples of such gauges to check : **[8]**

i) Length.
ii) Diameter.
iii) Depth.
iv) Distance between an internal and an external face.

b) Briefly describe the methods used for inspecting screw ring and screw plug gauges. **[8]**

Q6) a) What is meant by automated inspection. Why is it becoming an important part of manufacturing engineering? **[8]**

b) Enumerate your thoughts on the merits and limitations of analog vs. digital measuring equipment. Give specific examples. **[8]**

Q7) a) Discuss the rational subgroup concept. What part does it play in control chart analysis? **[8]**

b) A company uses the following acceptance sampling procedure. A sample equal to 10% of the lot is taken. If 2% or less of the items in the sample are defective, the lot is accepted; otherwise, it is rejected. If submitted lots vary in size from 5,000 to 10,000 units, what can you say about the protection by this plan? If 0.05 is the desired LTPD, does this scheme offer reasonable protection to the consumer? **[8]**

Q8) a) A certain dimension of a component produced in quantity on an automatic lathe is specified as 84.60±0.05 mm. A 5% inspection check resulted in the following variation of the dimensions measured to the nearest 0.01mm.

Dimension (mm)	84.56	84.57	84.58	84.59	84.60	84.61	84.62	84.63	84.64
Frequency	1	8	54	123	248	115	44	6	1

Calculate the mean value and standard deviation for the sample check and draw the frequency curve. Show that for practical purposes the variation of dimension for the whole batch would be expected to fall within the prescribed limits. **[10]**

b) With neat sketches explain the procedure of acceptance tests on a lathe and its influence in precision manufacturing. **[8]**

Total No. of Questions : 11] **[Total No. of Pages : 4**

P1598

[3865]-199
M.E. (Production)
RELIABILITY ENGINEERING
(2002 Course) (51110)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Define Tero-technology and State the importance of the same in evolving the "LCC" of an asset? **[4]**

b) A series of tests conducted under certain stipulated conditions on 1000 electronic components, the duration of tests is 10 hrs. Calculate failure density (fd); failure rate (Z) and reliability (R). **[12]**

Time (t)	00	01	02	03	04	05	06	07	08	09	10
No. of failures	00	212	180	160	135	125	55	45	35	34	19

OR

Q2) a) Explain with sketch effect of equipment reliability on life cycle cost. **[8]**

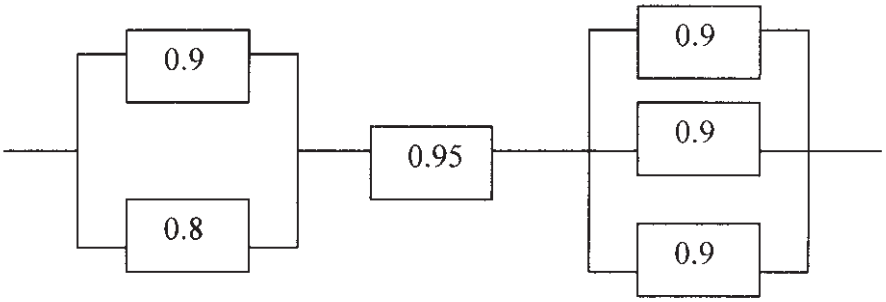
b) Evaluate failure density (fd), Hazard rate (Z) and Reliability (R). Plot these functions against time. **[8]**

Operating time (hrs)	00	01	02	03	04	05	06	07	08
No. of failures	00	232	150	131	120	110	90	89	78

Q3) a) Explain with sketch any 4 commonly used Fault tree symbol. **[4]**

P.T.O.

b) Construct a Fault tree for the block diagram shown below and calculate reliability of system. **[8]**



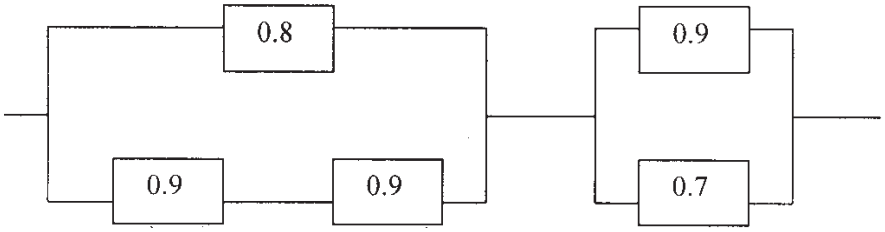
c) Explain RPN and its allocation. **[4]**

OR

Q4) a) Sketch and explain with meaning logic gate AND and logic gate OR. **[4]**

b) Explain in details FMEA process. **[4]**

c) Construct a Fault tree for the block diagram shown below and calculate reliability of system. **[8]**

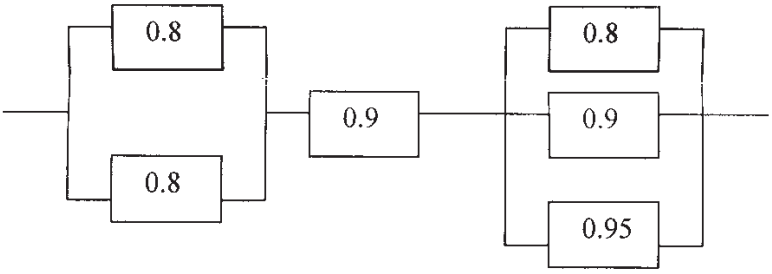


Q5) a) Explain with neat sketch, **[8]**

i) Series parallel configuration;

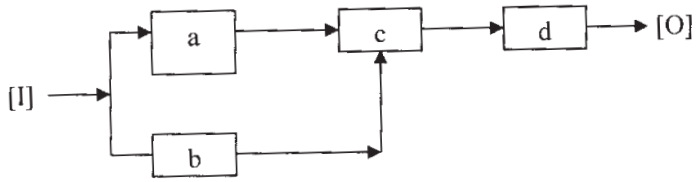
ii) Parallel series configuration in system reliability.

b) Calculate the reliability of the system shown below : **[10]**

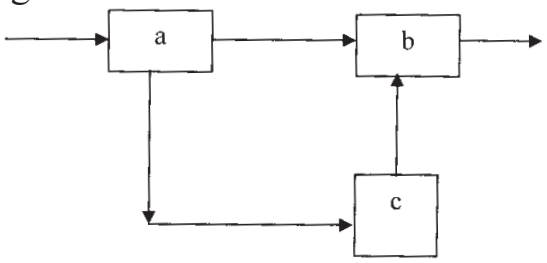


OR

Q6) a) Four elements a, b, c & d are connected to form a system as shown in figure. Determine the system reliability. Assume that the elements are independent. **[8]**



b) Calculate the reliability by using tie-set and cut set method of the system configuration shown below. **[10]**



Ra = 0.98; Rb = 0.95; Rc = 0.80

SECTION - II

Q7) a) Explain with sketch the reliability design process. **[8]**

b) A company is planning to acquire a truck. Two makes of trucks are available in the market. The cost of garaging and the driver's wages are same for both. The other data on cost are provided in the table.

Parameters	Truck A	Truck B
Capital cost	Rs. 2 Lakhs	Rs. 3 Lakhs
Annual Road Tax & Insurance	Rs. 7,000	Rs. 8,000
Operating Cost a) fuel consumption b) oil consumption c) fuel cost d) oil cost	 20 km/lit 4 lit/1000 km 4/lit 30/lit	 20 km/lit 4 lit/1500 km 4/lit 35/lit
Maintenance Cost a) service interval b) cost of service c) random breakdown d) cost of breakdown	 Every 6,000 km Rs. 5,000 Every 8,000 km Rs. 7,000	 Every 6,000 Rs. 2,500 Every 35,000 Rs. 10,000
Expected life	10 yrs.	10 yrs.

Calculate annual maintenance cost for a period of 30,000 km & find out which truck is advantageous? **[8]**

OR

Q8) a) Three sub systems with failure rates 0.005, 0.003, 0.001 are connected in series. System has a mission time of 20 hrs and its reliability required is 0.95. Find sub-system reliabilities. Use ARNIC method. **[6]**

b) In the system failure data are as shown below :

Failure No.	1	2	3	4	5	6	7	8	9	10
MTTF (Hrs)	7	11	18	21	14	20	22	28	24	26

Plot the reliability for mean and median ranking method. **[10]**

Q9) a) Define and explain the terms : **[8]**

i) Inherent Availability;
ii) Achieved Availability;
iii) Operational Availability.

b) Given two components, each having a constant failure rate of 0.10 failure per hour and a constant repair rate of 0.20 repair per hour, compute point and interval availability for a 10 hr mission and steady state availability for both series and parallel configuration? **[8]**

OR

Q10) a) What are different types of maintenance system? Compare reliability centered maintenance with total productive maintenance system. **[8]**

b) Derive an expression for 'Operational availability' and 'Inherent availability?

The following data have been collected at the plant :-
Mean time before failure = 20 hrs.
Mean time to repair = 10 hrs. Administrative logistic time is 30% of Mean Down Time (MTD). **[8]**

Q11) Write short notes on (Any 3) : **[18]**

a) Markov's Analysis of two independent components.
b) Grouped and Ungrouped data.
c) Reliability growth model.
d) Bath tub curve.
e) Matrix method of estimating system reliability.
f) Safety margin and safety factor.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1599

[3865] - 201

M.E. (Computer)

EMBEDDED SYSTEM DESIGN

(2002 Course) (Elective - II)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the different characteristics of embedded systems? Explain. **[8]**

b) What are the different design metrics applicable to embedded systems. **[10]**

Q2) a) What How embedded systems are different than other systems? Explain with examples. **[6]**

b) Define interrupt latency period. How does it affect the performance of the processor? **[6]**

c) How emulator is useful for Embedded systems? **[4]**

Q3) a) It is required to design a real time data acquisition system. For this application select the appropriate processor / microcontroller based on: **[8]**

i) Instruction cycle time.

ii) Bus width.

iii) Number of interrupts.

iv) On-chip RAM, ROM/Flash memory.

b) How contact-less smart card gets power up? Give details. **[8]**

Q4) a) Explain the different types of memories found on chip microprocessor or microcontroller. **[9]**

b) Explain the arbitration in I2C protocol with the help of neat timing diagram. **[7]**

P.T.O.

SECTION - II

Q5) a) Name and explain topology used to connect devices to host in USB protocol. Also state the application areas of USB. **[8]**

b) List and explain salient features of CAN protocol. Also explain the different frames used in CAN. **[10]**

Q6) a) Compare of ISA and EISA buses based on the features such as data rate, data size, connector size, applications. **[6]**

b) Explain the bus arbitration in CAN protocol. **[6]**

c) What are the important characteristics of I2C protocol? **[4]**

Q7) a) Explain the architecture of FPGA. How it can be programmed? What are its applications? **[10]**

b) Compare desktop OS and embedded OS. **[6]**

Q8) a) Define RTOS. Elaborate on features of RTOS. **[6]**

b) Differentiate between RTOS and desktop OS. **[6]**

c) What are the different features of VxWorks? **[4]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1600

[3865] - 206

M.E. (Computer)

GEOMETRIC & SOLID MODELING

(Revised Course 2002)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Enlist the levels of abstractions applicable to modeling system. Explain in brief. **[4]**

b) With the help of an example show that ordinary Boolean intersection of two cubes may produce **[8]**

i) Solid
ii) Plane
iii) Pint
iv) Line

c) Explain various Euler's operator to create and modify the close surfaces. **[6]**

Q2) a) Comment on the statement "Generic design cannot be displayed or converted to boundary representation". **[4]**

b) Why the mathematics of sweeping is said to be more delicate and demanding? **[4]**

c) Explain the winged edge representation technique for representing the boundary of polyhedron. **[8]**

Q3) a) What is range tree? What is its use in modeling? Explain in brief. **[6]**

b) Explain the following processes **[8]**

i) point / solid classification.

ii) curve / solid classification.

iii) surface/solid classification.

c) Define the term : static interval tree. **[2]**

P.T.O.

Q4) a) How do you perform the topological validation of manifold B-rep solid? **[8]**

b) How do we conceptualize the process of intersection of shells? Explain it with the different combination of face, edge and vertex intersection. **[8]**

SECTION - II

Q5) a) Explain the edge identification with respect to **[8]**

i) Topological aspect.

ii) Edge orientation.

iii) Singularities on edges.

iv) Edge identification information.

b) For the knot set $t_1 = 1$, $t_2 = 2$ ....., ti = 1 calculate $B_{i,3}(5.5)$ **[8]**

Q6) a) What property of raster displays makes the technique of the ray tracing possible? **[4]**

b) Explain the terms affine and projective spaces. **[6]**

c) How can the computational efforts involved in using ray tracing method be reduced? **[4]**

d) How a mathematical surface is rendered as a wire frame model? **[4]**

Q7) a) Find the approximation equation for the plane $3.2x+4.5y+12.3z+30=0$ when the coefficient x,y,z should be bounded by 3 and the constant term by 9. **[8]**

b) What is the curve and surfaces? Give the implicit and parametric representation of curves and surfaces? And give the conversion methods for implicit to parametric curves and surfaces. **[8]**

Q8) a) Prove the geometric example theorem : "if two lines AB and CD are congruent, then so are their halves". **[8]**

b) As Geometric modeling is based on floating point arithmetic, Explain the numerical errors in floating point arithmetic and geometric failure due to floating point arithmetic with example. **[8]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1601 **[3865]-209**

M.E. (Computer)

INTELLIGENT SYSTEMS

(Revised Course 2002)

Time : 3 Hours*]** **[*Max. Marks : 100

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Assume suitable data, if necessary.***
4) ***Draw sketches wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Why would evolution tend to result in systems that act rationally? What goals are such systems designed to achieve? **[8]**

b) What do you mean by Intelligent agents? Discuss the classification of Intelligent agents. **[8]**

Q2) a) Explain Best first search algorithm with the help of suitable example. **[8]**

b) Define in your own words the following terms : **[8]**

i) State and state space
ii) Search tree
iii) Search node
iv) Goal
v) Successor Function
vi) Solution Path
vii) Branching Factor
viii) Action

Q3) a) Consider a state space where the start state is number 1 and the successor function for state n returns two states, numbers 2n and 2n+1. **[8]**

i) Draw the portion of the state space for states 1 to 15.
ii) Suppose the goal state is 11. List the order in which nodes will be visited for breadth first search, depth limited search with limit 3, and iterative deepening search.
iii) Would bidirectional search be appropriate for this problem? If so, describe in detail how it would work.

b) What is memory bounded search? Explain IDA* with suitable example. **[8]**

P.T.O.

Q4) Write short notes on any three : **[18]**

a) Constraint Satisfaction Problem

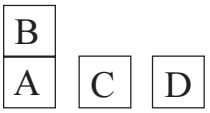
b) Contingency Problems

c) Arc consistency

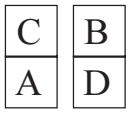
d) Backjumping.

SECTION - II

Q5) a) What is planning? Solve following blocks world problem using STRIPS notation. **[8]**



Start State



Goal State

b) Explain four planning methods for handling indeterminacy. **[8]**

Q6) a) Explain conditional planning in partially observable environment. **[8]**

b) Explain why the axioms of probability are reasonable. **[8]**

Q7) a) What is Hierarchical Task Network (HTN) Planning? Explain with algorithm, the basic HTN procedure. **[8]**

b) Explain what do you mean by decision networks? Also explain how these networks are used to make simple decisions. **[8]**

Q8) Write short notes on any three : **[18]**

a) Probabilistic Reasoning

b) Uncertainty

c) Decision - Theoretic Agents

d) Utility Theory.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1602

[3865]-211
M.E. (Computer Engineering)
ADVANCES IN COMPILER TECHNIQUES
(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain various phases of compiler stating their interaction with each other as well as with the symbol table. **[8]**

b) Explain bootstrapping with respect to compiler, also explain what is a cross compiler. **[8]**

Q2) a) Discuss various issues in designing the intermediate code. Compare various forms of intermediate code. **[8]**

b) Explain use of LEX and YACC in intermediate code generation process. **[8]**

Q3) a) Explain: unified algorithm for data flow analysis. **[8]**

b) State and explain fundamental data flow properties. Support your answer with proper examples. **[8]**

Q4) Write short notes : **[18]**

a) SSA form.

b) Planning a compiler.

c) bi directional data flow analysis.

P.T.O.

SECTION - II

Q5) a) Explain in detail structure of a parallelizing compiler. **[8]**

b) Explain: code generation for pipelined machines. **[8]**

Q6) a) Explain register allocation and assignment problem. **[8]**

b) Explain in what way the design of a compiler for standalone machine is different from design of compiler for distributed machines? **[8]**

Q7) a) Explain: Auto scheduling compilers. **[8]**

b) Why there is need for Just in Time compilation? Explain the process of JIT compilers in detail. **[8]**

Q8) Write short notes : **[18]**

a) Code optimization techniques.

b) LEX.

c) Phases of compiler.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1603

[3865]-212
M.E. (Computer)
COMPUTER VISION
(Revised Course 2002)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answer will be valued as whole.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is the aim of image preprocessing? Which are the basic types of preprocessing methods exists? **[6]**

b) State hierarchical data structure and explain any one of them. **[10]**

Q2) a) Explain the principles of image restoration based on : **[8]**

i) Inverse convolution.
ii) Inverse filtration.
iii) Wiener filtration.

List the main differences among the above methods.

b) Explain Hough transform considering example of circle detection. **[8]**

Q3) a) What are commonly used thresholding methods for segmenting an image in computer vision system? **[8]**

b) Which data structures facilitate region merging and splitting? **[8]**

Q4) Write short notes on : **[18]**

a) Image quantization.

b) Histogram equalization.

c) Edge relaxation.

P.T.O.

SECTION - II

Q5) a) Describe the concept of B-Spline curve interpolation. **[8]**

b) Write algorithm for region area calculation from Freeman 4-connectivity chain code representation. **[8]**

Q6) a) Explain how Hopfield network can be used for pattern recognition. **[8]**

b) Define the following terms : **[8]**

i) Class identifier.
ii) Decision rule.
iii) Discrimination function.
iv) Training set.

Q7) a) Explain single camera calibration for known scene. **[10]**

b) Explain the difference between a bottom up approach to 3-D vision as opposed to top down (model based). **[6]**

Q8) Write short note on : **[18]**

a) Statistical pattern recognition.

b) Semantic nets.

c) Object recognition as graph matching.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1604

[3865]-213
M.E. (Computer Engineering)
BIOINFORMATICS
(Old Course 2002) (Elective - II) (Semester - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer for two sections should be written in separate answer books.***
2) ***Question No.4 and 8 are compulsory. Out of remaining questions answer any two questions.***
3) ***Figures to the right indicate full marks.***
4) ***Draw neat diagrams where necessary.***

SECTION - I

Q1) a) Draw and explain the various components of eukaryotic cell. **[8]**

b) Explain in detail two biomolecules. **[4]**

c) What are the different types of cells found in human body? **[4]**

Q2) a) Write in detail about the various types of amino acids. **[8]**

b) Distinguish between DNA and RNA. **[4]**

c) What are enzymes? Comment on types of enzymes. **[4]**

Q3) a) Describe in detail the process of transcription and translation, in proteins. **[8]**

b) Explain the process of DNA replication. **[4]**

c) Write in detail about codon usage table. **[4]**

Q4) Write short notes on (Any 6) : **[18]**

a) Mutation and its types.

b) Genetic switch.

c) Promoters and enhancers.

d) Types of RNA.

e) Endoplasmic Reticulum.

f) Bacterial cell.

g) Difference between Prokaryotic and Eukaryotic cell.

P.T.O.

SECTION - II

Q5) a) Describe the primary, secondary and tertiary structure of proteins. **[6]**

b) Describe any two methods to predict protein secondary structure. **[6]**

c) Explain multiple sequence alignment. **[4]**

Q6) a) Write in detail about contents in protein databank PDB. **[8]**

b) What are the current protein and DNA databases available on internet. **[4]**

c) Write a note on EMBL databank. **[4]**

Q7) a) Draw and explain Ramchandran plot with reference to protein structure. **[6]**

b) Why is there a need to study bioinformatics. **[4]**

c) Explain the matrix method for pairwise sequence alignment. **[6]**

Q8) Write short notes on (Any 3) : **[18]**

a) A computer program to convert DNA sequence to protein sequence.

b) Tertiary structure prediction algorithm.

c) FASTA algorithm for sequence alignment.

d) Dynamic programming Algorithm.

e) Neural Network Prediction Algorithm.

Total No. of Questions : 10] [Total No. of Pages : 3

P1606

[3865]-218

M.E. (Petroleum)

ARTIFICIAL LIFT AND STIMULATION TECHNIQUES

(Revised Course 2002) (512103)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Question numbers One and Six are Compulsory. Out of the remaining solve two questions from Section - I and two questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, and electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define and explain the following properties. **[12]**

i) Solution gas oil ratio

ii) Specific Gravity of oil.

iii) Bubble-point pressure.

iv) Viscosity of Oil.

b) What is formation damage? State and explain the equations to calculate pressure drop due to formation damage in case of a vertical and horizontal well. **[6]**

Q2) a) Define:

i) Plunger over travel.

ii) Pump efficiency. **[4]**

b) Draw IPR for a well in a saturated oil reservoir using, both Vogel's equation and Fetkovich's equation. Following data is available.
Reservoir pressure = 3,100 psia.
Tested flowing bottom-hole pressure, pwf - 1 = 2,100 psia.
Tested production rate at pwf - 1 = 490 stb/day.
Tested flowing bottom-hole pressure, pwf -2 = 1,000 psia.
Tested production rate at pwf -2 = 800 stb/day.
Assume n = 1 and c = 0.0001 stb/day-psi^{2n} **[12]**

P.T.O.

Q3) a) Estimate the value of gas formation volume factor for 0.818 gravity dry gas in a reservoir with temperature 220 ^{o}F and reservoir pressure of 2150 psig. Assume gas compressibility factor, Z = 0.855. **[4]**

b) It was planned to install and open the valve at a depth of 7000 ft. Find the casing pressure at this depth, if the specifications given are , Ab = 1.0 sq. inch and Ap = 0.1 sq. inch. Pressure in the dome is 800 psi and the tubing pressure is 570 psi. **[4]**

c) What is intermittent gas lift? Explain with typical graph, the step wise design procedure for intermittent gas lift design, in brief. **[8]**

Q4) a) Calculate the required gas, daily injection rate, draw the graph and find the point of gas injection for continuous gas lift. Data given:
Perforation depth is 7300 ft.
Formation pressure is 2,400 psi.
Well's P.I. is 2.5 bpd/psi.
The well produces daily 800 barrels with a formation GLR of 100 scf/bbl. (gradient 320 psi/1000 ft.) Existing tubing size is 2 $\frac{3}{8}$ inch. O.D. and a WHP of 250 psi. Lift gas of 0.75 gravity is injected with surface injection pressure of 800 psi and gas gradient 26 psi / 1000 ft. GLR belonging to expected pressure traverse connecting injection point and WHP is 250 scf/bbl. **[8]**

b) Draw and explain the generic nature of graph to indicate the trend of GOR, PI and pressure against time in a typical reservoir having solution gas drive and bottom water drive mechanism. **[8]**

Q5) Write short notes on: **[16]**

a) Dynagraph.

b) Gas lift valves.

c) Sub-surface set-up of SRP.

d) Gilbert method and graphs.

SECTION - II

Q6) a) Following data is given for hydraulic fracturing job: **[10]**
Specific gravity of fracturing fluid = 1.11.
Viscosity of fracturing fluid = 20 cp.
Tubing inner diameter = 3.0 in.
Fluid injection rate = 9.8 bbls/ minute.
Calculate the maximum expected surface injection pressure.

b) Explain in brief carbonate matrix acidizing. **[8]**

Q7) a) Describe in brief any one mathematical model to explain hydraulic fracturing. Draw the sketch of a typical fracture geometry and discuss the design considerations for fracturing job in brief. **[10]**

b) Write the role of fracturing fluid and propent in hydraulic fracturing job. **[6]**

Q8) a) Calculate, effective plunger stroke, tubing and rod stretch, polished rod stroke and over travel if 80 bbls/day are to be produced using sucker rod pump. The proposed pump setting depth is 8200 ft. in $2\frac{7}{8}$ inch tubing O.D/I.D. is 2.875/2.441 inch. The unit utilizes a rod string consisting of $\frac{3}{4}$ inch and $\frac{7}{8}$ inch rods and operates at 17 spm. Assume volumetric efficiency of 0.8. Oil is having a Sp. gravity of 0.83, is at a level of 5,900 ft in the casing annulus. The elastic constant for the rod string is 0.774×10^{-6} in lb/ft. Modulus of elasticity for steel, 30×10^{6} psi. **[12]**

b) Write in brief remedial measures to any three workover problems. **[4]**

Q9) Draw the neat schematic sketch of surface and sub-surface set-up of ESP and calculate total dynamic head, no. of stages required and motor horsepower required for following ESP.

Data:

Desired rate = 9, 100 b/d.

P.I. = 8.2 b/d/ft. of drawdown.

Static fluid level 400 ft. from the S/C.

Surface flow line = 2,450 ft. of 4 inch, with elevation rise of 40 ft. , for this friction loss is 41 ft./1000 ft.

Perforations = 1850 – 2350 ft.

Wellbore depth = 2350 ft.

Tubing friction loss given = 20 ft./1000 ft.

From the performance curve, it is recommended to use the pump which gives 65 ft.of head per stage; while horsepower required is 9 hp per stage. **[16]**

Q10) Write a short note on: **[16]**

a) Sand control.

b) Production optimization.

c) Comparison of various ALT methods.

d) ALT other than SRP, ESP and gas lift.

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Total No. of Questions : 6] **[Total No. of Pages : 4**

P1607

[3865] - 219

M.E. (Petroleum Engineering)

RESERVOIR CHARACTERISATION AND MANAGEMENT

(2002 Course)

Time : 3 Hours] ***[Max. Marks :100***

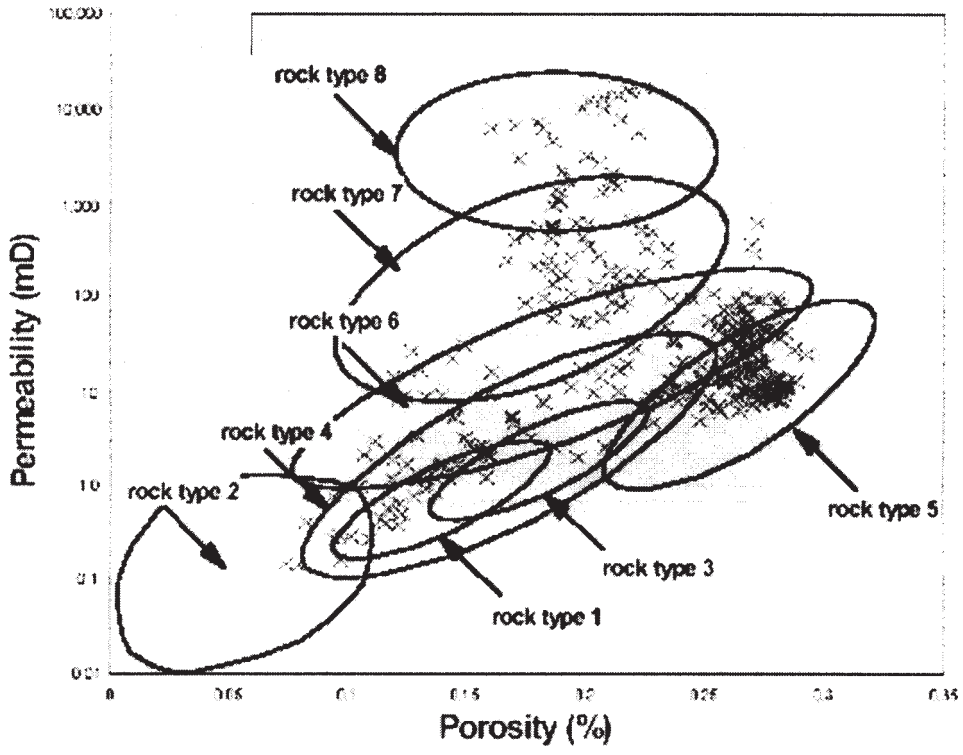
Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Assume additional data, if necessary.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Sketch and illustrate components of a reservoir system. How is quality of a reservoir ascertained using different parameters? **[15]**

b) Given below is the plot of porosity against permeability for different petrophysical carbonate rocks encountered in a well. Analyse the plot and comment on reservoir potential of all types of carbonate rocks mentioned in the figure given below. **[10]**



P.T.O.

Q2) a) Give a broad classification of reservoir heterogeneity as interpreted on different scales. How is it recognized using well test data? **[15]**

b) Write notes on **any two** of the following: **[10]**

i) Time relaxation (T_2) curves and fluid distribution in pore space.

ii) Estimation of porosity / lithology from well logs.

iii) Relative permeability curves.

iv) Borehole environment.

Q3) a) What are common reservoir drive mechanisms? Summarise typical characteristics of primary drive types. **[15]**

b) Explain in brief the stepwise approach to performing reservoir management. **[10]**

SECTION - II

Q4) a) Describe commonly used flood patterns with their characteristics. What are the factors that influence the injector/producer pattern? **[10]**

b) Explain the role of reservoir simulation in designing a water flood project. Name at least five parameters related to water flooding that can be optimized by reservoir simulation. Why is a history match of primary production performance necessary in the study? **[15]**

Q5) a) Write notes on **any two** of the following: **[16]**

i) Formation Damage

ii) IPR

iii) History matching

iv) Well Testing in a newly discovered reservoir

b) Explain Exponential Decline and Hyperbolic Decline models with suitable diagrams. **[9]**

Q6) a) Following are the details of production of oil from a small field.

Year	Annual Production bb1	CAPEX, in $ MM
1		10.0
2		12.5
3	108000	
4	108000	
5	108000	
6	108000	
7	87000	
8	69000	
9	51000	
10	34500	
11	17250	
12	8625	

Prepare a spreadsheet based on assumptions given below and Calculate NPV @10%.

- Oil price is $ 50 /bbl and is constant throughout the tenure.
- OPEX is $ 3/bbl for service life.
- Royalty is 10% on gross revenue.
- Income tax is 25%.
- Using above data, prepare a detailed chart on annual revenue using gross profit, royalty, net revenue, yearly total expenditure and net profit per year. Discuss how one barrel of oil is distributed. **[15]**

b) Consider the following investment opportunities that might be available to a company with a current priority in "minimum risk involved". **[10]**

Asset	Opportunity	Total Investment ($M = 10^6$\$)
A	Drilling exploration wells in an area with no history of occurrence of hydrocarbons	$20 M
B	Exploration project adjacent to producing field	$10 M
C	Redevelopment in producing field	$15 M

If a budget of $ 20 M is available for allocation of projects for next year, which is the best way to spend money acknowledging the factors of uncertainty and risk?

i) 100% allocation in asset C and 50% allocation in asset B.

ii) 100% allocation in asset C, 25% in asset B and 12.5% in asset A.

iii) 80% allocation in asset C, 40% in asset B and 20% in asset A.

Justify your decision with suitable arguments for each alternative.

Total No. of Questions : 6] **[Total No. of Pages : 1**

P1608 **[3865]-221**

M.E. (Petroleum Engineering)

ADVANCED NATURAL GAS ENGINEERING AND TECHNOLOGY

(Revised 2002 Course)

Time : 3 Hours] [***Max. Marks : 100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Answer two questions from each section.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of a non-programmable calculator is allowed.***
6) ***Assume suitable data, if necessary and clearly state it.***

SECTION - I

Q1) Explain how impurities like H_2S, CO_2 are removed from a natural gas stream. **[25]**

Q2) Derive the pipe line flow equation for steady state gas flow. **[25]**

Q3) Explain the design consideration using Molier charts and analytic methods. **[25]**

SECTION - II

Q4) Draw, derive and explain p/z equation for a gas reservoir. **[25]**

Q5) Draw a process flow diagram to show two methods how water is removed from a natural gas stream. **[25]**

Q6) Explain Isochronal and Modified Isochronal well test. **[25]**

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Total No. of Questions : 8] [Total No. of Pages : 3

P1609

[3865]-226
M.E. (Petroleum)
WELL CONTROL
(Revised Course 2002) (512109)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Q. 1 and Q. 5 are compulsory. Out of the remaining attempt two questions from Section I and two questions from Section II.***
4) ***Use of cm scale graph paper is allowed.***
5) ***Figures to the right indicate full marks.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define and explain in brief. **[12]**

i) Lost circulation.

ii) Annular capacity.

iii) Filtrate loss.

iv) Mud weight.

v) Duplex pump.

b) While pulling out driller forgot to fill the hole and 36 stands of drill pipes were pulled out dry. Use following data and calculate reduction in bottom hole pressure. **[6]**

Well depth = 8788 ft.(TVD), Casing shoe depth = 5500 ft. (TVD)

Mud weight = 12 ppg., Open hole capacity = 0.1482 bbl/ft.

Casing capacity = 0.1611 bbl/ft., Drill pipe metal displacement = 0.0076 bbl/ft., Length of one stand = 93 ft.

Q2) a) Explain, how will you calculate pump SPM, if annular velocity and pump output is given to you for the circulation through casing drill pipe annulus. **[4]**

b) Draw the neat schematic sketch of choke manifold and kill line. **[4]**

c) A well is being drilled with 11.8 ppg mud. How much barite is required to increase the mud density to 13 ppg.?

Hole volume = 659 bbl. Surface volume = 333 bbl.

Barite density is 35 .4 ppg. **[4]**

P.T.O.

d) Determine the height in feet of the influx using following data. **[4]**

Pit gain = 19 bbl

Hole size = 8.5 in

Drill collar OD = 6.5 in

Drill collar length = 450 ft.

Drill pipe OD = 5.0 in

Q3) a) Draw the neat schematic sketch of a Christmas tree, show all the components and write their functions in brief. **[8]**

b) What is well head equipment? Draw the schematic sketch and explain the different components of it. **[8]**

Q4) Write short notes on : **[16]**

a) Hole problems during drilling.

b) Offshore safety procedures.

c) Well completion and well control.

d) Mohr's circle.

SECTION - II

Q5) Use the following data and calculate : **[18]**

a) Initial circulating pressure.

b) Kill mud weight.

c) Final circulating pressure.

d) Surface to bit, and bit to surface strokes.

A kick was observed after closing the surface BOP. Fill out a kill sheet. Prepare step down plan on graph paper for drillers method.

Data : Original mud weight = 9.7 ppg,

Measured depth = 9,525 ft.,

Kill rate pressure @ 50 SPM = 950 psi

Kill rate pressure @ 30 SPM = 630 psi

Drill string-drill pipe 5.0 in.-19.5 lb/ft. capacity is 0.01776 bbl/ft.

HWDP 5.0 in. 49.3 lb/ft., capacity = 0.00883 bbl/ft., length = 240 ft.

Drill collars – 8.0 in. O.D. – 3.0 in. ID, capacity is 0.0087 bbl/ft.,

length = 366 ft.

Annulus – Hole size = 12¼ in. drill collar/open hole capacity = 0.0836 bbl/ft., drill pipe/open hole capacity = 0.1215 bbl/ft.,

Drill pipe/casing capacity = 0.1303 bbl/ft.

Mud pump (7 in. X 12 in. triplex @ 95% eff.) = 0.136 bbl/stk.

Leak of test with 9.6 ppg mud = 1130 psi

Casing setting depth = 4560 ft.

Shut in drill pipe pressure = 480 psi, Shut in casing pressure = 600 psi, Pit volume gain = 35 bbl, True vertical depth = 10.000 ft.

Q6) a) Explain different symptoms of well kick during drilling operations. **[6]**

b) Write a note on: **[10]**

i) Well control during cementing.

ii) Drilling fluid properties.

Q7) a) Write in brief procedure of well control using, **[10]**

i) Drillers method.

ii) Volumetric method.

b) What is the basis to know the type of influx? Determine the same using following data. **[6]**

SICP = 1054 psi

SIDPP = 780 psi

Height of influx = 420 ft.

Mud weight = 14.8 ppg.

Q8) a) Draw the schematic sketch of a BOP accumulator and hydro-pneumatic well control system. **[8]**

b) Explain various types of blowout preventors along with their schematic sketches. **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1610

[3865]-232

M.E. (Petroleum)

OFFSHORE TECHNOLOGY

(Revised Course 2002) (512108)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the different types of forces acting on a floating offshore vessel? Describe the mathematical method and concern equations to calculate them. **[9]**

b) What is tension leg platform? Write the principle of its operation. Also draw the neat schematic sketch and explain the construction and mooring details of TLP. **[9]**

Q2) a) Draw the typical graph or chart for any one type of productive formation testing operation. Indicate all the points in it. **[4]**

b) Define the following : **[2]**

i) Centre of gravity.

ii) Metacenter.

c) Explain the initial fundamental steps or procedure involved in drilling, casing lowering and cementing operation from fixed offshore platform. Write the same, applicable for any one type of single casing only. **[10]**

Q3) List the various modes available for storage and transportation of oil and gas at offshore platform. Discuss along with sketches, in detail, various natural gas storage systems and the design considerations for it. **[16]**

Q4) Write short notes on : **[16]**

a) HPHT drilling.

b) Classification of offshore structures.

c) Remote operating vehicles.

d) Drilling riser.

P.T.O.

SECTION - II

Q5) a) Write the various types of drilling fluids. What is the basis for selection and design of drilling fluid used in deep water drilling? Explain in brief. **[9]**

b) Along with applicable equations, discuss in detail, pipe line design considerations for the transportation of oil and natural gas. **[9]**

Q6) a) Explain 'rig motions and vessel offset measurement'. Write the permissible values in different operating conditions, for these two. **[8]**

b) What are the primary functions of a riser tensioner system and heave compensator? Draw the schematic sketch of any one. **[8]**

Q7) a) Describe in detail construction, towing and installation of any one type of fixed offshore platform. State and explain the design considerations for various structural members of this platform. Draw the free-body diagram, graph along with mathematical expressions, if any. **[12]**

b) Discuss in brief, 'Offshore Safety'. **[4]**

Q8) Write short notes on : **[16]**

a) Well planning.

b) Secondary well control.

c) Offshore production system.

d) Well completion.

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Total No. of Questions : 10] **[Total No. of Pages : 4**

P1611

[3865] - 233

M.E. (Instrumentation, Process & Biomedical)

ADVANCED MATHEMATICS

(2002 Revised Course) (506101)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) With usual notation, prove that (any two): **[6]**

i) $\Delta = \frac{\delta^2}{2} + \delta . \sqrt{\left(1 + \frac{\delta^2}{4}\right)}$

ii) $(1+\Delta)\,(1-\nabla) = 1$

iii) $\nabla y_{n+1} = h\left[1 + \frac{\nabla}{2} + \frac{5}{12}\nabla^2 + ... \right] y_n .$

b) The pressure P of wind corresponding to velocity V is given by the following data. Estimate P when V=25. **[10]**

V :	10	20	30	40
P :	1.1	2.0	4.4	7.9

Q2) a) The corresponding value of x and y are given by following table: **[8]**

x :	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y :	1.1	1.3	1.6	2.0	2.7	3.4	4.1

Fit a parabola of the form $y = a+bx+cx^2$.

b) Find by Newton-Raphson method, the real root of the equation $3x = \cos x + 1$. **[8]**

P.T.O.

Q3) a) Apply Runge-Kutta Method to find approximate value of y for x=0.2 in steps of 0.1 if $x+y^2=\frac{dy}{dx}$, given that $y = 1$ where $x = 0$. **[8]**

b) Solve, by iteration method, the following equations: **[9]**

$20x+y-2z=17$

$3x+20y-z=-18$

$2x-3y+20z=25$.

Q4) a) Given that **[8]**

x:	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y:	7.989	8.403	8.781	9.129	9.451	9.750	10.031

find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1.6$.

b) The velocity v(km/min.) of a moped which starts from rest, is given at fixed intervals of time t (min.) as follows: **[8]**

t:	2	4	6	8	10	12	14	16	18	20
v:	10	18	25	29	32	20	11	5	2	0

Estimate approximately the distance covered in 20 minutes by appropriate method of numerical integration.

Q5) a) Apply Lagrange's interpolation formula, to find the value of y when x=10, from the following table: **[6]**

x:	5	6	9	11
y:	12	13	14	16

b) Given: **[6]**

θ:	0°	5°	10°	15°	20°	25°	30°
$\tan\theta$:	0	0.0875	0.1763	0.2679	0.3640	0.4663	0.5774

using Stirling's formula, show that $\tan 16^\circ = 0.2867$.

c) Express $y = 2x^3-3x^2+3x-10$ in factorial notation and hence find the value of $\Delta^3 y$. **[5]**

SECTION - II

Q6) a) Prove that the liquid motion is possible when velocity at (x,y,z) is given by

$$u = \frac{3x^2 - r^2}{r^5}; v = \frac{3xy}{r^5}; w = \frac{3xz}{r^5}.$$

Where $r^2 = x^2+y^2+z^2$, and the stream lines are the intersection of the surfaces $(x^2+y^2+z^2)^3 = c\,(y^2+z^2)^2$ by the planes passing through OX. **[8]**

b) Stating the conditions, integrate Euler's equation of motion viz. **[8]**

$$\frac{\partial \bar{q}}{\partial t} + (\bar{q}.\nabla)\bar{q} = \bar{F} - \frac{\nabla p}{\rho}$$ to give Bernoulli's equation of motion.

Q7) a) If ρ and $\bar{v}$ are the density and velocity of a moving fluid then derive the equation of continuity of fluid dynamics namely $\nabla.(\rho\,\bar{v}) + \frac{\partial \rho}{\partial t} = 0.$

Also show that the above equation of continuity can be rewritten as

$$\rho\,\nabla.\bar{v} + \bar{v}.\nabla\,\rho + \frac{\partial \rho}{\partial t} = 0.$$ **[10]**

b) If a fluid is at rest, $\frac{\partial \bar{q}}{\partial t} = \bar{0}$, show that $\nabla \times (\rho\,\bar{F}) = 0$ and hence $\bar{F}.\,\text{curl}\,\bar{F} = 0$. **[6]**

Q8) a) Define Mean Time to Failure (MTTF) of the probability distribution function $f(t)$. Show that its variance is given by

$$\sigma^2 = \int_0^\infty t^2 f(t)dt - (\text{MTTF})^2.$$ **[5]**

b) The time-to-failure density function (PDF) for a system is $f(t) = 0.01$, $0 \le t \le 100$ days. **[5]**

Find:

i) R(t).

ii) The Hazard rate function.

iii) The MTTF.

iv) The standard deviation.

v) The median time to failure.

c) A hydraulic system is comprised of five components having the following constant failure rates (times are in days):

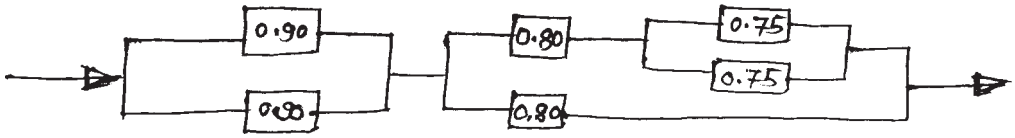
λ_1=0.001, λ_2=0.005, λ_3=0.0007, λ_4=0.0025, λ_5=0.00001

i) Find the system MTTF and standard deviation.

ii) Find the system design life if a 0.99 reliability is desired. **[8]**

Q9) a) A jet engine consists of five modules each of which was found to have a weibull failure distribution with a shape parameter of 1.5. Their scale parameters (characteristic life) are (in operating cycles) 3600, 7200, 5850, 4780 and 9300. Find the MTTF and median time to failure of the engine. **[8]**

b) Find the system reliability of the following series-parallel configuration. Component reliabilities are given. **[8]**



Q10)a) A requirement exists for an engine fuel pump to be repaired (or replaced) within 3 hr 90 percent of the time. If the repair distribution is lognormal with s=0.45, what MTTR should be achieved to meet this goal?

[Given : 1.28 is the normal deviate (z-value) corresponding to a cummulative probability of 0.90]. **[8]**

b) A component has MTBF = 200 hr and MTTR = 10 hr. with both the failure and repair distributions exponential. Find the interval availability for the first 10 time units. **[8]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1614

[3865]-236

M.E. (Instrumentation and Control) (Process and Biomedical)

APPLICATION OF DSP

(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Determine the magnitude and phase of following causal filter **[10]**

$$h(n)=\begin{cases}1;\ 0\le n\le 2\\ 0;\ \text{otherwise}\end{cases}$$

Draw the magnitude and phase response also.

b) Obtain the linear convolution and circular convolution of following sequences $x(n) = \{1, 2, 1\}$ $h(n) = \{4, 3, 2, 1\}$. **[8]**

Q2) Derive an equation for the desired impulse response of 7^{th} order bandreject FIR filter to meet the following specifications **[16]**

$$H(e^{j\omega})=\begin{cases}1;\ 0\le|\omega|\le\pi/3\\ \quad 2\pi/3\le|\omega|\le\pi\\ 0;\quad \text{otherwise}\end{cases}$$

Compare the filter magnitude response using Rectangular and Hamming window.

Q3) a) Explain the Divide and Conquer approach (Cooley-Tukey algorithm) for computation of DFT. **[10]**

b) Explain the DC motor speed control using DSP. **[6]**

P.T.O.

Q4) a) Consider the system $H(z)=\dfrac{z^{-1}+\frac{1}{2}z^{-2}}{1-\frac{3}{5}z^{-1}+\frac{2}{25}z^{-2}}$ **[10]**

Determine :

i) The impulse response.

ii) The zero state step response.

iii) The step response if $y(-1) = 1$ and $y(-2) = 2$.

b) Determine the direct form-II realization **[6]**

$2y(n) + y(n - 1) - 4y(n - 3) = x(n) + 3x(n - 1)$.

SECTION - II

Q5) Design a digital chebyshev filter using bilinear transformation technique such that the passband magnitude is constant to within 1 dB for frequency below 0.2π and the stopband attenuation is greater than 20dB for frequency between 0.6π and π. **[16]**

Q6) a) Explain in detail the speech analysis using Wavelet Transform. **[10]**

b) Obtain the cross correlation between the two sequences **[6]**

$x(n) = \{1, 2, 1\}$ $y(n) = \{4, 3, 2, 1\}$.

Q7) a) Determine the lattice coefficients corresponding to the FIR filter with system function $H(z)= A_2(z)=1+\frac{13}{24}z^{-1}+\frac{5}{8}z^{-2}$. **[8]**

b) Write a note on "DSP in Military applications". **[8]**

Q8) Explain the architecture of TMS320C67XX processor. Describe the addressing modes of TMS320CXXXX process. **[18]**

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1615

[3865]-239

M.E. (Instrumentation & Bio-Medical)

MICROCONTROLLER APPLICATION IN INSTRUMENTATION

(506108) (2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Design "Mains frequency indicator" with LED display using 8051 microcontroller. The expected display resolution is 0.1 hertz and display update timing is 10 seconds. **[25]**

Q2) Design a portable thermometer with following specifications. Develop flowchart and circuit schematic diagram. **[25]**

- Range : 0 - 100 deg.
- Least count : 1 deg.
- Power source : 9V battery.
- Display : LCD.
- Temperature Sensor type : semiconductor type.
- (Output = 10 mV/deg).

Q3) Suggest a scheme for driving two stepper motors with the help of one 8-bit port of a microcontroller. Discuss the scheme with hardware circuit diagram and software flow chart. **[25]**

P.T.O.

SECTION - II

Q4) An 8051 - microcontroller based system is to be driven with a crystal oscillator either 12 MHz or 11.0592 MHz. The system also requires RS-232 interface with a format given as : **[25]**

- Baud rate : 9600
- Start bit : one
- Stop bit : one
- Parity : no

Justify the crystal selection for the above said system.

Q5) Design a 1-second time base generation scheme using an 8051-microcontroller. The controller has 12 MHz crystal. **[25]**

Q6) Explain “Read” and “Write” cycle in 2-wire (IIC) based EEPROM with the help of timing diagram. **[25]**

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1616

[3865]-246

M.E. (Instrumentation) (Process & Bio.)

ADVANCED TECH. IN MODELING & OPTIMIZATION

(2003 Course) (Elective)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain in detail the role of mathematical modeling in process industries.

b) What are the principals of the formulation in modeling? Explain each in short.

[25]

Q2) Obtain linearized State space representation of the system shown in fig.1. **[25]**

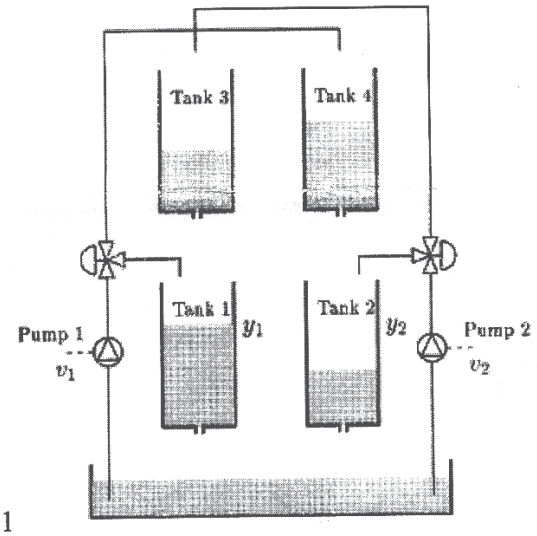

Fig.1

where
A_i cross-section of Tank i;
a_i cross-section of the outlet hole;
h_i water level.

P.T.O.

Q3) Explain in details the steps used to solve a minimization problem (with reference to any suitable method of minimization), and **[25]**

Find the minimum value of

$$w = 3x_1 + 2x_2$$

Subject to the constraints

$$\left.\begin{aligned} 2x_1 + x_2 \geq 6 \\ x_1 + x_2 \geq 4 \end{aligned}\right\}$$

Where $x_1 \geq 0$ and $x_2 \geq 0$.

SECTION - II

Q4) Write short note on : **[25]**

a) Interval Halving method.

b) Runga-Kutta method.

c) Muller method.

Q5) A steel company has two mills. Mill 1 costs \$60,000 per day to operate, and it can produce 300 tons of high-grade steel, 400 tons of medium-grade steel, and 350 tons of low-grade steel each day. Mill 2 costs \$70,000 per day to operate, and it can produce 450 tons of high-grade steel, 800 tons of medium-grade steel, and 300 tons of low-grade steel each day. The company has orders totaling 100,000 tons of high-grade steel, 150,000 tons of medium-grade steel, and 124,500 tons of low-grade steel. How many days should the company run each mill to minimize its costs and still fill the orders? **[25]**

Q6) Obtain differential model of the CSTH system shown in Fig. 2. Also obtain the linearized state model. **[25]**

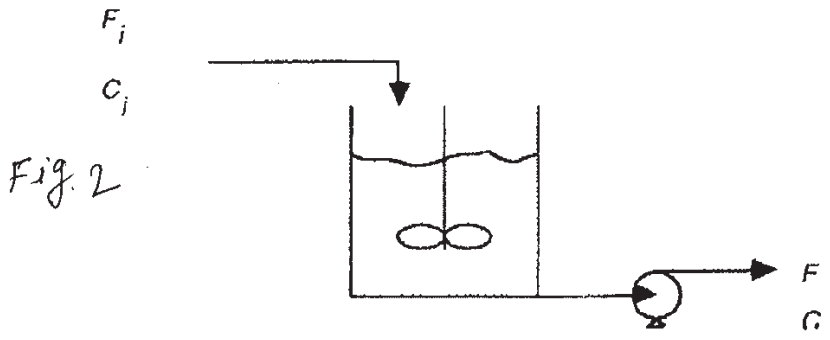

Fig. 2

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1619

[3865]-266
M.E. CSE (IT)
MOBILE COMPUTING
(Revised 2002 Course) (510125)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Attempt any three questions from Section - I and three questions from Section - II.***
2) ***Answers to the both sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable pocket calculator is allowed.***

SECTION - I

Q1) a) Give the comparison among GSM and CDMA mobile technologies with respect to band allocated, multiplexing technique, base station slots and speech coding rate. **[8]**

b) List the major parameters need to consider for calculating performance of Cellular Networks. Explain the significance of parameter. **[8]**

Q2) a) Compare the Macro, Micro and Pico Cells with respect to size, transmission power, antenna height, location, path loss exponent, signal characteristics and RMS delay. **[8]**

b) DAMPS has appreciably worse speech quality than GSM. Is this due to requirement that DAMPS be backward compatible with AMPS. Where as GSM had no such constraint? If not, what is the cause? **[8]**

Q3) a) How Personal Communication Services Network (PCS) is different from traditional wired and wireless networks? Draw the PCS architecture diagram and explain its components in short. **[8]**

b) What is SIM? What kind of support it provides to mobile equipment as well to mobile users. **[8]**

Q4) a) What do you mean by the radio spectrum? Which radio spectrum is more appropriate for present mobile technologies? Why the spectrum more than 3GHz is not useful for the mobile communication? **[8]**

b) What are the functions of rod shape and dish shape antennas used in mobile networks? How propagation path loss is calculated? **[10]**

P.T.O.

SECTION - II

Q5) a) Explain the CDMA technique by giving suitable example. **[8]**

b) What are the reasons behind the popularity of GSM technology? Do you think in future GSM would be completely replaced by CDMA technology? **[8]**

Q6) a) Explain the pros and cons of smaller cells in Cellular Networks. **[8]**

b) Give and explain the protocol stack for WAP. **[8]**

Q7) a) How is the difference between SMS and MMS? How are they sent from one mobile to other mobile? **[8]**

b) What happens if there are insufficient resources at new AP? What are the methods available to overcome these problems? **[8]**

Q8) a) Normally the shapes of individual cells are typically irregular. Give a possible reason why this might be? **[10]**

b) Why cellular networks and Wireless networks require Spread spectrum technology? Explain the working of Direct Sequence Spread Spectrum technology (DSSS). **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1620 **[3865]-267**

M.E. CSE (Information Technology)
NET CENTRIC COMPUTING
(Revised Course 2002) (510122)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Attempt any Three questions from Section - I and Three questions from Section - II.***
2) ***Answers to the both sections should be written in separate answer sheets.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) What is the need of CSMA/CD protocol? How it deals with the situation of collisions? **[8]**

b) Give the meaning of each following parameter and its value with respect to 10 Mbps. Ethernet Technology. **[8]**

Propagation Velocity	: 0.65c	Impedance	: 50 ohms
Network Diameter	: 0.925 km	Encoding	: Manchester
Propagation Delay	: 512 bit	Interframe Gap	: 9.6 ms
Backoff Limit	: 10	Jam Size	: 48-bits

Q2) a) What were the needs of Department of Defence (DoD)? How these needs are satisfied by TCP/IP model? **[8]**

b) How optical cable can carry 20,000 to 60,000 voice channels? Supports your answer with manual calculations. **[8]**

Q3) a) Explain the following terms with respect to queuing system. **[8]**

i) Inter-arrival time distribution.

ii) Service time distribution.

iii) Balking.

iv) Reneging.

v) Jockeying.

b) How network administrator can assure the throughput of network? **[8]**

P.T.O.

Q4) Write short notes on (Any Three) **[18]**

a) Network Design Issues.

b) Working of Routers.

c) NetBIOS.

d) Fault Diagnosis.

SECTION - II

Q5) a) Justify the following statement. **[8]**

"ATM is a faster PSDN than Frame Relay".

b) Explain the following terms with respect to Frame Relay Networks.

i) CSU ii) DSU iii) PVC iv) SVC **[8]**

Q6) a) Mention the meaning of following each term from security point of view. **[8]**

i) Authorization ii) Validation iii) Certification

iv) Time stamping v) Witnessing vi) Receipt

vii) Confirmation viii) Ownership

b) Give the advantages and disadvantages using VoIP. **[8]**

Q7) a) Compare the Network Attached Storage (NAS) with Storage Area Network with respect to following parameters. **[8]**

i) Connectivity ii) Data access method iii) Key requirement

iv) Type of applications v) Typical market segment

b) How multipoint line layout heuristics is used to design the network? **[8]**

Q8) Write short notes on (Any Three) **[18]**

a) VoIP Applications.

b) Wavelet Compression.

c) Routing in Optical Domain.

d) Internetworking.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1621

[3865]-269

M.E. CSE (Information Technology)

ADVANCED INTERNET TECHNOLOGY

(510127) (Revised Course-2002)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any 3 questions from Section-I and 3 questions from Section-II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Assume suitable data, if necessary.***
4) ***Draw sketches wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) What is the difference between multilevel and multi-lateral security models? **[8]**

b) Explain the avalanche effect. How much effect of changing 1-bit occurs in DES? Would this effect remain same for two and three key DES? **[8]**

Q2) a) What characteristic of data and information needs to be protected from security point of view? **[8]**

b) Explain in detail different attacks to be carried out on RSA. **[8]**

Q3) a) Compare between Kerberos 4.0 and 5.0. **[8]**

b) Give block diagram of X.800 security model and explain the function of each block in detail. **[8]**

Q4) Write short notes on (Any 3) : **[18]**

a) Security Policy.

b) ARP Hazard.

c) Physical and logical access control.

d) Digital Signature.

P.T.O.

SECTION - II

Q5) a) Explain SNMP Proxy with diagram. What is necessity of Proxy? **[8]**

b) Explain the TCP and IP spoofing with appropriate examples. **[8]**

Q6) a) How link and end to end encryption can be used to achieve better security solution? **[8]**

b) How PKI takes the care of Secure communication, Data Integrity, Authentication, Authorization and Non-Repudiation? **[8]**

Q7) a) What do you mean by network partitioning? Explain how security can be well implemented with network partitioning. **[8]**

b) What is the difference between packet filtering router and stateful inspection of firewall? **[8]**

Q8) Write short notes on (Any 3) : **[18]**

a) STS Protocol.

b) One time password schemes.

c) Secure Routing Interoperability.

d) Secure RTP.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1622 **[3865]-271**

M.E. CSE (IT)

INTELLIGENT SYSTEMS

(510128) (Revised Course 2002)

Time : 3 Hours*]** **[*Max. Marks : 100

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Assume suitable data, if necessary.***
4) ***Draw sketches wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Define in your own words : **[8]**

i) Intelligence

ii) Artificial Intelligence

iii) Intelligent Agent.

b) What do you mean by agent program? Explain with schematic diagram, four basic kinds of agent program. **[10]**

Q2) a) Explain Best first search strategy with suitable example. **[8]**

b) Define in your own words the following terms : **[8]**

i) Constraint Satisfaction Problem

ii) Backtracking Search

iii) Arc consistency

iv) Backjumping.

Q3) a) Explain the properties of task environment. **[8]**

b) Solve following problem using any of the Search technique. **[8]**
''You have three jugs, measuring 12 Gallons, 8 Gallons, and 3 Gallons, and a water faucet You can fill the jugs up or empty them out from one to another or onto the ground You need to measure out exactly 1 gallon water''.

P.T.O.

Q4) Write short notes on any two : **[16]**

a) Minimax Algorithm.

b) Memory Bounded Search.

c) Contingency Problems.

d) Uninformed Search Strategies.

SECTION - II

Q5) a) Explain how planning problem is expressed in STRIPS with the help of suitable example. **[8]**

b) What is Hierarchical Task Network (HTN) Planning? Explain with algorithm, the basic HTN procedure. **[8]**

Q6) a) Using the axioms of probability, prove that any probability distribution on a discrete random variable must sum to 1. **[8]**

b) What is Hierarchical Task Network (HTN) Planning? Explain with algorithm, the basic HTN procedure. **[8]**

Q7) a) Compare and contrast between simple replanning agent vs. Unbounded indeterminacy. **[8]**

b) Explain what do you mean by decision networks? Also explain how these networks are used to make simple decisions. **[8]**

Q8) Write short notes on any three : **[18]**

a) Utility Theory.

b) Decision - Theoretic Agents.

c) Hierarchical Task Network Planning.

d) Knowledge Engineering for Planning.

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1623 **[3865]-272**

M.E. CSE (IT)

OBJECT ORIENTED SYSTEMS

(Elective - I) (2002 Course)

Time : 3 Hours] [***Max. Marks : 100***

Instructions to the candidates:

1) ***Q. 1 and Q. 5 are compulsory. Of the remaining attempt any two in Section - I and any two in Section - II.***
2) ***Draw neat diagrams wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Make suitable assumptions, wherever necessary.***

SECTION - I

Q1) Design the software to support automatic teller machines (ATMs) to be shared by consortium of banks. ATM communicates with a central computer which clears transactions with the appropriate banks. ATM accepts a cash card, interacts with user, interacts with central system to carry out transactions, and dispenses cash and print receipt. The system requires appropriate record keeping and security provisions. The system should be able to handle concurrent accesses to the same account correctly. The bank will provide their own software for their own computers and you are to design the software for the ATMs. **[18]**

a) Identify the use cases and draw use case diagrams.

b) Draw state chart diagram.

c) Draw class diagram for the same.

Q2) a) Consider a e-dashboard system. This system should be able to display and maintain all college related information. It should display all college notices. It should provide login names to every student and staff of the college.

This system should provide facility of leave management for staff as well as students. It should manage hardware related queries. Also it should provide mail facility to staff as well as students. **[10]**

i) Identify the use cases and draw use case diagrams.

ii) Draw class diagram for the same.

P.T.O.

b) What are packages? With an example of your choice illustrate the feature use of importing/exporting packages. Enumerate any three standard stereotypes that apply to packages. **[6]**

Q3) a) A customer places an order with a supplier. The order is for various numbers of different kinds of parts. An order consists of a number of order lines; each line specifies a particular part from the supplier's catalogue, and says how many are to be ordered. In response to an order, the supplier makes up a delivery, consisting of all the ordered parts. Draw the class diagram and any 2 Interaction diagrams for this system. **[12]**

b) Write a note on 'Stubs and Skeltons in CORBA'. **[4]**

Q4) a) A simple system is to be developed to support the management of exercises completed by students taking a course. Students first meet with the course tutor to register for the module, and then during the course they submit a number of pieces of work. At any point, a student can find out from the system the marks they have received for any exercises already completed. The course tutor can enter a mark for a piece of work, and print out a summary of the marks gained by all students on course. Describe suitable use cases and draw various UCDs for this system. **[12]**

b) Explain Forward and Reverse engineering a USE CASE diagram. **[4]**

SECTION - II

Q5) A simple digital watch consists of a display showing hours and minutes separated by a flashing colon, and provides two buttons (A and B) which enable the display to be updated. **[18]**

a) To add two to the number of hours displayed, the following actions should be performed, where button B increments the hours display:

Press A; press B; press B;press A; press A

Draw a simple statechart showing precisely this sequence of events.

b) In the above interaction, the hours displayed could be incremented by any required number, and the whole interaction could be repeated as often as required. Redraw the statechart to incorporate these generalizations.

c) To increment the number of minutes displayed by the watch, button A can be pressed twice, followed by repeated presses of button B, each of which increases the minutes displayed by 1. Draw a complete statechart for the watch, incorporating updated to both the hours and minutes displayed. Give the states in your statechart meaningful names and add appropriate actions to any transition labeled 'press B'.

d) The watch is subsequently enhanced to incorporate an alarm, and the following interaction is proposed as a way of setting the time of the alarm:
Press A; press A; press B (repeatedly); press A; press B (repeatedly); press A.
The intention is that the user presses button A twice in quick succession, like a 'double click' with a mouse. Explain how this proposal would introduce non-determinism into the statechart for the digital watch. Show how you could remove the non-determinism by introducing an extra state into the statechart.

Q6) a) Draw a class diagram for a hypothetical word processor. Make and state suitable assumptions for this problem. **[8]**

b) Draw a package diagram for the hypothetical 'Airline Reservation System'. **[8]**

Q7) a) How Objects are identified? What are the categories of Objects? How Object behaviour is determined? **[8]**

b) What is the significance of Incremental and Evolutionary approach? How it supports component building? **[8]**

Q8) a) What is the importance of Workflows in a development process? What activities are performed in Elaboration and Construction phases of Unified Process? What is meant by Major and Minor milestone? **[10]**

b) Explain 'Life of Unified Process'. **[6]**

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1625

[3865] - 288

M.E. (Chemical)

ADVANCED MOMENTUM & HEAT TRANSFER

(2002 Course) (109101) (Theory)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***
6) ***Write the chemical reactions wherever necessary.***

SECTION - I

Q1) a) An incompressible fluid is flowing at steady state in the annular region between two coaxial circular cylinders. The radius of the outer cylinder is R and the annular gap is xR, where x is very small. Show that the volume rate of flow is given by

$$Q = [\pi(P_0-P_L)R^{-4}x^3 / 6\mu L][1-0.5x]$$

Consider common notations. **[10]**

b) Write a general expression for mass flow rate of a polymer liquid, described by Power Law model and show how the expression simplifies to Hagen-Poiseuille Law. State conditions. **[2]**

c) Derive equation of motion in dimensionless form. **[6]**

Q2) a) Show that the generalized Reynolds Number, for laminar flow through circular tube, of any time independent fluid is

$$N_{Re,\ gen} = [\delta V^{2-n}D^n / k8^{n-1}]$$

Assume common notations. **[6]**

b) For a flow of Bingham plastic fluid through a smooth circular tube, show that

$$Q = [\pi\Delta PR^4/8\mu_0 L]\ [1-(4/3)\ (\varsigma_0/\varsigma_R)+(1/3)\ (\varsigma_0/\varsigma_R)^4]$$

Assume common notations. **[10]**

c) Define non-Newtonian fluid giving basic mathematical expression. **[2]**

P.T.O.

Q3) a) A cylindrical rod of diameter kR moves axially with a velocity V along the axis of a cylindrical cavity of radius R. Assume that the fluid in the cylindrical cavity moves only due to rod motion. Show that the velocity distribution in the narrow angular region is given by

$V_z/V_\theta = \ln(r^\theta/R)/\ln k$

Assume common notations. **[10]**

b) Write Rabinowitsch - Mooney equation, explain notations and give dimensions. **[2]**

c) Obtain the following from Navier-Stokes equation

i) Creeping flow equation. **[2]**

ii) Euler equation. **[2]**

Q4) a) Two unbaffled tanks, one large and another small, filled with oil, are agitated. The agitators have impellors with diameter D_1 and D_2 rotating at speed N_1 and N_2 respectively. Show that the dynamic similarity, which is similar vortices in both tanks, can be achieved with

$$\mu_2/\rho_2 = [\mu_1 / \rho_1] [D_2/D_1]^{3/2}$$ **[6]**

Discuss the result. **[2]**

b) Using shell momentum balance, obtain an equation to determine viscosity in a capillary tube viscometer. **[6]**

State assumptions made while deriving the equation. **[2]**

SECTION - II

Q5) a) Derive an expression for thermal boundary layer thickness (δ_T) for the flow of power law fluid over a flat plate in laminar condition. **[10]**

b) Apply the statement of conservation of energy to the fluid in the macroscopic flow system and show that the steady state macroscopic energy balance is given by

$$\Delta[H+\tfrac{1}{2}(V^3/V) + gh] = Q + W$$ **[6]**

State assumptions

c) How is thermal diffusivity defined? What are its units? **[2]**

Q6) a) A slab, occupying a space between y = –b to +b, is initially at a temperature T_0. At time t = 0, the surface temperature is suddenly raised to T_s and maintained there. Find the transient temperature profile T(y,t). **[8]**

b) Explain different methods for power number correlation in non-Newtonian agitation. **[8]**

Q7) a) What is heat transfer augmentation? Explain active and passive methods of heat transfer augmentation. **[6]**

b) A polymer solution is to be heated from 15 to 28ºC before it is used as a thinner in a wall paint. The heating is to be carried out in a 1 m diameter stainless steel vessel, fitted with an anchor agitator of 0.9 m diameter, rotated at 100 RPM. The tank is filled up to 7 m depth. It is fitted with a helical heating coil (helix diameter 0.8 m) made of 25 mm OD and 22 mm ID copper tube, with total external heat transfer area of 1.8 m^2. Hot water at a mean temperature of 50ºC is fed to the coil at a rate of 28 kg/min. The values of power law constants are n = 0.35 and m = 26 – 0.056T PaS^n in the range $285 \leq T \leq 323$ K. Estimate the overall heat transfer coefficient and time needed to heat the batch of liquid. **[10]**

Q8) Write short notes on any four of the following: **[16]**

a) Significance of Brinkman number.

b) Heat transfer analogies.

c) Equation of mechanical energy.

d) Concept of tensor.

e) Heat transfer in liquid metals.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1627

[3865] - 293

M.E. (Chemical)

ADVANCED PROCESS DYNAMICS & CONTROL

(2002 Course) (109108)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain basic principles of empirical modeling approach for process identification. **[6]**

b) Explain limit cycle behaviour of non-linear systems. **[6]**

c) Explain antireset windup control systems. **[6]**

Q2) a) Explain step-response method of process identification. **[8]**

b) Explain frequency-response method of process identification. **[8]**

Q3) a) Explain control system for process with significant disturbances. **[8]**

b) Explain control system for open-loop unstable system. **[8]**

Q4) a) Explain distinguishing features of MIMO systems as compared to SISO systems. Give suitable examples of both the systems. **[8]**

b) Explain RGA method for finding best pairing of input-output variables of a MIMO systems. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain properties of RGA of a 3x3 MIMO system. **[8]**

b) What are decouplers? Design decouplers for a 2x2 MIMO process. **[8]**

Q6) a) What are sampled-data systems? Draw block diagram of computer-based control systems. **[8]**

b) Starting from PID-controller equation in continuous-time, derive its discrete-time form in position and velocity form. **[8]**

Q7) a) Explain use of Z-transform to analyze discrete-time systems. **[8]**

b) Define pulse transfer function of ZoH & FoH systems. **[8]**

Q8) Write short notes on the following:- **[18]**

a) Slope marks method for vector fields of non-linear system.

b) Dynamic Matrix Control.

c) Model algorithmic control.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1628

[3865]-294
M.E. (Chemical)
NOVEL SEPARATION TECHNIQUES
(2003 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any 3 questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Classify membrane separation processes with industrial applications. **[6]**

b) Define - transmembrane flux, solute rejection, membrane selectivity. **[6]**

c) Calculate water flux through a typical MF membrane at 1 bar, 298 K.

Data : τ = 1.0, $\eta = 1\times10^{-3}\frac{N-S}{m^2}$, r = 0.25 μm, l = 100 μm. **[6]**

Q2) a) Explain concentration polarization in R.O. membranes. **[8]**

b) Explain different types of membrane modules used for separation. **[8]**

Q3) a) Describe ELM process used for removal of phenol from waste water. **[8]**

b) Describe feed pretreatment methods in R.O. separation process. **[8]**

Q4) a) Distinguish between deadend and crossflow MF processes. **[8]**

b) Describe type 1 & type 2 felicitations for ELM process. **[8]**

P.T.O.

SECTION - II

Q5) a) Describe any two pervaporation processes. **[8]**

b) Describe the structural and compartmentation methods for organization of membranes used as membrane reactors. **[8]**

Q6) a) Describe TSA process in detail. **[8]**

b) Explain intraparticle mechanism for adsorption separation process. **[8]**

Q7) Describe the bioseparation process in details with the following points. **[16]**

a) Initial product harvest and concentration.

b) Cell disruption.

c) Initial purification.

d) Final purification and product purification.

Q8) Write short notes on the following : **[18]**

a) Zone melting.

b) Reactive extraction methods of separation.

c) PSA.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1629 **[3865]-295**

M.E. (Chemical)

CATALYSIS AND SURFACE PHENOMENON

(Elective - I) (2002 Course)

Time : 3 Hours] [***Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Give the classification of catalysis and discuss the preparation of Catalysis using Industrial process. **[16]**

Q2) What is BET? Derive the equation for surface area determination using BET method. **[16]**

Q3) Discuss the characterization of catalysis using

a) XPS method. **[8]**

b) NMR method. **[8]**

Q4) Write short notes on : **[18]**

a) Chemisorption

b) Poisons

c) Natural Zeolites.

SECTION - II

Q5) Discuss the chemistry and thermodynamics of adsorption. **[16]**

Q6) Define adsorption. What are the different types of adsorption? Discuss any 4 types. Write all necessary equations and draw the nature of plots. **[16]**

P.T.O.

Q7) Derive the equation for effectiveness factor in catalysis. **[16]**

Q8) Write short notes on : **[18]**

a) Kinetics of Catalyst deactivation.

b) Fluidized bed reactor.

c) Heat and Mass Transfer in catalysis.

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Total No. of Questions : 8] **[Total No. of Pages :2**

P1630

[3865]-296
M.E. (Chemical)
FLUIDIZATION ENGINEERING
(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Define fluidized state and discuss the regimization of fluidized state. **[8]**

b) What are the industrial applications of fluidization? **[8]**

Q2) a) Discuss the Hydrodynamics of fluidization system. **[8]**

b) Discuss the operating model of fluidization system. **[8]**

Q3) Explain the Davidson Model for gas flow and write all corresponding equations needed for the model. **[16]**

Q4) a) Derive the equation for minimum fluidization velocity. **[9]**

b) A fluidized bed consisting spherical particles is fluidized by water of density 900 kg/m^3 and viscosity 1 $mN\text{-}s/m^2$. The diameter of particles is 1.6 mm and density of particle is 2500 kg/m^3. Determine the minimum Fluidization velocity for laminar flow. **[9]**

SECTION - II

Q5) Derive the kinetic model for conversion of shrinking and growing particle in fluidization. **[16]**

Q6) Explain in details about. **[16]**

a) Modeling by bed collapsing.

b) Fluid catalytic cracking.

P.T.O.

Q7) Discuss the following in details; **[16]**

a) Pressure fluidization.

b) Three phase fluidization and Inverse fluidization.

Q8) Write short notes on; **[18]**

a) Geldart's classification for power assessment.

b) Fluidized bed dryer.

c) Heat & Mass Transfer in fluidization system.

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1631

[3865]-403
M.E. (Civil Construction and Management)
CONSTRUCTION TECHNOLOGY
(2008 Course) (501103)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Question No.1 and 5 are compulsory. Out of the remaining attempt any two questions from Section I and two questions from Section II.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) a) Explain in detail various problems faced during tunneling operation in soft soil. Also suggest suitable measures to overcome these problems. **[9]**

b) Compare and contrast Drill and Blast method and TBM method of tunnel construction. Discuss about the drilling patterns used for Drill and Blast method of tunneling in hard rock strata. Discuss the importance of ventilation in tunnel construction process. **[9]**

Q2) For a high rise building construction (40 storeys) concreting operations were planned using RMC setup with transit mixers and concrete pumps. For this particular project. **[16]**

a) List out various factors on which the concrete pump output will depend.

b) Draw a typical site layout for this project clearly showing the location of transit mixer delivery point, concrete pump and the building.

c) What will be the specifications of the concrete that has to be pumped?

d) List out various hazards involved and precautionary measures to be adopted to prevent the accidents.

Q3) a) With the help of neat labeled sketches explain the well point method of dewatering system to be used for construction of basement car park with a parking capacity of 200 cars. Assume suitable data. **[8]**

P.T.O.

b) List out various methods of dewatering. Explain in detail the electro-osmosis method of dewatering with suitable sketches. Recommend a suitable method of the following cases: **[8]**

i) Metro rail tunnel construction in Black cotton soil.

ii) Pedestrian subway puncturing an aquifer in basalt.

Q4) Write short notes on (any four) **[16]**

a) Tremie method of concreting.

b) Roller Compacted Concrete.

c) Asphalt grouting.

d) Part face Tunnel Boring Machine.

e) Specifications of Concrete to be used for under water concreting operations.

SECTION - II

Q5) a) Discuss the sequence of construction of pneumatic caisson in construction of a bridge pier over a perennial river. Draw a neat labeled sketch showing the site layout arrangement also. **[9]**

b) What do you mean by tilts in well foundations? What are the causes of tilts? Recommend suitable preventive and corrective measures to avoid such tilts in well foundations. **[9]**

Q6) Following defects were observed in case of pile concreting for a bored cast in situ type of pile. **[16]**

a) Discontinuity of concrete in the pile shaft at various levels.

b) Collapse of the reinforcement cage in the pile shaft.

c) Soil and rock pieces at the base of the pile shaft.

d) Disintegration of concrete in the pile shaft.

e) Poor pile performance under load test.

Enlist the reasons for occurrence of each type of defect. Suggest suitable precautionary measures you would undertake to prevent such defects.

Q7) In a construction of Metro Railway Project, part of alignment of the metro passes under a flyover for a length of 750m. As a Project Manager you have to suggest a suitable technique for construction out of the following options:

a) Use of Steel Sheet Piles.

b) Use of R.C. Diaphragm walls.

c) Use of 750mm dia. bored cast in situ touching piles.

Justify the reasons for recommending a particular method and clearly state the merits of the selected method over other methods. Also enlist the drawbacks of other methods. **[16]**

Q8) Write short notes on (any four) : **[16]**

a) Anchor Piles.

b) Open Caissons.

c) Mound type of Coffer dam.

d) Colgrout technique.

e) Shotcreting.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1632

[3865] - 404

M.E. (Civil) (Construction & Management)

NEW CONSTRUCTION MATERIALS

(2008 Course) (Elective - I)

Time : 4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) What is GRC? Compare and contrast between the 2 methods of producing GRC. What are advantages of GRC? Enlist any 6 applications of GRC. **[2+8+5+3]**

Q2) What are flexible-rigid pavements? What are their advantages? Explain in detail the research investigations and the findings thereof conducted on such pavements at IIT Kharagpur, with a case study. **[2+4+10]**

Q3) What is High Performance Concrete? What are its properties-explain each in brief. Explain use of HPC in detail for any 2 construction applications. **[2+4+5+5]**

Q4) Explain details of:- **[4+4+4+4]**

a) Glenium Concrete.

b) Asset management of rural roads.

c) Construction chemicals.

d) Smart materials.

P.T.O.

SECTION - II

Q5) a) Explain with a neat sketch how flyash is produced. **[4]**

b) Classify flyash and compare class C and class F based on their properties. **[6]**

c) Explain with examples, the good properties of flyash useful in construction. **[8]**

Q6) a) Explain different physical and chemical properties of silica-fume. **[2+2]**

b) Explain in brief any 4 construction applications wherin silica fume is used. **[4×2]**

c) Discuss advantages of silica fume concrete. **[4]**

Q7) a) Explain with sketches any 4 tests conducted on SCC. Also discuss about their expected results. **[4×3]**

b) Discuss limitations for use of SCC in the Indian Context. **[4]**

Q8) Explain the details of:- **[4+4+4+4]**

a) FRP applications in Civil Engineering.

b) Eco-friendly construction.

c) Steel fibres use in concrete.

d) Nuclear radiation shielding.

Total No. of Questions : 8] **[Total No. of Pages : 3**

P1633

[3865] - 405

M.E. (Civil Construction & Management)

DISASTER MANAGEMENT

(2008 Course) (Elective - I) (Theory) (501104)

Time : 4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Question No.1 and 5 are compulsory. Out of the remaining attempt any two questions from Section I and two questions from Section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, wherever necessary.***

SECTION - I

Q1) a) Enlist various types of land based disasters. Which of these disasters are man made and natural disasters? Discuss about preventive measures related to these disasters. **[6]**

b) Discuss about the physical, economic and environmental losses that occur on account of tsunami and cyclones. **[6]**

c) In event of a major natural disaster it is common phenomenon of outbreak of epidemic diseases. Enlist the causes of this type of secondary disaster and suggest suitable preventive measures. **[6]**

Q2) a) What do you mean by Contingency Planning in case of Natural Disasters? Explain this concept with respect to flood disaster clearly detailing the steps involved. **[8]**

b) Explain the concept of plate tectonics with respect to earthquakes. **[4]**

c) Discuss the classification of various types of volcanoes and explain any one in detail along with effects on human beings. **[4]**

P.T.O.

Q3) a) List out the disasters related to changing weather patterns. Are these disasters controllable or uncontrollable? Explain the causes and effects of any one of these disasters. **[6]**

b) Advances in Engineering and Technology leads to comfortable life and at the same time is a major cause of disaster. Explain this statement with suitable examples. **[6]**

c) Explain the different methods for awareness creation in community with respect to disaster preparedness. **[4]**

Q4) a) Discuss in detail the application of Remote Sensing and GIS in Early Warning systems and Disaster preparedness. **[6]**

b) Explain the concept of Ecosystem based disaster management. Discuss this concept with respect to cyclones. **[4]**

c) Explain the concept of Vulnerability in Emergencies. Is there any relation between vulnerability and development? If yes explain. **[6]**

SECTION - II

Q5) a) As a planning engineer being a part of Disaster response team, plan a relief camp for a village with population of 10000 people affected by flood disaster. The planning and design thumb rules should be clearly stated and in conformance with SPHERE GUIDELINES. Undertake the design process for:

i) Temporary Housing including public places.

ii) Public Water and Sanitation (latrines only) facilities. **[10]**

b) What are the different sources of drinking water? Enlist and explain the various technical criteria considered for short listing an appropriate source in case of emergency response. **[4]**

c) Discuss importance of sanitation in emergencies. Explain in detail link of Sanitation with water supply and hygiene promotion. **[4]**

Q6) a) Explain Disaster Response Mechanism in India. Discuss the organization structure for Response mechanism from Central Government level to District level administration clearly explaining the roles and responsibilities of all concerned involved. **[10]**

b) Enlist various water treatment processes available in case of water supply in emergency response. Explain in detail with appropriate sketches any two methods. **[6]**

Q7) a) Explain in detail the design criteria for building construction in earthquake prone area. **[6]**

b) Explain with neat labeled sketch any two different types of latrines commonly used for excreta disposal in emergency response. **[4]**

c) Enlist various water quality parameters. Discuss about any four parameters in detail as per WHO water quality guidelines in emergencies. **[6]**

Q8) Write short notes on (**any four**): **[16]**

a) Phases in Emergency Response.

b) Gender in Emergencies.

c) Role of Civil Engineer in Emergencies.

d) Pump out test for assessment of yield of wells.

e) Chlorine and alum dosing for water treatment.

Total No. of Questions : 8] **[Total No. of Pages : 3**

P1634

[3865]-408

M.E. (Civil) (Const. & Management)

RESOURCES MANAGEMENT

(Theory) (501105) (Elective - II) (2008 Course)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Question No. 1 and 5 are compulsory. Out of the remaining attempt any two questions from Section I and two questions from Section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data wherever necessary.***

SECTION - I

(Materials Management)

Q1) a) State the primary as well as secondary objectives of A-B-C analysis. Discuss the potential areas of conflict in achieving the primary objectives of materials management.

Give a suitable example of application of this analysis. **[12]**

b) Explain the concept of Materials Planning vis-à-vis project scheduling for a residential township project. **[6]**

Q2) a) With the help of a suitable flow chart explain the Materials flow process in a construction project. Highlight and explain the control mechanisms that need to be incorporated in this flow process. **[8]**

b) In context of Materials procurement explain the following : **[8]**

i) Vendor short listing process.

ii) Ethics and principles on part of procurement manager.

P.T.O.

Q3) a) Explain the term inventory. With suitable example assess the relation between stores layout and inventory control. **[6]**

b) Explain the concept of Make or Buy decisions. In case of construction projects explain with suitable examples under what circumstances a Materials Manager has to take such decisions. **[6]**

c) Explain the importance of lead time analysis in inventory management. **[4]**

Q4) a) List out major categories of materials used in construction projects. Of all these categories of materials for which categories of materials will you use the following inventory models : ABC analysis, VED analysis, FSN analysis. Explain with examples. **[8]**

b) Discuss the symptoms of poor inventory management and enlist steps for effective inventory control. **[4]**

c) Explain the concept of buffer stock. Discuss the factors that influence the decisions related to buffer stock. Recommend suitable buffer stock of A class materials for a contractor working on a NH road project.**[4]**

SECTION - II

(Human Resource Management and Equipment Management)

Q5) a) Out of various forms of organization, explain in detail which of them is most suitable for Human Resource Development. **[4]**

b) Apart from financial incentives discuss the factors for motivation of HR. Explain the term gap identification vis-à-vis HR. What is its use? What are the types of gaps? How to overcome them? **[8]**

c) Differentiate between Resource Development and Organization Development. What comes first Resource Development or Organization Development? **[6]**

Q6) a) Explain the use of Management Information System (MIS) for management of equipment resource. **[6]**

b) A hydro electric power project employs 4 scrapers of 180 kW engine capacity along with a tractor of 150 kW. The equipment has worked for 8000 hours on the project and output at present is 185 cu.m/day. Assume working hours 2000 and working days 200. The initial cost of scraper is Rs. 45,00,000/- and of tractor is Rs. 12,00,000/-. Life of scraper is 10000 hours and that of tractor is 12000 hours. Cost of tyre for scraper is Rs. 2,50,000/- and life is 3000 hours. Estimate the hourly ownership and operating cost for **scraper only**. Use the recommendations of Plant and Machinery Committee 1974. Assume suitable data wherever necessary. **[10]**

Q7) a) You are a project manager for a Nuclear Power Plant Project. Assuming suitable data enlist various equipments required for the completion of this project. Classify these equipments on the basis of A-B-C analysis. Discuss the procurement process and vendor short listing criteria for procurement of Class A equipments. **[6]**

b) Explain the importance of equipment logbook. Discuss about what data has to be entered in this document? **[5]**

c) Enlist various factors influencing the successful operation of construction equipment. Explain any one in detail. **[5]**

Q8) Write short notes on (**any four**) : **[16]**

a) Need for Human Resource Planning (HRP) and Strategy for successful HRP.

b) Manual operations vs. mechanized operations.

c) Concept of equipment downtime, factors constituting downtime and measures to reduce downtime.

d) Factors influencing Employee Behaviour and Performance.

e) Check list for successful Equipment Management.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1635

[3865]-409

M.E. (Civil) (Const. & Mgmt.)

TQM IN CONSTRUCTION

(Elective - II) (2008 Course)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain PDCA cycle with an example. **[4]**

b) Explain QFD with an example. **[4]**

c) Explain capabilities of PRRT software. **[5]**

d) Discuss problems in implementation of TQM programs. **[5]**

Q2) a) Classify the construction defects and explain each one with appropriate examples. **[12]**

b) Explain TQM philosophy with an example. **[4]**

Q3) a) Explain eight ISO 9001:2000 principles with examples. **[8]**

b) Explain audit process of ISO 9001:2000 in detail. **[8]**

Q4) a) Discuss various reasons for poor quality of a construction project and suggest recommendations to ellimate these causes. **[10]**

b) Explain quality circles and their role in TQM programs. **[6]**

P.T.O.

SECTION - II

Q5) a) Explain various principles involved in TQM programs. **[6]**

b) Explain the various components of TQM programs. **[8]**

c) Explain the term 'Kaizen' with an example. **[4]**

Q6) a) Draft a check list for ensuring the quality of reinforcement, formwork, concreting activities of an RCC work executed on site. **[12]**

b) Explain internal customer satisfaction with examples. **[4]**

Q7) Explain with examples, following terms. **[16]**

a) Quality planning
b) Quality control
c) Quality assurance
d) TQC
e) Efficiency
f) Effectiveness
g) NC
h) MR

Q8) a) Explain in detail, how six sigma is a very effective mathematical tool in improving the construction quality in various activities executed on site. **[12]**

b) Explain role of QIT in TQM. **[4]**

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1637 **[3865]-416**

M.E. (Civil Construction and Management)
INFRASTRUCTURE DEVELOPMENT
(501111) (Elective - III) (2008 Course)

Time : 4 Hours] [***Max. Marks : 100***

Instructions to the candidates:

1) ***Que. No. 1 and 5 are compulsory. Out of the remaining attempt any two questions from Section-I and two questions from Section-II.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) With respect to the existing 5 year plans and the proposed 5 year plans in India, explain the nature of the infrastructure growth in Rural India as well as Urban India, with appropriate examples. Explain funds management with respect to the same. **[18]**

Q2) a) Explain the need for Public-Private partnership in India for the Infrastructure growth. **[4]**

b) Discuss the advantages and limitations for the same. **[6]**

c) Explain any one mechanism of PPP in detail. **[6]**

Q3) a) What is FDI? **[2]**

b) Why does the Indian Government promotes FDI? **[4]**

c) How much FDI is allowed in the different sub-sectors of Infrastructure existing and proposed in India? **[8]**

d) What are the limitations of FDI? **[2]**

P.T.O.

Q4) Explain in detail the following :

a) Vanaz to Ramwadi Metro in Pune City. **[4]**

b) Ports connectivity projects in India. **[4]**

c) New International Airport at Delhi. **[4]**

d) Mumbai Monorail Project. **[4]**

SECTION - II

Q5) a) Government of India constituted a Cabinet Committee on Infrastructure in 2009. Discuss the composition, roles and responsibilities of this committee vis-à-vis. Infrastructure Development. **[6]**

b) Explain the forward and backward linkages of Infrastructure development to various sectors of Indian Economy. **[6]**

c) Environmental Clearances are considered as the critical component in start of Infrastructure Projects. Explain this statement with suitable examples. **[6]**

Q6) a) Explain the roles and responsibilities of International Project Management Consultants in Infrastructure Projects. Is it justifiable to use services of these consultants? Explain with suitable examples. **[8]**

b) In light of Indo-US Nuclear Deal discuss the importance of development of Nuclear Power Plants in the Indian Energy Scenario. Concrete is the principal material that will be utilized in this project. Explain various types of concrete that will be required in a typical Nuclear Power Plant Project. **[8]**

Q7) a) Discuss in detail the grey areas of Indian Contracting firms vis-á-vis International Contracting firms in event of global competition of Infrastructure Projects. **[8]**

b) Aviation sector is one of the fastest growing sectors of Indian Infrastructure. Explain the importance of air transport vis-á-vis other forms of transportation. What are the important points to be considered in selection of site for construction of airport. **[8]**

Q8) Write short notes on (any four) : **[16]**

a) Risks involved in Infrastructure Projects.

b) Freight Corridor Project.

c) Private investment in Railways.

d) Infrastructure Development and Environmental Pollution.

e) Bharat Nirmaan Project.

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Total No. of Questions : 8] **[Total No. of Pages :2**

P1638

[3865]-418
M.E. (Civil) (Const. & Mgmt.)
THRUST AREAS IN PROJECT MANAGEMENT
(2008 Course) (Open Elective - IV)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain the life-cycle of any construction project and discuss the role of project pre-planning in each subsequent stage. Justify the role with proper examples from construction sector. **[18]**

Q2) Compare and contrast between ISO 9001 and ISO 9004. Explain the role of top management in successful implementation of ISO 9001 with proper examples. Explain the process of external auditing. **[16]**

Q3) What is project partnering? Is it a substitute for the contracting system? What are its advantages? How is the partnering charter drafted and executed? Explain with a case study. **[16]**

Q4) Explain the details of : **[16]**

a) John Mullions 7 point test.

b) Strategic planning.

c) Supply chain management.

d) IQ, EQ and SQ in HRD.

P.T.O.

SECTION - II

Q5) Explain concept of fast track construction diagrammetically. When is such track adopted? What are the risks involved in it and how these are mitigated? Explain with any case study. **[18]**

Q6) Compare and contrast between transactional and transformational types of leadership with proper examples. Discuss the following covey habits and explain whether they are of transactional/transformational nature, with examples

a) Think win-win.

b) Synergy.

c) Be - proactive.

[16]

Q7) What is SWOT analysis? Perform SWOT analysis for the present day Indian Construction Sector and Draw the SWOT matrix for the same. How is this matrix useful? Explain. **[16]**

Q8) Explain the details of: **[16]**

a) Pre-Engineered construction.

b) MIVAN technology.

c) Competency development in construction Industry.

d) Advantages of proflex roofing system.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1639

[3865] - 440

M.E. (Civil) (Hydraulic Engg.)

REMOTE SENSING AND G.I.S. IN WATER RESOURCES ENGINEERING

(2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State any four principles of photogrammetry. **[8]**

b) What is photo interpretation? State any three principles of photo interpretation. **[8]**

Q2) a) State the concept of remote sensing & describe the classification of remote sensing. **[8]**

b) What are different sensing systems? Explain any one of them in detail? **[8]**

Q3) a) State difference between analog and Digital systems of remote sensing. **[8]**

b) Explain the interaction of multispectral imagery in remote sensing. **[8]**

Q4) Write short notes (Any Three): **[18]**

a) Interpretation of Radar imagery.
b) Types of Reflectors.
c) Types of Aerial photographs.
d) Spectral response of natural earth surface features.

P.T.O.

SECTION - II

Q5) a) State concept of G.I.S. and explain how the data collection and its analysis is done in G.I.S. **[8]**

b) Differentiate between Spatial database and Attribute database. **[8]**

Q6) a) How the data quality is maintained in G.I.S. What are the probable errors expected in data quality? **[8]**

b) State any four sources of data in G.I.S. **[8]**

Q7) a) What is Raster Analysis? Explain how it is carried out. **[8]**

b) Explain role of G.I.S. in watershed management. **[8]**

Q8) Write short notes (Any Three): **[18]**

a) Role of remote sensing in crop yield and land use management.

b) Significance of G.I.S. in wet land management.

c) Application of G.I.S. in surface runoff estimation.

d) Georeferensing of G.I.S. data.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1640

[3865] - 441

M.E. (Civil Hydraulic Engineering)

DAM ENGINEERING

(2008 Course) (Elective - I)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is reservoir operation? Explain any one method of reservoir operation. **[8]**

b) With the help of basic principle, derive the equation for principal stress acting on gravity dam. consider the tail water. **[8]**

Q2) a) Enlist the design steps of 2-D method of gravity dam. **[8]**

b) Derive equation of thick cylinder theory for designing an arch dam. **[8]**

Q3) a) State design principles of rockfill dam. **[8]**

b) Explain the rockfill characteristics for design of rockfill dam. **[8]**

Q4) Write short notes (Any three) : **[18]**

a) Trial load theory of an arch dam.
b) Stress concentration around openings in gravity dam.
c) Foundation treatment in gravity dam.
d) Dynamic response approach in gravity dam.

P.T.O.

SECTION - II

Q5) a) State different forces acting on an earth dam. Give equations for them. **[8]**

b) How pore pressure is developed in earth dam? How it is measured? **[8]**

Q6) a) What is filter? What are its types? State the design criteria for filter. **[8]**

b) Explain concept and types of buttress dam. **[8]**

Q7) a) Explain the classification of spillway based on different aspects. **[8]**

b) Enlist the design steps of design of chute spillway. State the input data parameters required for this design. **[8]**

Q8) Write short notes (Any Three): **[18]**

a) Automatic gates.

b) Buckets & their types in energy dissipation.

c) Sudden drawdown condition & its significance.

d) Seepage control through foundation of earth dam.

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1642

[3865] - 458

M.E. (Civil Structures)

DESIGN OF COMPOSITE CONSTRUCTION

(Revised Course 2008) (Elective - I)

Time : 4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are composite structures? State benefits of composite constructions. **[8]**

b) Compare the I.S., B.S. and Euro codal provisions of composite construction. **[8]**

c) Explain with sketch the elastic behaviour of composite beams. **[10]**

Q2) a) Compare the stress block for concrete strength according to Eurocode and I.S.456-2000 with help of Figure and equations. **[12]**

b) With help of concept sketch, derive the equation for design resistance to sagging moment for a composite slab. **[12]**

Q3) With respect to composite columns, write concept - analysis - equations and draw concept sketch for following- **[24]**

a) Concrete filled circular tubular sections.

b) Effective elastic flexible stiffness.

c) Non dimensional slenderness.

d) Local buckling of steel sections.

P.T.O.

SECTION - II

Q4) a) State the input parameters required to design a composite truss. **[5]**

b) For a composite truss, enlist the design steps for - **[20]**

i) Evaluation of precomposite stage loading.

ii) Design of top chord.

iii) Design of bottom chord for composite stage.

iv) Determining the capacity of composite section in compression.

Q5) Enlist the design steps for design of Multi-storeyed residential composite building for following components. **[25]**

a) Composite slabs with profile decks.

b) Composite beam.

c) Compression members.

d) Vertical cross bracings.

e) Foundation.

Q6) a) Enlist the design steps for design of composite bridge for following components. **[20]**

i) One way deck slab for class AA loading.

ii) Longitudenal girders.

iii) Cantilever portion of deck slab.

iv) Composite deck slab.

b) State the input data required for design of composite bridge. **[5]**

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1643 **[3865]-460**

M.E. (Civil-Structures)

ADVANCED DESIGN OF METAL STRUCTURES

(Elective - II) (2008 Course)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Solve any two questions from each section.***
2) ***Answers to the two sections should be written in two separate answer books.***
3) ***Use of non programmable pocket calculator is permitted.***
4) ***Neat sketches should be drawn to illustrate your answer.***
5) ***Use of IS - 800, 802, 875. Steel table, Aluminium section table is allowed.***

SECTION - I

Q1) a) Explain the term equivalent radius of gyration in unsymmetrical aluminium sections are subjected to bending moment. **[5]**

b) Explain with ASCE committee recomendations, permissible stress in compression for aluminium columns. **[7]**

c) An Indian standard aluminium section ISALC 200 @ 15.33 kg/m carries a vertical load of 100 kN at an eccentricity of 65 mm along x-x axis. The effective length of column is 1.5 m. Find whether the column is strong enough to carry the load. The column is partially fixed at both ends. Properties of ISALC 200 are as follows. **[13]**

$A = 56.78\ cm^2$ $Z_{xx} = 349.97\ cm^3$

$\gamma_{xx} = 7.85$ cm $\gamma_{yy} = 3.12$ cm

Q2) Suggest the suitable back up structure for a hoarding 12 m × 8 m, to be installed on terrace of a building. The height of building above G.L. is 20 m. Assume suitable data for lighting arrangement. The location of hoarding is in the zone having basic wind speed 35 m/s. Design section of display panel board consisting of grid structure. Find the design force on foundation. Sketch the typical structural arrangement for foundation to this back up structure.

Assume $K_1 = 1.03$, $K_2 = 0.98$, $K_3 = 1.0$ **[25]**

Q3) a) Two channel sections without bent lips 180 mm × 50 mm are connected with the web to act as beam. The thickness of channel section is 2 mm. The effective span of simply supported beam is 3.8 m. Determine the maximum uniformly distributed load including self weight which can be supported by beam. The beam is laterally supported throughout its length. **[20]**

P.T.O.

b) Explain the design consideration. When light gauge steel members are subjected to **[5]**

i) Combined axial and bending stress.

ii) Combined bending and shear stress.

SECTION - II

Q4) a) Sketch the typical welded joints in tubular structure. **[8]**

b) Illustrate the design considerations for design of scaffolding using tubular sections. Sketch typical scaffolding layout for deck slab. **[9]**

c) What are the advantages and disadvantages of tubular sections when used as structural member? **[8]**

Q5) ISMB 600 is to be used as castillated beam. Using hexagonal openings in web having side of hexagon as 200 mm, compare the capacity of ISMB 600 and its castillated beam having span 20 m, when it has to carry uniformly distributed load. **[25]**

Q6) Design the section for microwave tower subjected to superimposed loads due to accessories as shown in fig. 1. **[25]**

a) Calculate panel point loads due to wind.

b) Find reaction tower foundation due to superimposed dead load, wind load, accessory loads.

c) Find force in base cross arm and leg member.

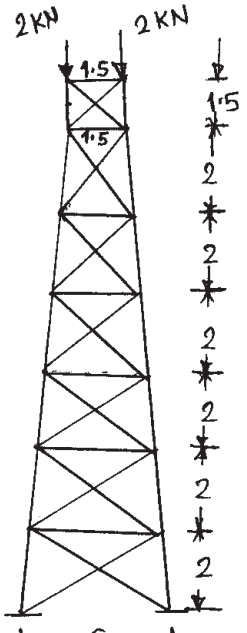

fig. 1

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1644

[3865]-461

M.E. (Civil - Structure)

STRUCTURAL DESIGN OF STEEL BRIDGES

(2008 Course)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any two questions from section I and II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams should be drawn wherever necessary.***
5) ***If necessary, assume suitable data and indicate clearly.***
6) ***Use of nonprogrammable electronic pocket calculator, IS 800 and steel table is allowed.***

SECTION - I

Q1) a) Explain in brief, classification of steel bridges as per the service and structural arrangement. **[10]**

b) Explain in detail cantilever method for the erection of steel bridges.**[8]**

c) Explain in brief, loads and forces for the design of horizontal lateral bracing of railway steel bridges. **[7]**

Q2) A deck type plate girder railway bridge of span 24 m is provided for a single broad gauge track. The self weight of stock rails and check rails are 0.6 and 0.4 kN/m respectively. The self weight of sleepers is 3 kN/m. Design cross section for plate girder, horizontal truss bracing and draw the design sketches for the bridge structures. The EUDL for B M is 2280 kN, for S F is 2503 kN and impact factor is 0.417. **[25]**

P.T.O.

Q3) A through type railway truss girder bridge consists of two Pratt trusses as shown in Fig. 3. The bridge supports an equivalent uniformly distributed live load of 150 kN/m. The dead load transmitted to each truss inclusive of self weight is 15 kN/m. Design the members U_2U_3, U_3L_3, U_2L_3 and L_2L_3 using channel section. Assume the impact factor to be 15%. **[25]**

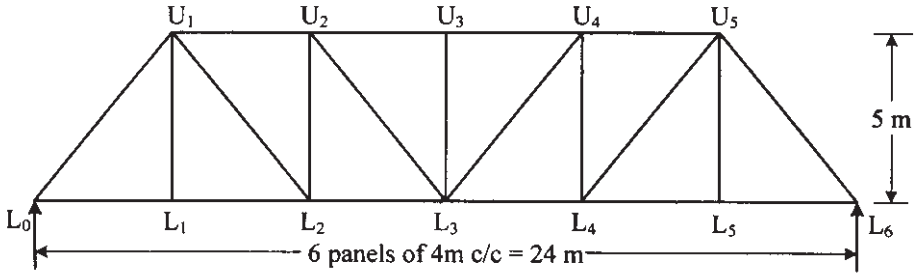

Fig. 3

SECTION - II

Q4) The effective span of a deck type plate girder two lane highway bridge is 24 m. The reinforced concrete slab is 250 mm thick inclusive of the wearing coat. The foot paths are provided on either side of the carriage way. Design the maximum section of plate girder, if the bridge is to carry IRC class A loading as shown in Fig. 4. **[25]**

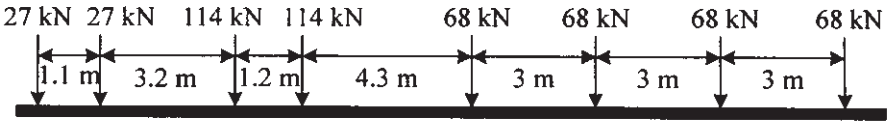

Fig. 4 IRC Class A loading

Q5) The effective span of through type truss girder highway two lane bridge is 30 m. The reinforced concrete slab is 250 mm thick inclusive of the wearing coat. The foot paths are provided on either side of the carriage way. The spacing between centre to centre of truss girder is 12 m. The highway bridge is to carry IRC A standard loading. Suggest a suitable truss girder for the bridge. Design the central top chord, bottom chord, the vertical and diagonal members of the central panel. **[25]**

Q6) a) Explain in brief fixed and free bearing with its function. **[7]**

b) The effective span of a truss girder through type bridge for a single broad gauge track is 50 m. Reaction due to dead load, live load and impact load is 1509 kN. Vertical reaction due to wind is 250 kN. Tractive force is 476 kN and breaking force is 588 kN. Design the rocker bearing and draw the design sketches. **[18]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1645

[3865] - 478

M.E. (Mech. - Heat Power)

PERFORMANCE ASSESSMENT OF MECHANICAL EQUIPMENT

(2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from Section I and three questions from Section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule steam tables, mollier charts, electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain fouling and slagging in detail with their reasons and how it can be avoided in practice? **[8]**

b) Classify various industrial boilers and explain any two boilers in details.**[8]**

Q2) a) Explain design considerations for modern boilers. **[6]**

b) A boiler produces 220 ton of dry saturated steam per hour at a pressure a pressure 60 bar (abs.) from feed water at a temperature of 120ºC.**[12]**

Coal consumption = 1200 ton/day

Calorific value of coal = 17600 kJ/kg

1% of coal escapes unburnt.

Determine

i) The equivalent evaporation per ton of coal fired.

ii) The efficiency of boiler

iii) Overall efficiency of the boiler.

Q3) a) What are the different methods used to control the air supply under variable load conditions? Why the speed control is more economical than damper control? Why the damper control is preferred over speed control even if this is more costly. **[8]**

P.T.O.

b) Write a note on following terms related to furnaces- **[8]**

i) Temperature control

ii) Draft control

iii) Waste heat recovery and

iv) Furnace efficiency

Q4) a) Explain the classification of cogeneration in detail and state its application in industries. **[8]**

b) Explain various trends in different cogeneration power plant. **[8]**

SECTION - II

Q5) a) Explain different types of fan and blowers and state each features and limitations. **[8]**

b) Explain in details flow control strategies and energy conservation opportunities for fans and blowers. **[8]**

Q6) a) State various types of pumps. Also explain the various components of pumping system. **[8]**

b) Explain various performance terms for pumps. **[8]**

Q7) a) Explain different types of air compressors with their applications. **[8]**

b) What is capacity assessment of any air compressors, Explain with an examples. **[8]**

Q8) a) Discuss the energy conservation in boilers and pumps in brief. **[8]**

b) Explain the waste heat recovery of any two mechanical equipments. **[10]**

Total No. of Questions : 8] **[Total No. of Pages : 5**

P1646

[3865] - 479

M.E. (Mechanical) Heat Power Engg.

REFRIGERATION TECHNOLOGY

(2008 Course) (Elective - I) (502104 - B)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Q.No. 1 is compulsory.***
2) ***Solve any two questions from Q.No.2, 3 and 4.***
3) ***Q.No. 5 is compulsory.***
4) ***Solve any two questions from Q.No.6, 7 and 8.***
5) ***Use of refrigerant property tables, thermodynamic charts, psychrometric charts, calculator, and log table are allowed.***
6) ***If required, assume suitable data, cases, conditions etc. with supportive justifications.***
7) ***Use dark graphite pencils, ball point pens to mark the cycles etc. on the thermodynamic charts.***

SECTION - I

Q1) a) Write the merits of vapour absorption system over mechanical vapour refrigeration system with their applications. **[6]**

b) Discuss in details the operational advantages between flooded and pumped recirculation evaporators with supporting figures, P-h charts etc. **[8]**

Q2) Find the following energy performance parameters for the ammonia refrigeration plant layout shown in Figure 1. **[18]**

a) Refrigeration capacity per kg of the refrigerant.

b) Theoretical cycle COP

c) Total theoretical power consumption of the compressors.

d) P-h chart.

P.T.O.

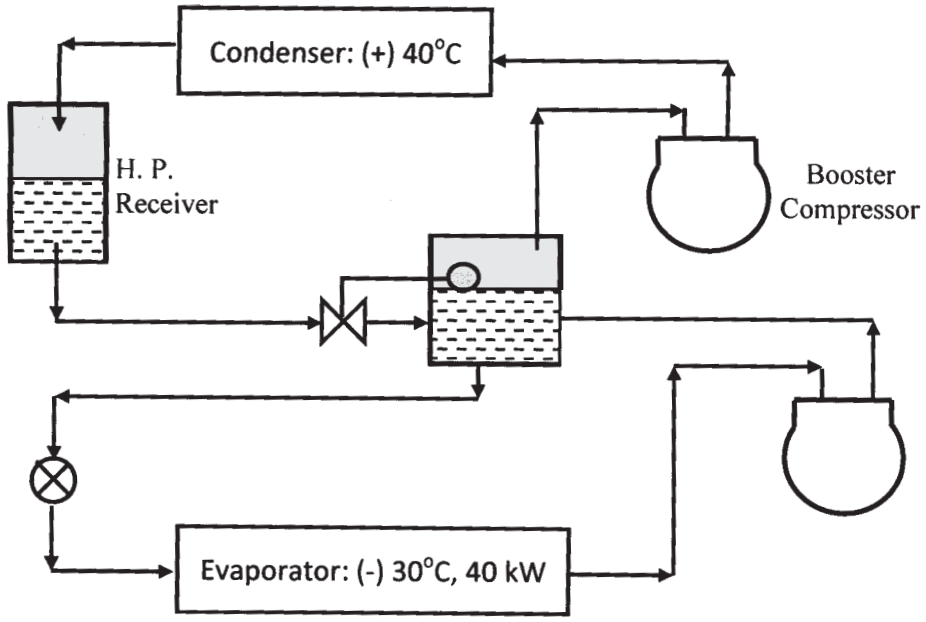

Figure 1

Q3) Pune city based dairy unit has planned to setup a block ice manufacturing plant of 40 metric tons per day capacity for the milk precooling and preservation purpose. The temperature of ice is required at (-)5°C. The dairy unit has got ample potable water. **[18]**

Design the refrigeration plant considering the following data:

a) Refrigerant preferred: ammonia

b) Electrical motor efficiency = 96%

c) Transmission efficiency = 92%

d) Compressors are available in the displacement capacities = 100, 150, 200, 250, 300CC.

e) Compressor speed = 1400 rpm.

f) Volumetric efficiency for the compressors is given as function of pressure ratio 'R' of the compressor.

$$\eta_{vol} = (-0.2381\ R^2) + 5.9306\ R + 38.632$$

g) Isentropic efficiency for the compressors is given as function of pressure ratio 'R' of the compressor.

$$\eta_{ise} = = (-0.0855\ R^2) + 2.5473\ R + 72.44$$

h) Assume: 'C_p' of ice = 2.106 kJ/kg-K, 'C_p' of liquid water = 4.108 kJ/kg-K, 'C_p' of brine solution = 3.82 kJ/kg-K and density of brine solution = 1200 kg/m^3.

i) Consider the following weather data

Weather station	Cooling DBT/MCWBT					
	0.4%		1.5%		2.5%	
	DBT	MCWBT	DBT	MCWBT	DBT	MCWBT
	°C	°C	°C	°C	°C	°C
Pune	38.4	20.5	37.4	20.4	36.3	20.6

Summarize the design for the refrigeration plant layout, actual refrigeration capacity, actual electrical motor power consumption and actual plant COP.

Q4) A two-stage cascade refrigeration system operating between the pressure limits of 15 bar and 0.19 bar with HFC 134A as the working fluid. Heat rejection from the lower cycle to the upper cycle takes place in an adiabatic counter-flow heat exchanger where the pressure in the upper and lower cycles are 4 and 5 bar, respectively. In both cycles, the refrigerant is a saturated liquid at the condenser exit and a saturated vapor at the compressor inlet, and the isentropic efficiency of the compressor is 85%. If the mass flow rate of the refrigerant through the lower cycle is 0.09 kg/s,

a) Draw the temperature - entropy diagram of the cycle indicating pressures; determine

b) The mass flow rate of the refrigerant through the upper cycle,

c) The rate of heat removal from the refrigerated space, and

d) The COP of this refrigerator; and

e) Determine the rate of heat removal and the COP if this refrigerator operated on a single-stage cycle between the same pressure limits with the same compressor efficiency. **[18]**

SECTION - II

Q5) a) Draw the working diagram of the double effect LiBr-H_2O vapour absorption refrigeration system. **[7]**

b) Enlist the expansion valves and explain working of thermostatic expansion valve with a neat sketch. **[7]**

Q6) Calculate the plant theoretical COP for the HCFC-22 refrigeration plant shown in Figure2. **[18]**

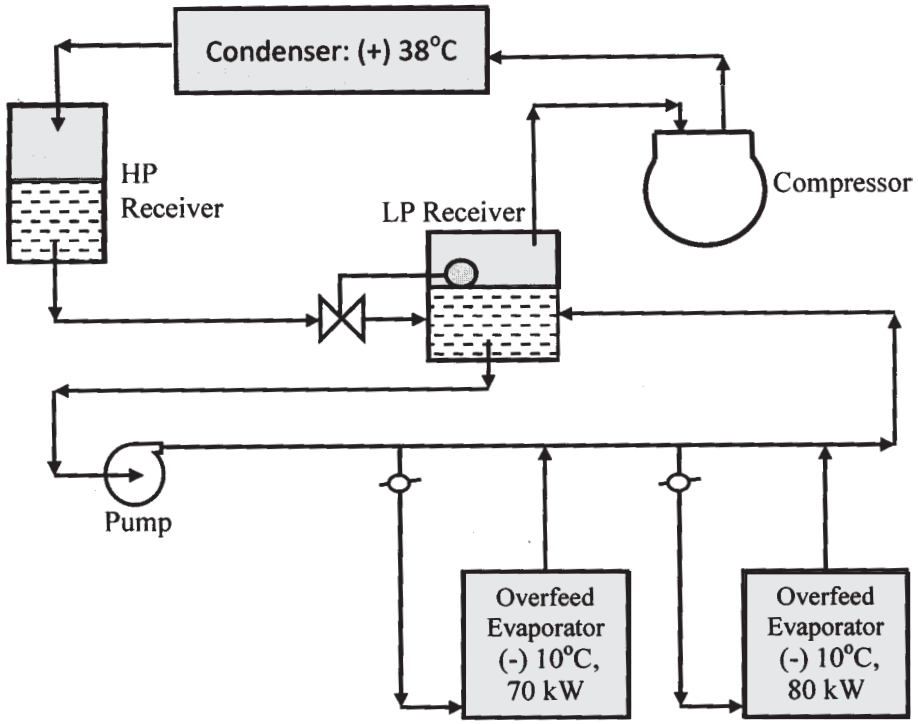

Figure 2

Q7) The refrigeration plant is required to be designed to meet the following requirements at the site.

a) Chilled water: 0.4 kg/s, supply temperature (+) 4ºC, return temperature (+) 8ºC

b) Propylene glycol: 0.2 kg/s, supply temperature (-) 20ºC, return temperature (-) 16ºC. Consider the following data

- i) Specific heat of propylene glycol 30% concentration: 3.33 kJ/kg-K
- ii) Density of propylene glycol 30% concentration: 1076 kg/m^3
- iii) Isentropic efficiency of the compressor: 78%
- iv) Volumetric efficiency of the compressor: 85%
- v) Compressor models are available in displacement capacities: 100, 125, 150, 175, 200, 225, 250, 300, 325 CC
- vi) Fresh clean water is available throughout the year in the temperature range: 20 to 30ºC.

Justify the selected plant layout for an energy efficiency and mark the cycle on the P-h chart. Calculate the actual plant capacities, number of compressors required, actual compressor power consumption and actual plant COP. **[18]**

Q8) In the concept of district cooling plant, the chilled water is produced at central refrigeration plant and supplied to different buildings/facilities in the radius of 4 to 5 km through the common pipe network as per the requirements of the individual facilities/buildings. The task has come to design the district cooling refrigeration plant to supply chilled water to three facilities. The following is the information available.

a) Central Retail Mall: 18 liter per second, supply temperature 5ºC and return temperature 8ºC at the mall headers, distance of the mall from the central refrigeration plant is 5 km on the East side of the district cooling plant.

b) IT Centre: 16 liter per second, supply temperature 4ºC and return temperature 9ºC at building place, distance of the mall from the central refrigeration plant is 4 km on the West side of the plant.

c) Five (05) Screen Multiplex: 12 liter per second, supply temperature 5ºC and return temperature 7ºC at the multiplex location, distance of the mall from the central refrigeration plant is 2 km on the East side of the refrigeration plant.

Consider the gain of heat in the pipe network from surrounding ground. Following is the data available for the design of the plant.

i) Thermal conductivity of cold insulation: 0.02554 W/m-K
ii) Insulation is available in strips of thickness: 25, 50, 75 and 100 mm
iii) External pipes are available in sizes, external diameter/wall thickness (in mm): 19.10/1.07, 22.20/1.14, 28.60/1.27, 34.90/1.4, 41.30/1.52
iv) The pipes are buried in the ground at the depth of 1.5m
v) Thermal conductivity of the pipe material: 15.78 W/m-K
vi) Temperature of ground at 1.5 m depth = 19ºC
vii) Displacement capacities of the available compressors : 200, 300, 400, and 500 CC
viii) Isentropic efficiency: 71%
ix) Volumetric efficiency: 85%
x) Speed of the compressor: 25 rps
xi) Potable clean water available at the plant location at temperature 29ºC

Draw the plant layout and corresponding P-h thermodynamic chart. Conclude the design for

1) Actual refrigeration capacity,
2) Actual total heat gain in the piping network,
3) Total compressor power consumption,
4) Actual refrigeration system COP. **[18]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1648 **[3865]-488**

M.E. (Mechanical) (Heat Power Engg.)
ADVANCED FLUID MECHANICS
(2008)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive the governing equation for conservation of mass using divergence theorem. **[10]**

b) Explain the meaning of Total derivative. **[8]**

Q2) a) Derive the exact solution of Navier stokes equations. **[8]**

b) Two infinite plates are at *h* distance apart. There is a fluid of viscosity 'μ' between the plates and pressure is constant. The upper plate is moving at speed U = 4m/s. The height of channel is *h* = 1.8 cm. Find the shear stress at the upper and lower walls if μ = 0.44 kg/ms and ρ = 888 kg/m^3. **[8]**

Q3) a) Derive the expression for Coutte flow. **[8]**

b) Consider the steady two dimensional incompressible velocity field, $\bar{v} = (u, v) = (ax + b)\bar{i} + (-ay + c)\bar{j}$, where *a. b. c.* are constants. Determine the pressure as function of *x* and *y*. **[8]**

Q4) a) Explain the various boundary wall conditions. **[8]**

b) Air moves over a 10m long flat plate. The transition from laminar to turbulent flow takes place between Reynolds number of 2.5×10^6 and 3.6×10^6. What are the minimum and maximum distance from the front edge of the plate along which one expect laminar flow in the boundary layer? The free stream velocity is 30m/s and $v = 1.5 \times 10^{-5}$ m^2/1. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain Prandtl's mixing length hypothesis. **[10]**

b) Explain the effect of viscous friction in compressible flow. **[8]**

Q6) a) Explain the concept of oblique-shock. **[8]**

b) Explain K-Epsilon model in turbulent flow. **[8]**

Q7) a) Explain how fluid velocity varies with flow area in a isentropic flow. **[8]**

b) Explain the significance of property relations for isentropic flow of ideal gases. **[8]**

Q8) a) During flow over a flat plate the laminar boundary layer undergoes a transition to turbulent boundary layer as the flow proceeds in the downstream. It is observed that a parabolic laminar profile is finally changed into $1/7^{th}$ power law velocity profile in turbulent regime. Find out the ratio of turbulent and laminar boundary layers if the momentum flux within the boundary layer remains constant. **[8]**

b) Air enters a diffuser with a velocity of 200 m/s. Determine the **[8]**

i) Speed of sound and

ii) The Mach number at diffuser inlet when the air temperature is 30°C.

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Total No. of Questions : 8] **[Total No. of Pages : 8**

P1649 **[3865]-492**

M.E. (Mech.) (Heat Power)

HEAT EXCHANGER SYSTEM DESIGN AND PERFORMANCE

(2008 Course) (Elective - IV) (502112) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section but Q. 7 is compulsory.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rules, Mollier charts, electronic pocket calculator and steam table is allowed, property tables.***
6) ***Assume suitable data, if necessary and use attached graphs.***

SECTION - I

Q1) a) Explain in detail what you understand by flow induced vibration (FIV) as referred to shell & tube exchanger. **[6]**

b) In an oil – to – water heat exchanger, the oil enters the exchanger at 100°C with a heat capacity rate of 3700 W/K. Water is available at 15°C and 0.6kg/s. Determine the exit temperature in a 1-2 TEMA E shell –and -tube exchanger by the MTD method for U = 500W/m ^{2} -K and surface area of 10 m^2 consider C_p = 1.88 and 4.19kJ/kg. K for oil and water, respectively. **[10]**

Q2) a) Explain which heat exchanger, is suitable for following applications with reasoning **[12]**

i)	Cryogenic applications.	ii)	Vapour condensation.
iii)	Slurries-suspensions-pulps.	iv)	Heat sensitive liquids.
v)	Following liquids.	vi)	High Viscosity fluids.

b) What are the various friction factors (J-factors) considered in Bell-Delaware method for designing shell and tube heat exchanger. **[4]**

Q3) a) In a 90° circular bend, water at 25°C flows at 2kg/s. The pipe inside diameter is 25mm, the radius of curvature of the bend is 150mm, and the average height of the pipe inside surface roughness is 0.025 mm. The downstream straight pipe length is 0.25m. Assume that the flow entering the pipe is fully turbulent. Compute the pressure drop associated with the bend and the downstream pipe. Use the following properties of water: density 997kg/m^3 and a dynamic viscosity of 0.000855 Pa.s. **[10]**

P.T.O.

b) Arrange the following exchangers in the order of most allowed design pressure drop Δp. **[6]**

i) Noncompact liquid-to liquid exchanger.

ii) Highly compact gas-to-gas exchanger.

iii) Moderately compact gas-to-gas exchanger.

iv) Compact water-to water exchanger.

Q4) a) Explain Quern method for designing shell and tube heat exchanger. **[7]**

b) In a shell-and tube feed water heater, cold water at 15°C flowing at the rate of 180 kg/h is preheated to 90°C by flue gases from 150°C flowing at the rate of 900kg/h. The water flows inside the copper tubes (d_i = 25 mm, d_o = 32 mm) having thermal conductivity k_w = 381 W/m-K. The heat transfer coefficient on gas and water side is 0.002m^2-K/W. Determine the flue gas outlet temperature, the overall heat transfer coefficient based on outside tube diameter, and the true mean temperature difference for heat transfer. Consider specific heat for flue gases and water as 1.05 and 4.19kJ/kg-K. respectively, and the total tube outside surface area as 5m^2. There are no fins inside on outside the tube and there is no fouling on the gas side. **[11]**

SECTION - II

Q5) Determine the effectiveness and the outlet temperatures of the hot and cold fluids of a two-disks (in-parallel) counterflow rotary regenerator for a vehicular gas turbine using the following data. **[14]**

Operating conditions	Disk geometry
Airflow rate = 2.029kg/s	Disk diameter = 0.683m
Gas flow rate = 2.094kg/s	Hub diameter = 0.076m
Disk speed = 15rpm	Seal face coverage = 7%
Air inlet temperature = 480°C	Matrix effective mass (two disks) = 34.93kg
Gas inlet temperature = 960°C	Matrix compactness β = 5250m^2 /m^3
Flow length = 0.0715m	Flow split, gas: air = 50:50
Heat transfer coefficients	Physical properties
h_{air} = 220.5W/m^2-K	$C_{p, air}$ = 1.050 kJ/kg-K
h_{gas} = 240.5W/m^2-K	$C_{p, gas}$ = 1.084 kJ/kg-K

Specific heat of matrix material = C_w = 1.130 kJ/kg-K.

Q6) a) Explain the selection criteria's of heat exchangers based on following operating parameters. **[7]**

i) Pressure & Temperatures. ii) Fluid leakage & contamination.

iii) Material & fluids compatibility.

b) Explain the various streams of flows in the shell side of STHE. Draw neat sketches wherever required. **[7]**

Q7) A 1 pass – 1-pass counterflow water to water plate heat exchanger has 47 thermal plates or 48 fluid channels (24 channels for each fluid.) On each fluid side, chevron plates of $\beta = 30°$ are used for 8 channels and 30° and 60° mixed chevron plates are used for 16 channels. Assume that $\beta_{effi} = 39.8°$ and the following are empirical correlations for the Nu and Re numbers based on equivalent diameter,

$$Nu = 0.724\left(\frac{\beta}{30^\circ}\right)^{0.646} \mathrm{Re}^{0.583}\,\mathrm{Pr}^{\frac{1}{3}}$$

$f = 0.80\mathrm{Re}^{-0.25}$ for $\beta = 30°$

$f = 3.44\mathrm{Re}^{-0.25}$ for $\beta = 30°$ and 60° mixed plates.

The following process geometry, and other information is provided as under

Process variables	Hot fluids	Cold fluids
Fluid type	Water	Water
Mass flow rate (kg/s)	18	10
Inlet temperature (°C)	40	20
Outlet temperature (°C)	30	38
Allowable pressure drop (kPa)	30	20

Plate geometry information :

Plate width W (m) = 0.5 — Plate length (height) L (m) = 1.1

Port Diameter D_p (m) = 0.1 — Channel spacing 2a mm = 3.5

Equivalent diameter De (m) = 7×10^{-3} — Projected area per plate A (m^2)=0.55

Fluids properties [use the same constant properties (for simplicity) on both hot-and cold-fluid sides]

Dynamic viscosity (Pa.s) = 8.1×10^{-4} — Density (kg/m^3) = 995.4

Thermal conductivity (W/m-K) 0.619 — Specific heat (J/kg-K) = 4177

Pr = 5.47

Additional information :

Total fouling resistance = 4×10^{-5} m^2 K. W

Plate Wall thermal resistance = 3×10^{-6} m^2 K. W

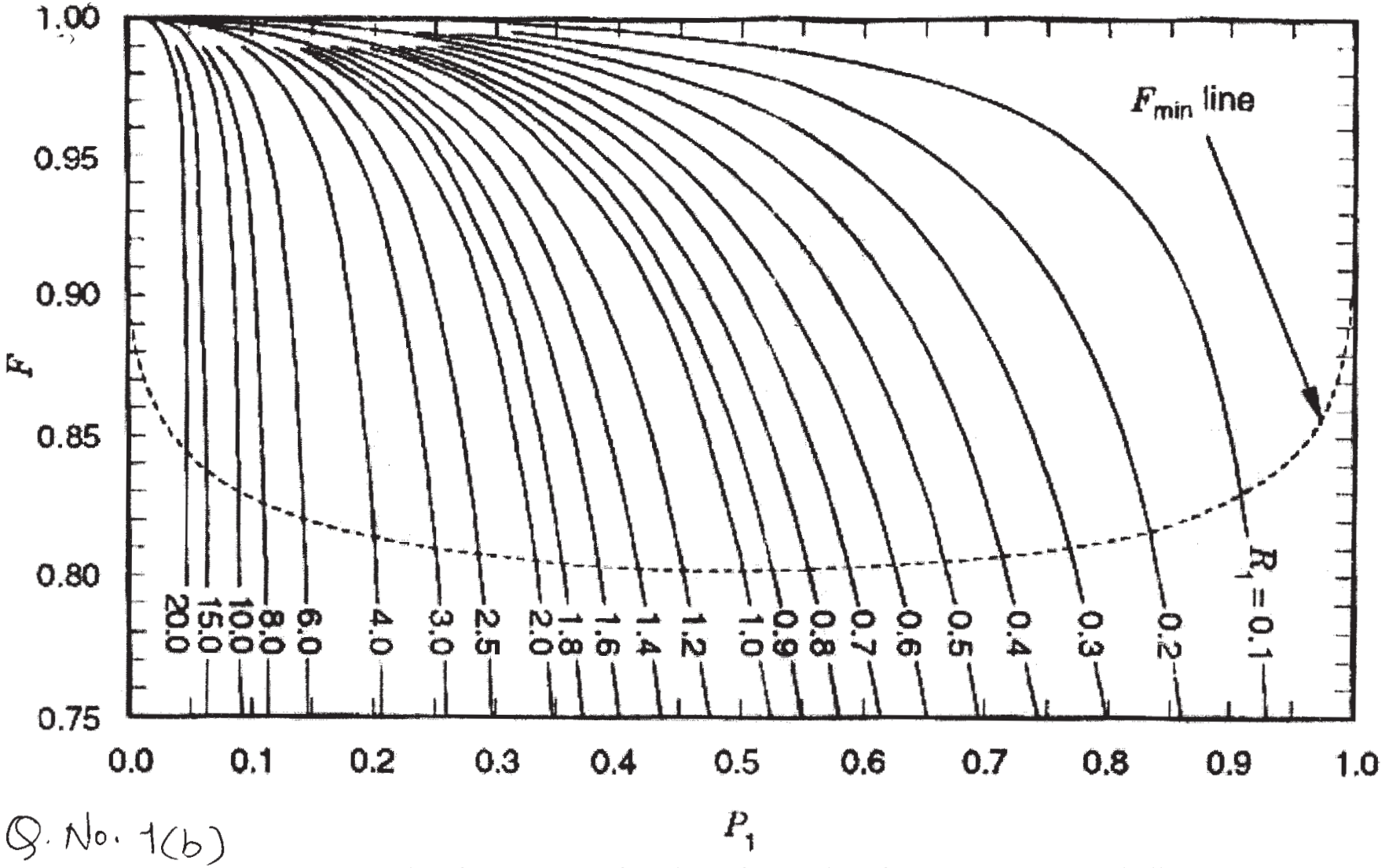
Determine heat transfer and pressure drop performance of this exchanger. **[22]**

Q8) a) Name the specific heat exchanger & explain their construction for the following application **[7]**

i) Air preheater in boiler. ii) Condenser in window air conditioner.

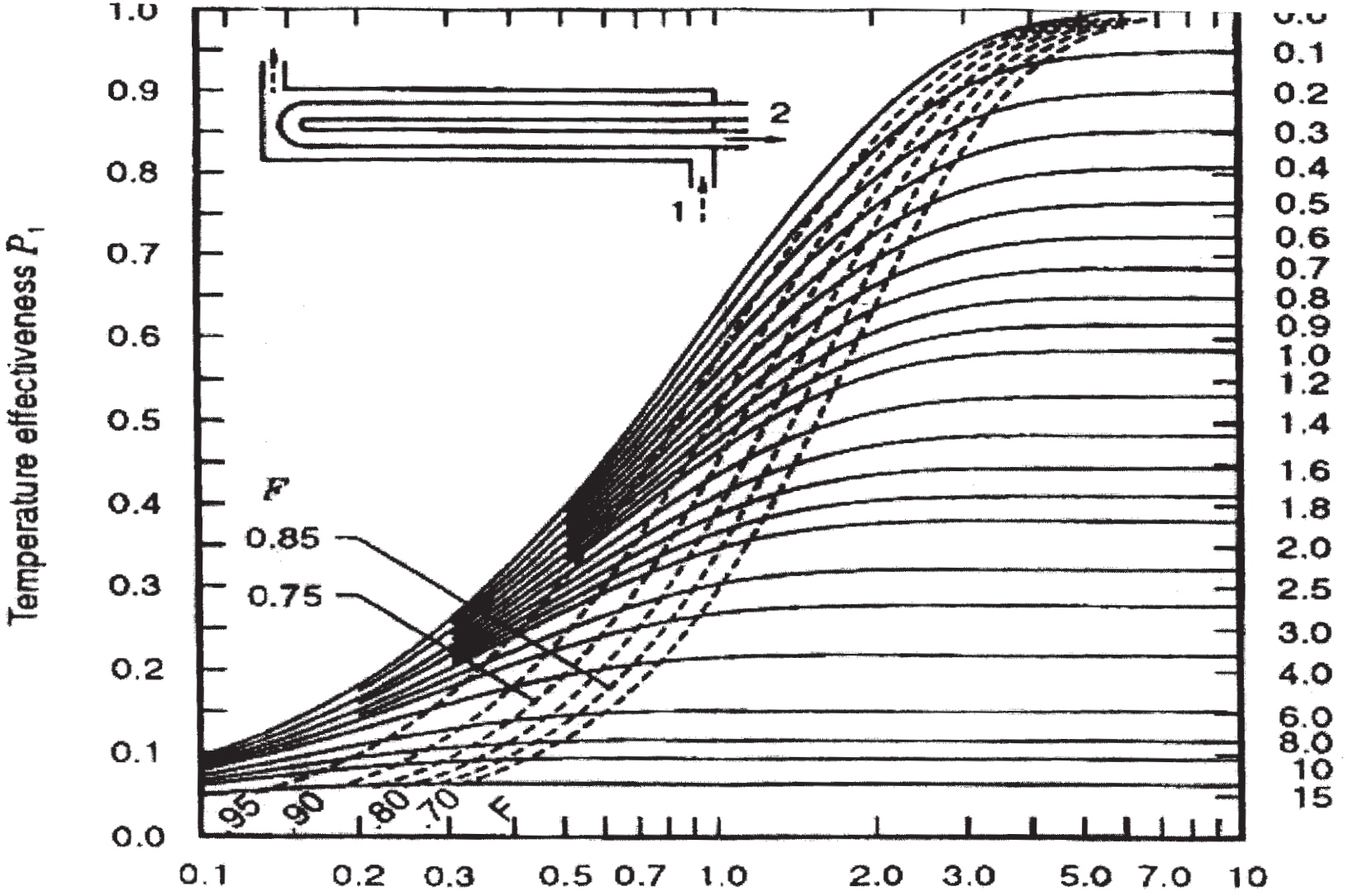
iii) Water cooled condenser. iv) Cooling Towers.

b) Explain the heat exchanger design methodology with flowchart. **[7]**



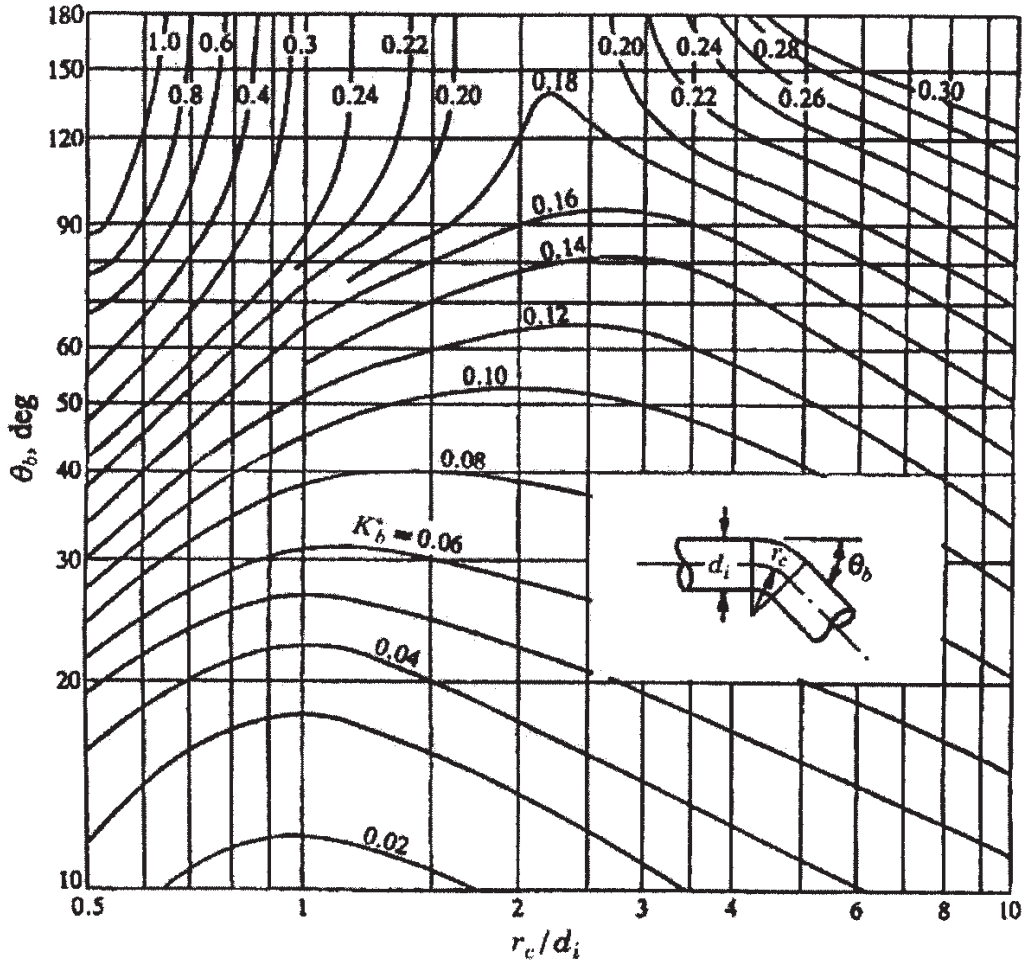
Q. No. 1(b)

LMTD correction factor F as a function of P_1 and R_1 for a 1-2 TEMA E shell-and-tube exchanger with the shell fluid mixed (From Shah, 1983).



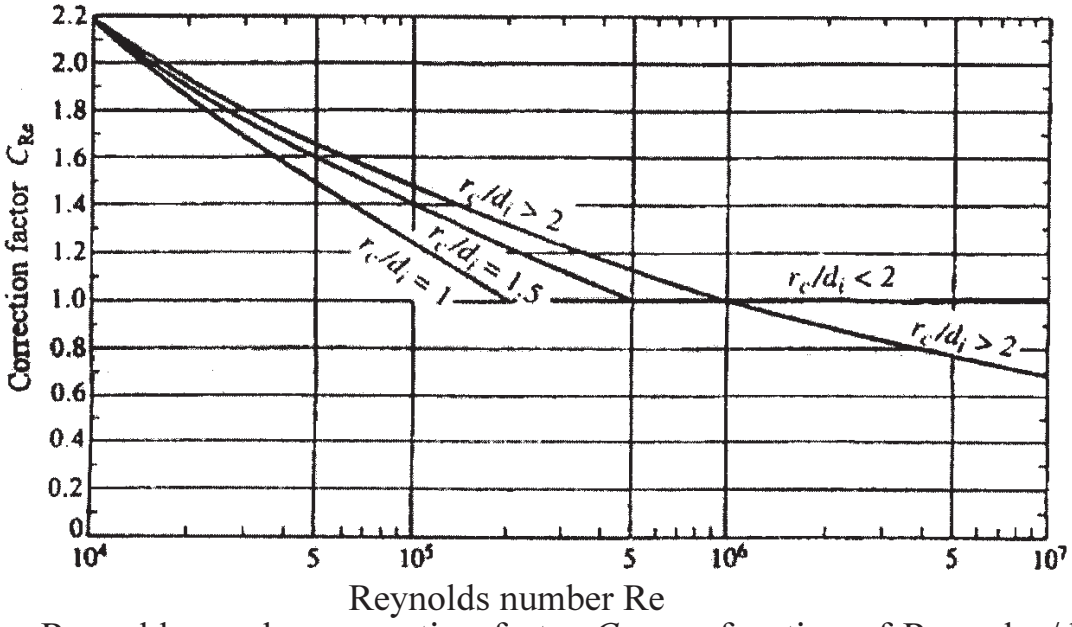
Q. No. 1(b)

P_1 as a function of NTU$_1$ and R_1 for a 1–2 TEMA E exchanger, shell fluid mixed;

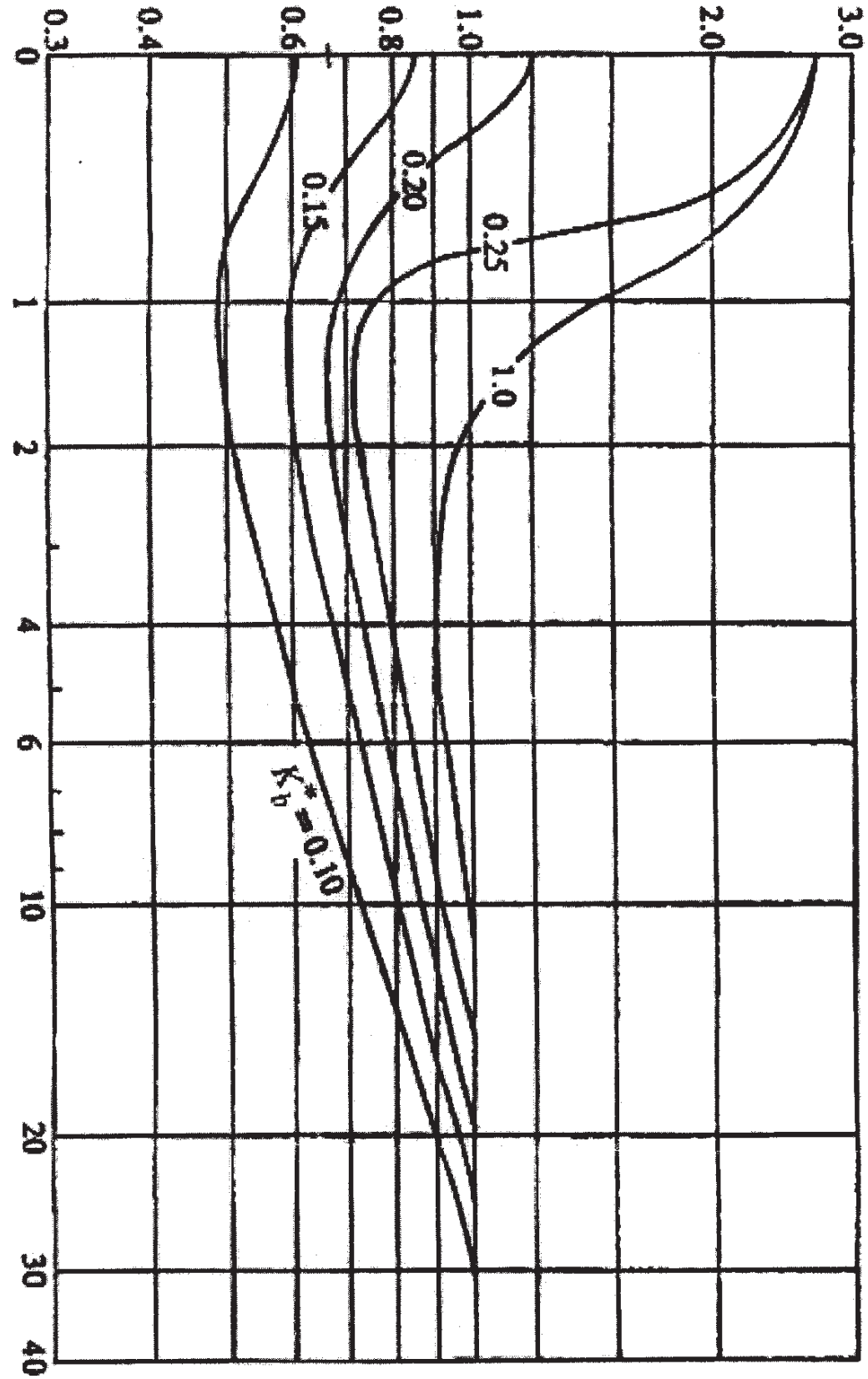


Q. No. 3(a)

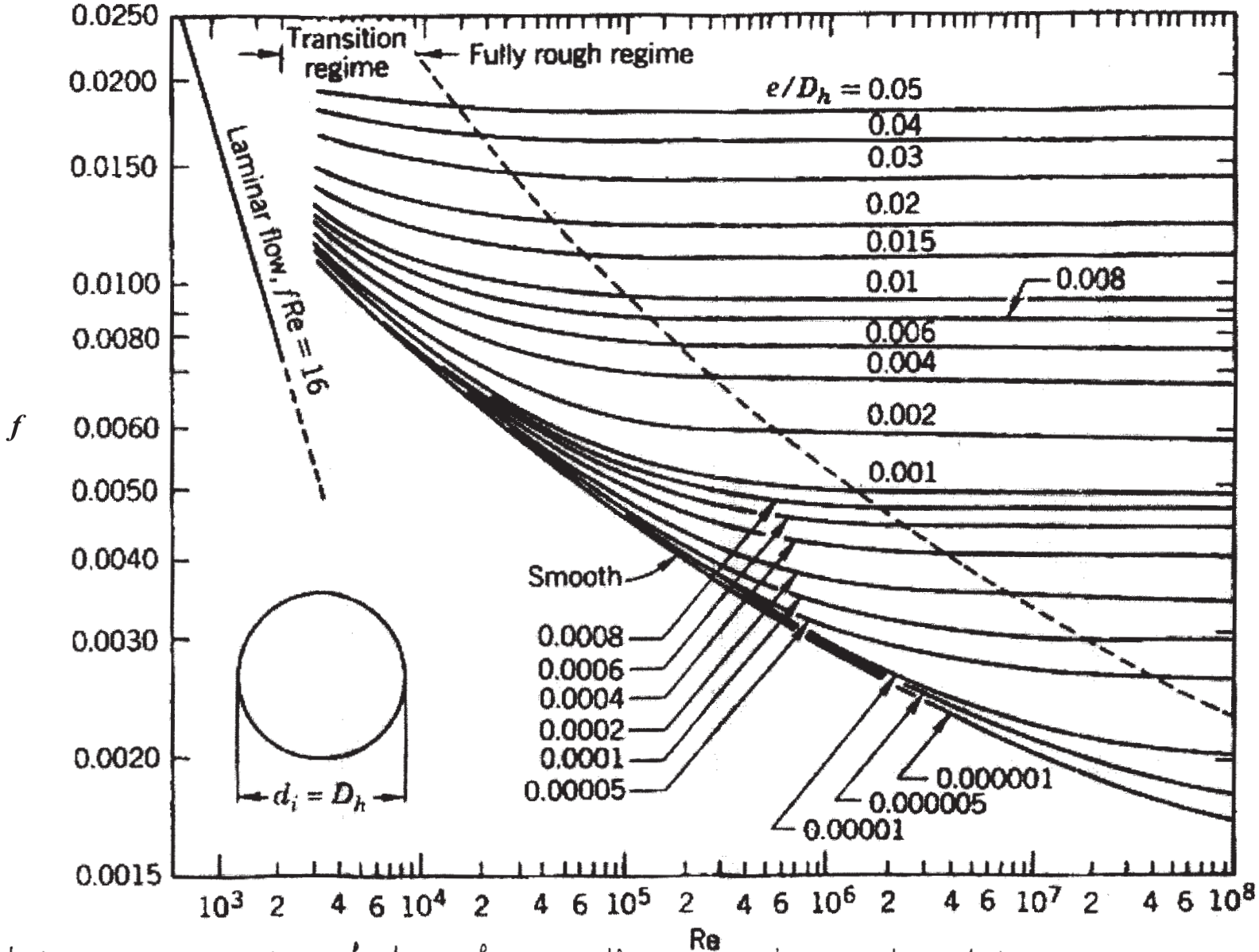
Bend pressure loss coefficient K_b* at Re = 10^6 for circular cross section bends. (From Miller,1990.)



Reynolds number correction factor C_{Re} as a function of Re and r_c/d_i. (From Miller,1990.)



Outlet pipe length correction factor C_{dev} as a function of the outlet pipe L/d_i and K_b^* (From Miller, 1990).



Graph. 1 : Fanning friction factors for smooth and rough circular tubes.

Q. No. 3(a)

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Total No. of Questions : 8] **[Total No. of Pages :2**

P1650

[3865]-493
M.E. (Mechanical Engg.) (Heat Power)
COMPUTATIONAL FLUID DYNAMICS
(New 2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Assume suitable data, if required.***
2) ***Figures to the right indicate full marks.***
3) ***Use of logarithmic tables, slide rule and electronic pocket calculator is allowed.***
4) ***Answer any three questions from each section.***

SECTION - I

Q1) Consider developing flow (entry length) between two parallel plates, separated by a distance h.

a) What are the governing equations in discretised form? **[6]**

b) Present the algorithm for determining pressure (SIMPLE). **[12]**

Q2) Consider quasi-one dimensional compressible flow in a nozzle.

a) Write the simplified governing equations for this case. **[8]**

b) Solve the continuity equation using the MacCormack method. **[8]**

Q3) For supersonic flow over a flat plate

a) Write the full governing equations. **[6]**

b) Present the algorithm for updating u, the x-component velocity. **[10]**

Q4) a) When is relaxation method used. Outline the method with an example. **[6]**

b) What are numerical dissipation and dispersion. Give one example for each. **[6]**

c) If there is a wave with a sudden jump in its amplitude, how will numerical dissipation and dispersion distort the solution. **[4]**

P.T.O.

SECTION - II

Q5) Consider a square ABCD of length *l* as the control volume in a flow domain:

a) Apply mass conservation. **[6]**

b) Apply momentum equation in terms of momentum flux and shear stress. **[12]**

Assume face and cell centre values are known. The control volume length *l* is not small.

Q6) Consider one dimensional transient conduction equation:

a) Write the expression for the explicit method. Derive the stability criterion. **[10]**

b) Present the semi-implicit algorithm. **[6]**

Q7) Write the equation for two-dimensional transient conduction. Present the algorithm for solving it using the Alternating Di-rection Implicit (ADI) scheme. What is the main advantage of this scheme? **[16]**

Q8) Consider the linear wave equation

$$u_t + a u_x = 0$$

a) Apply Lax-Wendroff method to solve this equation. **[6]**

b) What is the order of accuracy? **[6]**

c) What is the stability criterion? **[4]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1651

[3865] - 497

M.E. (Mechanical) Design Engineering

INSTRUMENTATION & AUTOMATIC CONTROL

(2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to two sections should be written in separate answer sheets.***
3) ***Assume suitable data if any.***
4) ***Numbers to right side of question indicate marks.***

SECTION - I

Q1) a) Explain the broad category of methods of measurement. **[8]**

b) Explain the different types of correlation. **[8]**

Q2) a) The data about sales and advertisement expenditure of a firm is given below. **[12]**

	Sales (in crores of Rs.)	Advertisement expenditure (in crores of Rs.)
Mean	40	6
standard deviations	10	1.5
co-efficient of correlation r = 0.9		

i) Estimate the likely sales for a proposed advertisement expenditure of Rs. 10 crores.

ii) What would be the advertisement expenditure if the firm proposes a sales target of 60 crores of Rupees?

iii) What is extra advertisement expenditure for unit crores of rupees change in sales?

iv) What is likely change in sales if the advertisement expenditure increases by one crore of Rupees?

b) Explain the difference between regression analysis & correlation. **[6]**

P.T.O.

Q3) a) Explain with a neat sketch the working of a electromagnetic flow meter. **[8]**

b) Explain the working of Ferry's total radiation pyrometer. **[8]**

Q4) a) Explain with a neat sketch the working of variable reluctance sensor to measure pressure. **[10]**

b) A McLeod gauge is available which has volume of $150cm^3$ and a capillary diameter of 1.5 mm. Calculate gauge reading for a pressure of 30μm of mercury. **[6]**

SECTION - II

Q5) a) Explain the significance of molar absorptivity. **[4]**

b) Cytosine has molar extinction co-efficient of $6x10^3$ $mo1^{-1}$ cm^{-1}. at 270 nm at PH7. Calculate the absorbance of $1+10^{-3}$ M cytosine solution in 1 mm cell at 270 nm. **[4]**

c) Explain double beam UV-spectrophotometer with a neat sketch. **[8]**

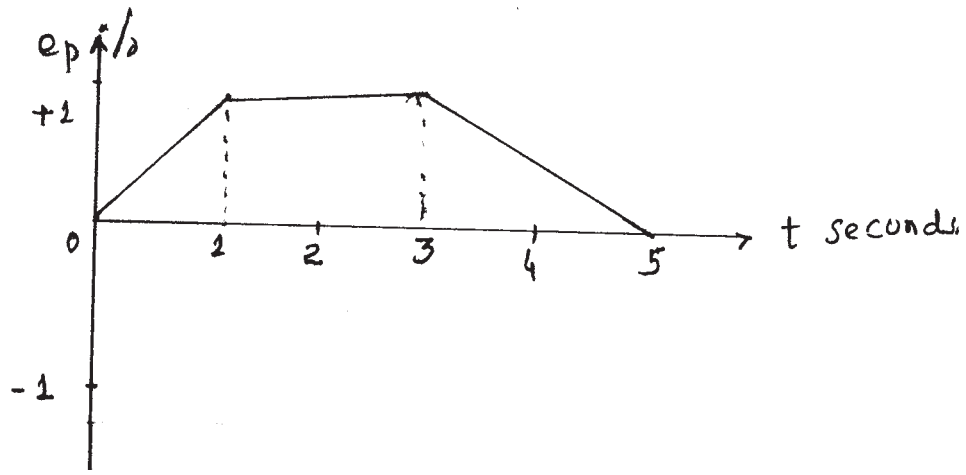
Q6) a) A thermistor is calibrated between 145°C& 215°C. The specified accuracy is ± 0.25% of instrument span. Find maximum static error. **[4]**

b) Explain any one Power measuring instrument with a neat sketch. **[6]**

c) Explain in brief measurement of any one thermo physical property of a substance. **[6]**

Q7) a) Explain the importance of chromatography. **[6]**

b) The error shown in fig. below is applied to a proportional-Derivative controller with K_p=5, K_D= 0.5 s and P_O= 20% Draw a graph of resulting controller output. **[10]**



Q8) Write short notes on any three **[18]**

a) Measurement of noise.

b) Hydraulic controllers.

c) Calibration of thermocouples

d) Ultrasonic flow meter.

Total No. of Questions : 10] **[Total No. of Pages : 3**

P1652

[3865] - 498

M.E. (Mechanical Engineering) (Design Engineering)

ADVANCE MATERIAL SCIENCE

(2008 Course) (502204-B)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Square bracketed figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule and non-programmable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What do you mean by the term "Engineering Materials"? and How engineering materials be classified? How it is important to the Design Engineer to have the knowledge of the engineering material? **[6]**

b) Define the terms lattice, unit cell, basis and crystal structure. **[4]**

c) Bismuth has a hexagonal structure, with a_0=0.4546 nm and c_0=1.186 nm. The density is 9.808 g/cm^3 and atomic weight is 208.98 g/mol. Determine **[6]**

i) the volume of the unit cell; and
ii) the number of atoms in each unit cell.

Q2) a) What is coordination number? How it is useful to decide lattice structure? What its physical significance in metallic structure? **[6]**

b) How will you differentiate theoretical density, linear density and planner density of lattice? **[4]**

c) Determine the Miller indices of plane that passes through three points having the following coordinates:

i) 0, 0, 1; 1, 0, 0; and ½, ½, 0
ii) ½, 0, 1; ½, 0, 0; and 0, 1, 0.
iii) 1, 0, 0; 0, 1, ½; and 1, ½, ¼. **[6]**

P.T.O.

Q3) a) Explain the method of plotting an equilibrium diagram and derive the lever rule as applied to the equilibrium diagram. **[8]**

b) Define the following using a binary equilibrium peritectic phase diagram **[8]**

i) pertectic reaction.

ii) pertectic temperature.

iii) peritectic composition.

iv) peritectic point.

Q4) a) What is precipitation hardening? How it is achieved in non ferrous material? Explain it with the help of a typical equilibrium diagram. **[8]**

b) Explain the various methods to achieve high strength in HSLA Steels. **[8]**

Q5) Write notes on any three of the following: **[18]**

a) Creep resisting steel.

b) Equilibrium diagram for Cu:Sn

c) Heat treatment of tool steel.

d) Maraging Steel.

e) Dual phased steel.

SECTION - II

Q6) a) What is super conducting material? How they are produced? What are its applications? **[8]**

b) Define Biomaterials and explain broadly their purposes. How they are differ from conventional materials? **[8]**

Q7) a) What are the reinforcing materials in composites? How it is laid in the composite material and how it affects the strength of the material? **[8]**

b) Explain how the volume of the fiber, fiber orientation and fiber strength are related with each other. **[8]**

Q8) a) What is shape memory alloy? What is mechanism of change of shape with temperature? What do you understand meaning of ferromagnetic shape memory alloy? **[8]**

b) What are the main compositions of engineering ceramics? What are important properties of the ceramics? Why ceramics doesn't have corrosion tendency? **[8]**

Q9) a) Explain CVD and IVD ion implantation method. **[6]**

b) What is PVD? Explain the process in detail mentioning its advantages, limitations and applications? **[6]**

c) Why anodic coatings are better than cathodic coatings particularly for corrosion resistance purpose? **[4]**

Q10) Write short notes on Any four of the following: **[18]**

a) Ceramics and cermets.

b) Nano materials and its applications.

c) Ortho dental materials.

d) Heat Treatment of Non ferrous materials.

e) Tribological aspects of surface coatings.

f) Smart Materials.

Total No. of Questions :10] **[Total No. of Pages :4**

P1653

[3865]-504

M.E. (Mechanical-Design Engineering)

ADVANCED MACHINE DESIGN

(Revised 2008 Course) (502209)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Show the effect of height to thickness relation on characteristics of belleville springs. **[8]**

b) Derive an expression for maximum space efficiency of helical springs. **[8]**

Q2) a) What is difference between design for finite and infinite life problems? Explain modified Goodman diagram. **[8]**

b) The work cycle of mechanical component subjected to completely reversed bending stress consists of following three elements : **[8]**

i) ± 350 N/mm^2 for 85 % of time,

ii) ± 400 N/mm^2 for 12 % of time and

iii) ± 500 N/mm^2 for 3 % of time.

The material for component is 50C4(s_{ut} = 660N/mm^2) and the corrected endurance limit of the component is 280N/mm^2. Determine life of the component.

Q3) a) Explain the following terms : **[8]**

i) True stress and true strains.

ii) Estimated time to rupture.

b) A cantilever beam has a rectangular cross section 4 cm wide and 8 cm deep. The length is 150 cm with 1600 N load at free end. The material is 0.35 carbon steel with n = 8 and B = 40×10^{-35} $(cm^2/N)^n$ per day. Find the permanent deflection after 10 years of service. **[8]**

P.T.O.

Q4) a) Explain the use of composite materials in mechanical engineering giving examples of such use, state reasons for a preference in favour of such materials. **[8]**

b) Consider a graphite-epoxy laminate, whose elastic constants along and perpendicular to the fibres are as follows, **[8]**

E_{xx} = 181 GPa; E_{yy} = 10.3 GPa; G_{xy} = 7.17 GPa;
υ_{xx} = 0.28; υ_{xy} = 0.01594

Obtain the compliance coefficients appropriate to *x'y'* axes which are at

i) + 30° (counter-clockwise) to *xy* axes and

ii) + 9° to *xy* axes.

Q5) Write short note on the following : **[18]**

a) Vibration and surging of Helical springs.

b) Fault tree analysis.

c) Hybrid materials & applications.

SECTION - II

Q6) a) How do you identify the optimum solution in the simplex method. **[6]**

b) A uniform column of rectangular cross section is to be constructed for supporting a water tank of mass 'M' shown in fig.1. It is required

i) to minimize the mass of the column for economy and

ii) to maximize the natural frequency of transverse. Vibration of the system for avoiding possible resonance due to wind. Formulate the problem of designing the column to avoid failure due to direct compression & buckling.

Assume the permissible compressive stress to be σ_{max}. **[10]**

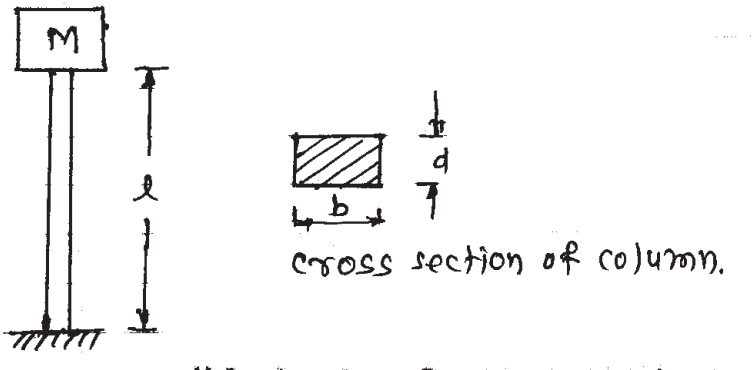


Fig.1. Q. 6(b), Water tank on a column.

Q7) a) Explain the term peaking & topping as applied to gear. **[6]**

b) Two 10 teeth gears are to mesh without undercutting. The gears are generated using standard nob with 20° pressure angle. Module is 4 mm, the clearance is 0.2 mm. Using extended centre distance method find out,

i) Hob shift.

ii) Blank diameter & depth of cutter setting.

iii) Actual pressure angle.

Take usual notations;

$$\theta = \text{inv}\,\phi$$

$$\phi = v - \frac{2}{15}v^3 + \frac{3}{175}v^5$$

where, $v = \sqrt[3]{3\theta}$

$\theta \& \phi$ are in radians. **[10]**

Q8) a) Prove that reliability with respect to time 't' is

$$R(t) = \text{Exp}\left[-\int_0^t h(t)dt\right]$$ **[8]**

b) Alpha industries Ltd has deputed four different batches of its employees to four different training organizations (A, B, C and D) for same training programme, which aims to train them in improving their decision-making skills. Each batch consist of 5 employees with similar qualifications & work experience. After the training programme, the company conducted a common examination to test their level of additional knowledge gained through the training programme. The % scores of the employees of the batch are summarized in table as,

A	B	C	D
80	70	65	90
90	60	50	89
96	55	58	85
85	85	55	95
70	90	40	80

perform ANOVA to check whether this is significant difference between the training organization in terms improving the decision-making skill of the employees by assuming a significance level of 0.05. **[8]**

Q9) a) Discuss the various design consideration for connecting rod of 1.C. Engine. **[6]**

b) Design an aluminium alloy piston for a single acting four stroke engine for the following specifications :

Cylinder bore	= 0.30 m
Stroke	= 0.375 m
Max gas pressure	= 9 MPa
Brake mean effective pressure	= 1.3 MPa
Fuel consumption	= 0.22 kg/kW/hr
Speed	= 550 rpm

[10]

Q10) Write a short note on the following : **[18]**

a) Design for different machining process.

b) Classical lamination theory of composite material.

c) S and S_0 spur gears.

Total No. of Questions : 10] **[Total No. of Pages : 03**

P1654

[3865] - 507

M.E. (Mechanical - Design Engineering)

ENGINEERING FRACTURE MECHANICS

(502211) (2008 Course) (Elective - III)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the load - displacement characteristics of cracked bodies under:

i) constant load conditions.

ii) constant displacement conditions. **[8]**

b) Distinguish between the following types of fracture mechanics problems.

i) Linear-elastic

ii) Elastic-plastic

iii) Time-dependent. **[8]**

Q2) a) Explain the concept of energy balance during crack growth? **[8]**

b) Determine the *strain energy release rate* for a double cantilever beam with a >> 2h and *l* >> 2h (shown in Fig. 1), where P is the applied load and B is the width of the beam. **[8]**

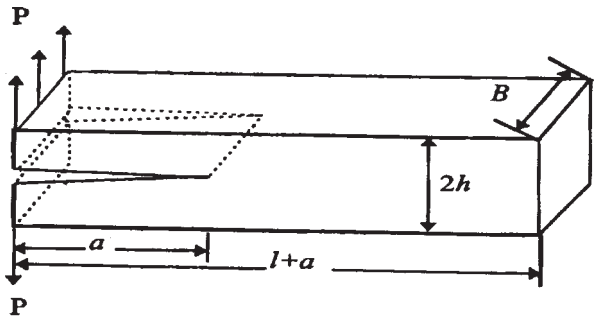


Fig. 1 Double cantilever beam

P.T.O.

Q3) a) Explain in brief the plastic zone shape according to Tresca criterion. **[8]**

b) Describe the following local fracture mechanisms: **[8]**

i) Cleavage fracture ii) Brittle fracture

iii) Ductile fracture iv) Intergranular fracture

Q4) a) Determine the critical crack size for a central crack in a plate where the applied stress is 151.7 MPa in tension and the plane strain fracture toughness is 60.45 MPa $m^{1/2}$. Assuming the ratio of crack length to plate width as 0.2, determine the plate width in mm. **[6]**

b) Explain in brief the *finite element method* and the *compliance method* for evaluating fracture toughness? **[12]**

Q5) a) Define the terms COD and CTOD. Explain the relationship between COD and CTOD? **[6]**

b) Explain the following: **[10]**

i) Plastic constraint factor ii) Irwin's fracture criterion.

SECTION - II

Q6) a) Define J-integral. Discuss the significance and limitations of J - integral as a fracture parameter? **[10]**

b) Explain the following terms: **[6]**

i) Stress intensity factor ii) Crack tip plasticity

Q7) a) Explain the factors causing fatigue failure with an application of each? **[8]**

b) Define '*fatigue crack propagation*'. Explain the 'Paris law' for fatigue crack propagation? **[8]**

Q8) a) A plate of width $2.b = 50$ mm contains a central crack of length $2.a_0 = 10$ mm, and is subjected to a constant-amplitude tensile cyclic stress normal to the crack which varies between $\sigma_{min} = 100$ MPa and $\sigma_{max} = 200$ MPa. The crack growth is dictated by the following equation:

$$\frac{da}{dN} = 0.42 \times 10^{-11} (\Delta K)^3$$

Where $\frac{da}{dN}$ is expressed in *m/cycle* and ΔK in MPa $m^{1/2}$

Calculate the number of cycles required for the crack to propagate to a length $2.a = 20$ mm. The stress intensity factor K_I of the plate is given by

$$K_I = \sigma(\Pi.a)^{1/2}\left[\frac{2.b}{\Pi.a}\tan\left(\frac{\Pi.a}{2.b}\right)^{1/2}\right]$$ **[10]**

b) What are the characteristics of the fatigue crack growth rate curve? **[6]**

Q9) a) Explain in brief the mechanisms of creep deformation? **[10]**

b) Draw the fatigue-creep interaction diagram at constant temperature and explain? **[6]**

Q10) Answer any *three* of the following: **[18]**

a) Strain range partitioning.

b) Effect of temperature on fatigue.

c) Stages in creep curve.

d) Three point bend specimen test.

Total No. of Questions : 10] **[Total No. of Pages : 2**

P1655 **[3865]-508**

M.E. (Mechanical-Design Engineering)

COMPUTER AIDED ENGINEERING

(502211) (Elective - III) (Course 2008)

Time : 4 Hours] [***Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections mustd be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data wherever necessary.***
6) ***Use of pocket non programmanle electronic calculator is allowed.***

SECTION - I

Q1) a) Justify modeling and simulation as a design procedure with simple example. **[12]**

b) Enlist data exchange issue related to analysis and simulation. **[4]**

Q2) a) Explain the procedure to build any geometric model with the help of Blend and parent child feature available in commercial modeling software. **[8]**

b) Explain how to reduce idle time and effective time of modeling and analysis using CAD/CAM/CAE software's. **[8]**

Q3) a) Justify with suitable example which type of geometric modeling is preferred for Modular assembly. **[8]**

b) Discuss the **[8]**

Q4) a) Explain **[8]**

b) Discuss **[8]**

Q5) Explain in detail the following : **[6×3]**

a) Vanaz

P.T.O.

b) Ports

c) New Inte

SECTION - II

Q6) a) Explain **[12]**

b) Discuss **[4]**

Q7) a) Explain **[8]**

b) Discuss **[8]**

Q8) a) Explain **[8]**

b) Discuss **[8]**

Q9) a) Explain **[8]**

b) Discuss **[8]**

Q10)Explain in detail the following : **[6×3]**

a) Vanaz

b) Ports

c) New

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Total No. of Questions : 10] **[Total No. of Pages : 3**

P1656

[3865]-510
M.E. (Mech.) (Design Engineering)
INDUSTRIAL TRIBOLOGY
(2008 Revised Course) (Elective - IV) (502212)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain the mechanism of adhesive wear. Derive equation for the law of adhesive wear as proposed by Archad. Explain Rowe's modification of Archad equation. **[16]**

Q2) Discuss various types of friction and explain following theories of friction. **[16]**

a) Tomlinson's theory of molecular attraction.

b) Bowden-Tabor theory of simple adhesion.

c) Stick-slip vibration.

Q3) What is a short bearing? Write down the basic equation for pressure distribution in case of a short bearing and deduce the load rating equation in the term.

$$W = \left[\frac{\eta.\upsilon.L^3}{4c^2}\right]\frac{\in}{(1-\in^2)^2}\left[\pi^2(1-\in^2)+16\in^2\right]^{1/2}$$

where W – total load

υ – shaft surface speed

η – viscosity

c – radial clearance

L – bearing length (total axial) and

$\in$ – eccentricity ratio **[18]**

P.T.O.

Q4) A fixed inclined slider bearing has maximum to minimum film thickness ratio as '2'. It operates under hydrodynamic condition. Derive following expression for its load carrying capacity.

$$W = 0.156 \frac{\eta . \upsilon . L . B^2}{h_o^2}$$

where η – viscosity of oil.
υ – sliding velocity
L – length of bearing
B – width
h_o – minimum oil film thickness. **[16]**

Q5) Write the generalized Reynold's equation and explain the physical significance of the following terms involved in it. : **[16]**

a) Physical wedge term.

b) Density wedge term.

c) Strech term.

d) Normal squeeze term.

e) Translational squeeze term.

f) Local expansion term.

SECTION - II

Q6) The following data is given for the hydrostatic step bearing of a vertical turbogenerator.

Thrust load = 450 kN.
Shaft diameter = 400 mm.
Recess diameter = 250 mm.
Shaft speed = 750 rpm.
Viscosity of lubricant = 30 cp.

Draw a neat sketch showing the effect of film thickness on energy losses. Calculate the optimum film thickness for minimum power loss. The specific gravity and specific heat of lubricating oil are 0.86 and 2 kJ/kg °C respectively. For the optimum film thickness, find out the temperature rise. Assume that the total power loss is converted into frictional heat. **[18]**

Q7) a) Explain the phenomenon of Elastohydrodynamic lubrication. State its applications. **[6]**

b) Distinguish between squeeze film lubrication and hydrodynamic lubrication. Give their practical applications. **[6]**

c) Bearing material properties. **[4]**

Q8) Derive an expression for volume. How rate of air at outlet pressure (free air) for aerostatic step bearing in the form. **[16]**

$$Q_o = \frac{\pi h_o^3 (P_i^2 - P_o^2)}{12\eta . P_o \log_c (R_o / R_i)}$$

Where

Q_o - volume flow rate of air at outlet pressure.
h_o - air-film thickness.
P_i - supply pressure of air.
P_o - outlet pressure of air.
η - absolute viscosity of air.
R_o - outer radius of shaft.
R_i - radius of recess in shaft.

Q9) A rectangular plate is approaching an oily fixed plane surface with a velocity 'V' at the instant, the film thickness is h_1. Derive an expression for the time 't' taken to reduce the film thickness from h_1 to h_2. The viscosity of lubricant is 'η'. **[16]**

Q10) Two cylinders of radii R_1 and R_2 and length 'L' are rotating against each other and transmitting load 'w'. The cylinders are made of same material with modulus of elasticity 'E' and poisson's ration M.

Find the width of contact. **[16]**

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Total No. of Questions : 10] **[Total No. of Pages : 3**

P1657

[3865] - 514

M.E. (Mechanical - Mechatronics)

DESIGN OF MACHINE ELEMENTS

(502804) (2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of non programmable electronic calculator is allowed.***

SECTION - I

Q1) a) What do you understand by standards in design? What are the types of standards? **[5]**

b) What are preferred numbers, how they are related with preferred sizes? **[5]**

c) What are the ergonomic considerations in design? **[6]**

Q2) a) What is factor of safety? What are the factors considered while choosing it? **[8]**

b) Explain any two theories of failures used in design of machine components. **[8]**

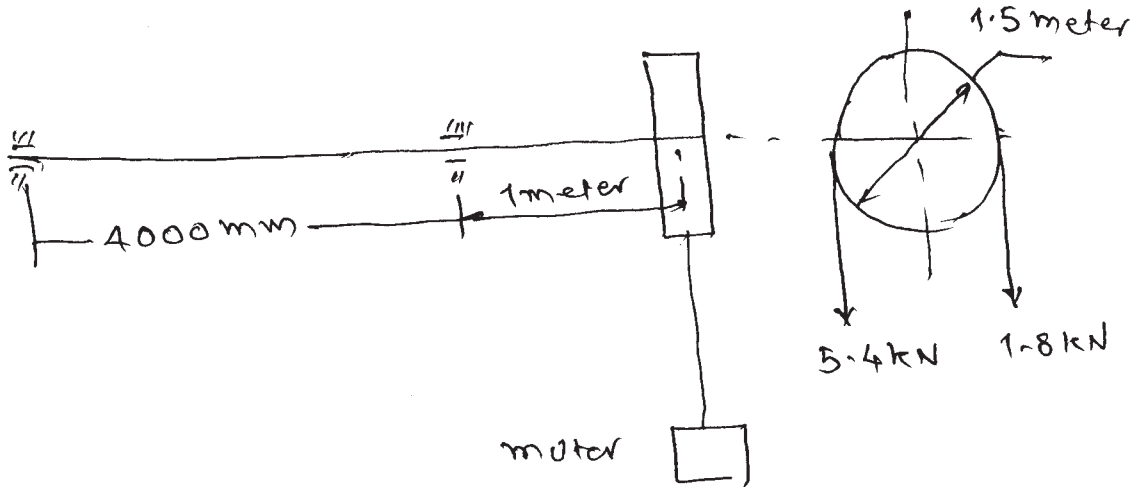
Q3) a) Explain different modes of failures in design. **[6]**

b) A hydraulic press exerts a total load of 3.5 MN. This load is carried by two steel rods, supporting the upper head of press. If the safe stress is 85 MPa and E = 210 kN/mm^2, determine the diameter of rods, extension in each rod in a length of 2.5 m. **[12]**

Q4) a) What is ASME code for shaft design? **[4]**

b) A line shaft is driven by a motor placed vertically below it. The pulley on the line shaft is 1.5 m in diameter and has belt tensions 5.4 kN and 1.8 kN on the tight and slack side of the belt respectively. Both these tensions may be assumed vertical. If the pulley is overhang 1M on the shaft, the distance of the center line bearing is 4000 mm, find the diameter of shaft. Assume maximum allowable bending stress as 80 MPa and maximum allowable shear stress as 42 MPa. (Ref fig) **[12]**

P.T.O.



Q5) a) Draw a neat labeled sketch of flexible coupling. **[6]**

b) A rod made of steel 40Crl (Sut = 550 N/mm^2) is subjected to a completely reversed axial load of 100 kN. The rod is machined on lathe and expected reliability is 95%. There is no stress concentration. Determine the diameter of rod using factor of safety 2 for an infinite life condition. Assume Ka = 0.78, Kb = 0.85, Kc = 0.868 with usual meaning. **[10]**

SECTION - II

Q6) a) What are the different types of springs? State their applications. **[6]**

b) A helical spring is made of a wire of 6 mm diameter and has out side diameter of 75 mm. If the permissible stress is 350 MPa and modulus of rigidity 84 kN/mm^2 find the axial load which the spring can carry and the deflection of the spring. **[10]**

Q7) a) What are the characteristics of good bearing materials? **[4]**

b) Write short note on **[6]**

i) Static load carrying capacity of roller bearings.

ii) Dynamic load carrying capacity of roller bearing.

c) Explain the procedure of selection of ball bearing from manufacturers catalog. **[6]**

Q8) a) What are the desirable properties of gear materials? **[5]**

b) Design a pair of spur gears with 20° full depth involute teeth. The pinion shaft is connected to a 10 kW, 1440 r.p.m. motor. The starting torque of the motor is 150% of the rated torque. The speed reduction is 4:1. The pinion and gear are made of plain carbon steel 40C8 (Sut = 600 N/mm^2). The factor of safety can be taken as 1.5. Design the gears, specify the gear dimensions and suggest suitable surface hardness. **[12]**

Q9) a) Write short note on Hydro static bearing. **[5]**

b) A full journal bearing of 50 mm diameter and 100 mm long has bearing pressure of 1.4 N/mm^2. The speed of the journal is 900 r.p.m. and ratio of the journal diameter to the diametral clearance is 1000. The bearing is lubricated with oil whose absolute viscosity at operating temperature of 75ºC is 0.011 kg/m-s. The room temperature is 35ºC. Find:

i) Amount of artificial cooling required.

ii) Mass of the lubricating oil required.

if the difference between the outlet and inlet temperature of oil is 10ºC. Assume specific heat of oil as 1850 J/kg/ºC. **[12]**

Q10)a) What is the design procedure of rolling contact bearings for cyclic load and speed? **[8]**

b) What is the design procedure of spring subjected to fluctuating loads?**[8]**

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1660

[3865]-522
M.E. (Mechanical) (Mechatronics)
DRIVES AND ACTUATORS
(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answers to the two sections must be written on separate answer papers.***
2) ***Answer any two questions from each section.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain with neat sketch, the four quadrant chopper for variable speed drive of a dc motor. **[16]**

b) Explain slip power recovery (static scherbus) scheme for speed control of three phase Induction motor. **[9]**

Q2) a) Explain with suitable block diagram the various types of voltage source inverter controlled Induction motor drive. **[9]**

b) State the factors which governs the size and rating of the motor for any particular application and hence explain the following ratings of electrical motors. **[8]**

i) Continuous rating.

ii) Short time rating.

iii) Intermittent rating.

iv) Continuous maximum rating.

c) Describe various quadrant operations of DC drives. **[8]**

Q3) a) Explain driver circuit for stepper motor. Also write control algorithm. **[10]**

b) Explain Transfer and output characteristics of n-channel MOSFET. **[8]**

c) Explain following electric braking methods of Induction motor **[7]**

i) Regenerative.

ii) Plugging.

P.T.O.

SECTION - II

Q4) a) What is a synchronous motor? What are different types of synchronous motor? Explain any two type of synchronous motor. **[10]**

b) What is vector control with respect to induction motor. Explain basic principle of vector control. **[8]**

c) How is the step of a variable reluctance stepper motor controlled? **[7]**

Q5) a) A pressure difference is 2.1 psi occurs a constriction in 10 -cm- diameter pipe. The constriction constant is 0.008 m^3/s per $kPa^{1/2}$. Find **[8]**

i) the flow rate in m^3/s and

ii) the flow velocity in m/s.

b) Explain the selection criteria for valves. **[8]**

c) Explain the working principle and one practical example of smart actuators with a neat diagram. **[9]**

Q6) a) Write short notes on: **[18]**

i) Piston Actuators.

ii) VSI controlled induction motor drive.

iii) Solenoid valve.

b) Compare Electro hydraulic and Electric actuator with respect to advantages, disadvantages and applications. **[7]**

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Total No. of Questions : 8] **[Total No. of Pages : 3**

[3865] - 533

P1663

M.E. (Mechanical Engineering) (Automotive)

ADVANCED HYDRAULICS AND PNEUMATIC SYSTEMS

(2008 Course) (Elective - I) (502302 - C)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Name different components of a Hydraulic brake system. What are their functions? **[6]**

b) Oil of specific gravity 0.8 and kinematic viscosity 186 mm^2/s flows through a 300 m smooth pipe connecting two tanks where the surface level difference is 0.16 m. Ignoring losses other than pipe friction, determine the size of pipe necessary for a flow rate of 89 1/s. **[6]**

c) Discuss the effect of temperature on fluid properties. **[6]**

Q2) A fixed capacity pump supplies oil to a variable capacity motor which delivers a constant power output of 15 kW. **[16]**

The following data apply to the system

Pump capacity = 131 ml/rev

Pump speed = 1000 rev/min

Pump volumetric efficiency = 90%

Motor maximum capacity 82 ml/rev

Motor volumetric efficiency = 95%

Motor overall efficiency = 80%

Loss of pressure between pump and motor = 0.1 p, where p is the pump delivery pressure

Overall efficiency of the complete transmission system is 50%

Calculate:

The pump delivery pressure, The mechanical efficiency of the pump maximum output torque of the motor and the speed at which this torque is delivered.

P.T.O.

Q3) a) Explain, how Accumulator size is determined for different operating conditions? **[6]**

b) Compare characteristics of Gear, Vane and Piston pumps. **[6]**

c) What are the advantages of Cartridge valves? **[4]**

Q4) a) Explain any two applications of pneumatics in Automobiles. **[6]**

b) Explain constructional details of Hydraulic power unit with the help of a neat diagram. **[10]**

SECTION - II

Q5) a) What are the advantages of pilot operated systems? Explain any typical pilot operated pneumatic circuit. **[8]**

b) What are the different centre positions available in direction control valves used in hydraulics? Explain applications of such direction control valves with different centre positions. **[8]**

Q6) a) What is the difference between a back pressure sensor and a proximity sensor? **[4]**

b) What must be done to fluidic systems to insure that they will operate reliably? **[6]**

c) Using DeMorgan's theorem, Design a NOR circuit to generate the function: $Z = \overline{A} + \overline{B} + \overline{C}$. **[6]**

Q7) a) What is the importance of Performance characteristics of a flow control valve? Interpret the Performance curves of 3 different inline flow control valves given in figure no 1. **[6]**

b) Explain a typical set-up and procedure to test a pressure relief valve. **[8]**

c) Write in short on Hydraulic shock absorbers. **[4]**

Q8) a) A pneumatic system has two cylinders. The sequence of their operations is as follows: **[8]**

i) Cylinder 1 extends.
ii) Cylinder 2 extends.
iii) Cylinder 2 retracts.
iv) Cylinder 1 retracts.

Propose a pneumatic circuit to fulfill above requirements. Do not use solenoid operated valves.

b) Explain with the help of suitable circuits how Synchronizing movement of hydraulic rams is obtained. **[8]**

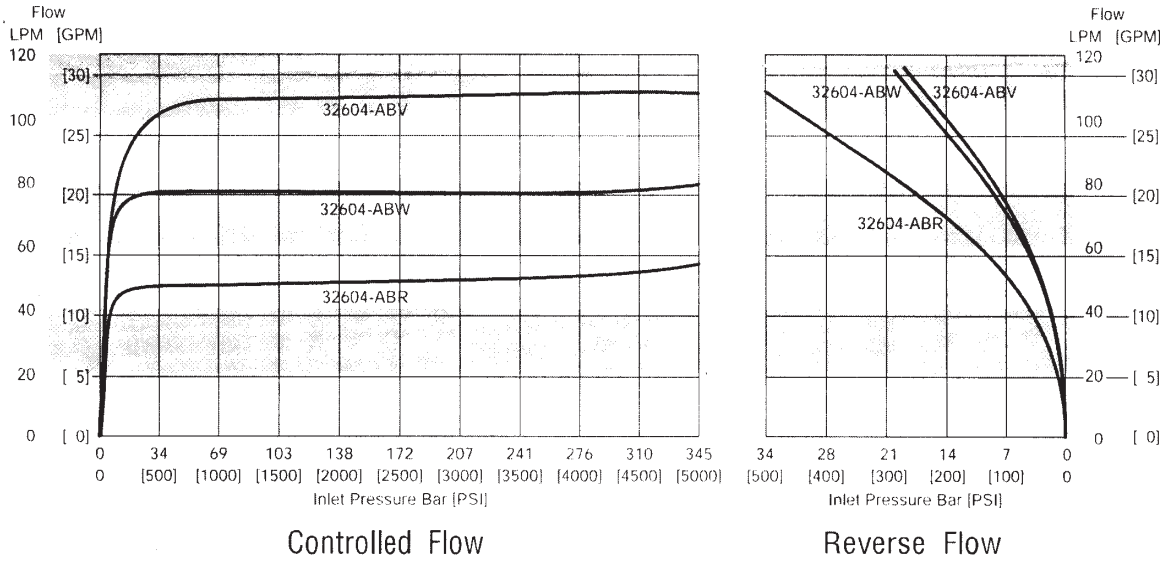

Figure No 1: Performance curves of Inline flow control valves

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1664

[3865]-543

M.E. (Electrical) (Control Systems)

COMPUTER AIDED CONTROL SYSTEM DESIGN

(2008 Course) (Elective - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables and electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain clearly the terms 'Absolute Stability' and 'Relative Stability'. Discuss the measures of relative stability using Bode plots. **[8]**

b) Derive the transfer function of a simple lag-lead compensating network. Draw the corresponding Bode diagrams. **[8]**

OR

Q2) a) Compare feedback compensation with cascade compensation. Under what conditions feedback compensation is preferred? **[4]**

b) A unity feedback control system has

$$G(s) = \frac{k}{s(1+0.1s)(1+0.25s)}$$

Design a suitable phase-lag or phase-lead compensator to have

i) Velocity error constant k_v = 5.0 sec^{-1}

ii) Phase margin ≥ 40°

Draw Bode diagrams of compensated and uncompensated system. **[12]**

P.T.O.

Q3) a) Describe the computer method for obtaining the polar plot of a typical linear control system. Draw the flow chart and write its algorithm. **[12]**

b) Explain clearly how to reshape this polar plot to obtain the desired performance. **[6]**

OR

Q4) a) Explain with algorithm the computer method for obtaining the root-locus plot of a linear closed-loop control system. Draw its flow chart. **[12]**

b) Explain how to reshape this root-locus plot to obtain desired response. **[6]**

Q5) a) Define singular point and discuss the different singular points in phase-plane method. **[6]**

b) Explain with illustration the phase-plane method for simulating the non-linear control system with 'Dead-Zone' as nonlinearity. How to obtain the time response from the phase trajectory? **[10]**

OR

Q6) a) Compare critically the 'Describing Function Method' and 'Phase-Plane Method' for the design of non-linear control system. **[6]**

b) Explain with algorithm the computer method for simulating the control system containing 'saturation' non-linearity using describing function method. How to determine the stability of non-linear control system using DF method? **[10]**

SECTION - II

Q7) a) Define and explain the concepts of controllability and observability of a control system. **[6]**

b) Outline the procedure to determine the controllability and observability using computer method. Give its algorithm. **[10]**

OR

Q8) a) Explain with example the relation between controllability, observability and pole-zero cancellation. **[6]**

b) Explain the computer method for obtaining the solution of state and output equations of a closed-loop system represented by **[10]**

$$\dot{x}(t) = \mathrm{A}x(t) + \mathrm{B}u(t)$$

$$y(t) = \mathrm{C}x(t)$$

with usual notations.

Q9) a) Draw the block diagram and explain the method of pole placement using linear state variable feedback. **[8]**

b) A linear control system is represented in state space form

$$\dot{x} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 6 & -11 & 6 \end{bmatrix} x + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$$

Design the linear state variable feedback to place the poles at desired locations S = –2, –3 and –4. **[10]**

OR

Q10) a) What is an observer? Draw the block diagram showing the structure of an observer system and explain the nature of the state estimation problem using full order observer. **[12]**

b) Explain the procedure for design of reduced order observer. **[6]**

Q11) a) Explain clearly the working of P, PI and PID controllers. **[8]**

b) Explain step by step the design procedure of tunable PID controller using Ziegler-Nichols Method. **[8]**

OR

Q12) a) Draw the block diagram of basic computer control scheme (Digital Control System) and explain the working of each block. **[8]**

b) A discrete-time control system is represented by the difference equation

$x(k + 1) = \mathrm{F}\, x(k) + \mathrm{G}\, u(k)$

Where k is the sampling instant; $x(k)$ is $n \times 1$ state vector; $u(k)$ is $m \times 1$ Control Vector; F and G are constant matrices of compatible dimensions. Give algorithm and explain the procedure for computer solution of closed-loop system response. **[8]**

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Total No. of Questions : 12] **[Total No. of Pages :2**

P1665

[3865]-551
M.E. (Electrical) Control System
INTELLIGENT CONTROL SYSTEM
(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Your answers will be valued as a whole.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is Neural Network? **[6]**

b) What are disadvantages of an Artificial Neural Network. **[4]**

c) Give the role of weight matrix in ANN in different learning methods. **[8]**

OR

Q2) a) Explain single layer Neural Network with one output and two input. **[6]**

b) What are the paradigms of Neural Network learning. **[6]**

c) Explain the perceptron learning rule. **[6]**

Q3) a) Draw a neat sketch for recurrent network. Write it's output function and hence explain delay and integer block with it's equation. **[10]**

b) Explain perceptron decision boundary and hence explain the role of bias and weight matrix. **[6]**

OR

Q4) a) Write the activation function for hamming classification if

$w_1 = \begin{bmatrix} 1 & -1 & -1 \\ 1 & 1 & -1 \end{bmatrix}$ $b_1 = \begin{bmatrix} 3 & 3 \end{bmatrix}$ $w_2 = \begin{bmatrix} 1 & -0.5 \\ -0.5 & 1 \end{bmatrix}$. The network is to recognize the component from the set of two.

The pattern supplied are **[12]**

P_1 = [0.61 -0.23 -0.56]
P_2 = [0.71 0.95 -0.51]
P_3 = [0.62 0.83 -0.47]
P_4 = [0.83 -0.59 -0.57]

P.T.O.

b) What is back-propagation algorithm? **[4]**

Q5) a) Explain classical ART network and discuss on stability and plasticity. **[8]**

b) What is BAM? Explain energy function of a BAM. **[8]**

OR

Q6) a) Write short note on Linear Vector Quantization. **[8]**

b) Explain the function of self organizing Map. **[8]**

SECTION - II

Q7) a) What are the characteristics of fuzzy systems? **[6]**

b) What are the role of α-cut in fuzzy set theory? **[6]**

c) Define the following: **[6]**

i) Equality of fuzzy set.

ii) Empty fuzzy set.

iii) Universal fuzzy set.

OR

Q8) a) Given A = $\{(x_1 , 0 . 1) , (x_2, 0.5) , (x_3 , 0.3)\}$ and

B = $\{(y_1, 0.3) , (y_2, 0.4)\}$ be the two fuzzy sets on the universe of discourse. X = $\{ x_1, x_2, x_3, \}$ and y = $\{y_1, y_2,\}$ respectively. Find the cartesian product of A and B. **[10]**

b) Explain the operation on the fuzzy relations. **[8]**

Q9) a) What are fuzzy implications? Explain with examples. **[8]**

b) What are linguistic variables? Explain with examples. **[8]**

OR

Q10) a) What are the various parts of fuzzy logic control system. **[8]**

b) What are the various defuzzification methods? Explain them. **[8]**

Q11) Apply Feed Forward Network approach to robot end effector positioning with camera-robot co-ordination. **[16]**

OR

Q12) Explain in detail fuzzy logic model for ' Air Conditioner Controller'. **[16]**

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1666

[3865]-556
M.E. (Electrical) (Power Systems)
POWER SYSTEM MODELLING
(2008 Course) (Semester - I) (503203)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections must be written on separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary and state clearly the same.***
5) ***Use of pocket electronic calculator is allowed.***

SECTION - I

Q1) a) Develop a mathematical model of a 3-phase, phase-shifting transformer. **[12]**

b) Determine the exact ABCD parameters for a 735 kV, 3-phase, 50Hz transmission line which is 500 km long. Assume that resistance/phase/km is $0.015\,\Omega$, serieo inductive reactance/phase/km is $0.5\,\Omega$ and shunt capacitive susceptance per phase per km is 7 micro siemens. Neglect shunt conductance. **[13]**

Q2) a) Derive the transfer function of a hydraulic turbine. State the assumptions made. **[12]**

b) Discuss the need for modelling of power system and its components. **[13]**

Q3) a) Develop a simplified model of a boiler. What assumptions are made in the simplifications. **[12]**

b) Draw the circuit diagram of a TCR and sketch the current waveform of a TCR. Obtain the circuit model for a TCR when the delay angle is α w.r.t. zero crossing of the line voltage. **[13]**

SECTION - II

Q4) a) A 2-pole, 3-phase, salient-pole synchronous machine has two damper windings, one along d-axis and the other along q-axis. Write down the machine equations in phase variables. Using Park's transformation, obtain the machine equations in dqo variables. **[20]**

P.T.O.

b) An alternator has the following data :-

$L_{aa} = (3.2 + 0.05 \cos 2\theta)\ m\text{H};$

$L_{ab} = -\left(1.6 + 0.05\cos\left(2\theta + \frac{\pi}{3}\right)\right) m\text{H};$

$L_{afd} = (40 \cos\theta)\ m\text{H};$

$L_{ffd} = 500\ m\text{H}.$

Determine the expressions for L_d and L_q. **[5]**

Q5) a) Write down the expressions for the flux linkages along *d* – and *q* – axes of a salient pole machine and then obtain an expression for the electromagnetic torque developed by the machine. **[12]**

b) A salient pole alternator is connected to the infinite bus and is operating in steady state with a load angle, δ. Draw the phasor diagram in *d*,*q* variables and obtain an expression for δ, in terms of *d*,*q* variables and machine parameters. **[13]**

Q6) Write short notes on the following :-

a) Model for a tap-changing transformer; **[8]**

b) Excitation control of alternator using a d.c. exciter; **[8]**

c) A model for transmission line of medium length. **[9]**

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1668

[3865]-563
M.E. (Electrical) (Power Systems)
HIGH VOLTAGE POWER TRANSMISSION
(Sem. - II) (2008 Course) (503210)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections must be written on separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary and state clearly the same.***
5) ***Use of pocket electronic calculator is allowed.***

SECTION - I

Q1) a) A 6 pulse, hvdc converter is operating with an overlap angle $\mu < 60°$. Carry out an analysis and obtain an expression for output current I_d in terms of source inductance, line voltage, overlap angle and delay angle. Draw the circuit diagram and a.c. line current waveform for a complete cycle. State the assumptions made in the analysis. **[13]**

b) The a.c. Line voltage of a 3-phase bridge inverter is 220 kV when the extinction angle is 20° and an overlap angle of 15°. Calculate the d.c. Voltage of the inverter. Calculate the necessary extinction angle to maintain the a.c. Line voltage at 220 kV. When the d.c. Voltage drops to 198 kV. Assume the overlap angle has increased by 4.3°. **[12]**

Q2) a) Describe the different types of multi-terminal HVDC systems proposed and explain advantages and disadvantages of such systems. **[15]**

b) Draw a schematic diagram of control of a hvdc system and discuss the complete control of a hvdc converter with their characteristics. **[10]**

Q3) Write short notes on the following:

a) Advantages of hvdc system over EHVAC system. **[8]**

b) A 12-pulse hvdc converter; **[9]**

c) Desirable features of hvdc converter control. **[8]**

P.T.O.

SECTION - II

Q4) a) The receiving end voltage (V_R), receiving end current (I_R), surge impedance (Z_O) and wave length (λ) of a loss-less, long transmission are known. Write down the differential equations for this transmission line and obtain the expressions for the voltage and current at any point on the transmission line. Interpret these equations in terms of standing waves at power frequency. **[15]**

b) State and explain the factors to be considered in the design of EHVAC transmission line. **[10]**

Q5) a) Determine the relative attenuation occuring in 5 cycles in the overvoltage surge set up on a 66 kV cable fed through an air-blast circuit breaker when the breaker opens on a system short-circuit .The breaker incorporates resistance switching. The network parameters are :– R = 7.8 Ω; L = 0.4 mH; and C = 0.0495 μF. **[10]**

b) A loss-less transmission line is on open-circuit. Using the travelling wave concept, discuss the step-response of such a transmission line. Explain how losses and attenuation will be included in a practical case. Sketch the step-response of the transmission line for a practical case. **[15]**

Q6) a) Using the concept of travelling waves, discuss the behaviour of a transmission line under **[12]**

i) Short-circuit conditions; and

ii) Conditions when the termination impedance is equal to Z_o.

b) Write a note on the following:

i) Bewley Lattice diagram; and **[6]**

ii) Methods of voltage control in HVAC transmission systems. **[7]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1669

[3865]-591

M.E. (E & T/C) (VLSI Embeded)

ASIC DESIGN AND MODELLING

(504184) (2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain ASIC Design flow in detail. List the different EDA tools used for ASIC Design. **[10]**

b) Draw the FSM state diagram for traffic light controller and write VHDL code for the same. Assume suitable data. **[8]**

Q2) a) Describe the various verification issues. **[8]**

b) What do you mean by synthesizable and nonsynthesizable statements in VHDL? Give two example of each type. **[8]**

Q3) a) Explain the various type of ASIC, what is importance of AISC cell library? **[8]**

b) Draw a stick diagram for 2-input AHD gate. Calculate area needed on chip. **[8]**

Q4) a) Explain the various type of simulation. **[8]**

b) Explain boundary scan in detail. What is BIST? **[8]**

P.T.O.

SECTION - II

Q5) a) Explain DFT in detail. How it can be categorized? Where it is useful? **[10]**

b) Discuss the power analysis. **[6]**

Q6) a) What is need of clock distribution and explain technique of clock distribution? **[8]**

b) Describe the floor planning in detail. **[8]**

Q7) a) What are the analog mixed signal design issues? **[8]**

b) Differentiate the testing and verification. **[8]**

Q8) Write short note on : **[18]**

a) Timing analysis.

b) DRC and ERC.

c) Automatic test pattern generation (ATPG).

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1670

[3865]-593
M.E. (E & TC) (VLSI & Embedded Systems)
MACHINE INTELLIGENCE
(2008 Course) (Elective - I) (504198)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer 3 questions from Section I and three questions from Section II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are basic learning laws? Explain how concept learning helps in learning? **[8]**

b) What is meant by gradient descent methods? Explain the difference between Method of steepest descent & Newton's method. **[8]**

Q2) a) What is the basis for Boltzmann learning law? Describe Boltzmann Machine. **[8]**

b) What is the Hopfield model of a neural network? Explain the difference between the discrete & continuous Hopfield models in terms of energy landscape & stable states. **[8]**

Q3) a) What is a self-organization network ? What are the salient features of the Kohonen's self-organizing learning algorithm? **[8]**

b) Describe adaptive neurofuzzy interface system? Discuss the ANFIS architecture for the sugeno fuzzy model. **[8]**

Q4) a) What are the components of a competitive learning network? Explain how a competitive learning network with linear units performs a short term memory task. **[10]**

b) What is the significance of 'resonance' in ART network? Explain the 'gain control' mechanism in ART. **[8]**

P.T.O.

SECTION - II

Q5) a) What are different inference mechanisms in Fuzzy rule based systems? Explain Mamdani inference mechanism. **[8]**

b) Let $x = [2, 5]$ & $y = [1, 6]$ with Fuzzy membership functions

$$\mu_x = \begin{cases} (x-2) & 2 \le x \le 3 \\ (5-x)/2 & 3 \le x \le 5 \end{cases}$$

$$\& \ \mu_y = \begin{cases} (y-1)/3 & 1 \le y \le 4 \\ (6-y)/2 & 4 \le x \le 6 \end{cases}$$

respectively. Compute each of the following operation to obtain $\overline{Z}$ & μZ

$Z = F(x, y) = x * y$ for $* \in \{+, -, \max, \min\}$ **[8]**

Q6) a) What are the Fuzzy relations? Explain the operations on the Fuzzy relations. **[8]**

b) Compute the following logical operations. **[8]**

i) If $\mu(a) = 0.9$ AND $\mu(a \Rightarrow b) = 0.2$ THEN $\mu(b) = ?$

ii) If $\mu(\overline{a}) = 0.8$ AND $\mu(a \Rightarrow b) = 0.8$ THEN $\mu(b) = ?$

Q7) a) What is soft computing? Describe the different soft computing characteristics. **[8]**

b) What are genetic algorithms? Describe major components of Genetic Algorithms. **[8]**

Q8) Write short notes on (any three) : **[18]**

a) K-means clustering Algorithm.

b) Fuzzy Filtered neural network.

c) Performance of computer Vs Biological Neural Networks.

d) Principle component networks.

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Total No. of Questions : 8] **[Total No. of Pages : 02**

P1671

[3865] - 600

M.E. (VLSI and Embedded System)

FAULT TOLERANT SYSTEM DESIGN

(2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain different modelling techniques used for testing of a digital system. **[10]**

b) Define wired logic mechanism. Explain in detail with diagram wired-AND logic and Bidirectionality. **[8]**

Q2) a) Write two RTL models for a negative edge triggered D - flip-flop. Model 1 doesnot allow accessing past values of signals and Model 2 removes this instruction. **[8]**

b) Brief in detail the general logic simulation process. Compare the benefits of simulation based design with respect to prototype based process. **[8]**

Q3) a) Write a short note on errors and faults. **[8]**

b) Define the terms:- **[8]**

i) Test evaluation
ii) Guide Probe Testing
iii) Fault diagnosis
iv) Test Generation

Q4) a) Define and explain in detail with timing diagram different delay models w.r.t. 2 input AND gate. **[10]**

b) What is unknown logic value. Show that the use of μ and $\overline{\mu}$ leads to incorrect results & comment on the results, for the Fig(1) shown below:- **[8]**

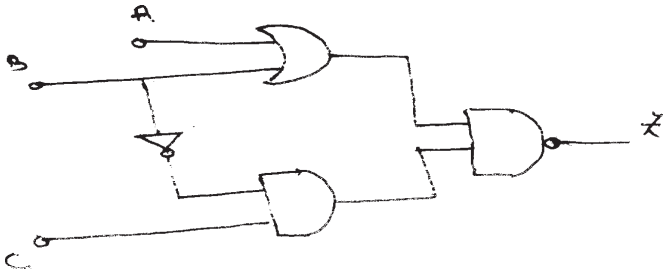

Fig-(1)

P.T.O.

SECTION - II

Q5) a) Define Detectability. Find the test vector that determine the OR bridging fault between input B and C for the Fig (2) shown below: **[8]**

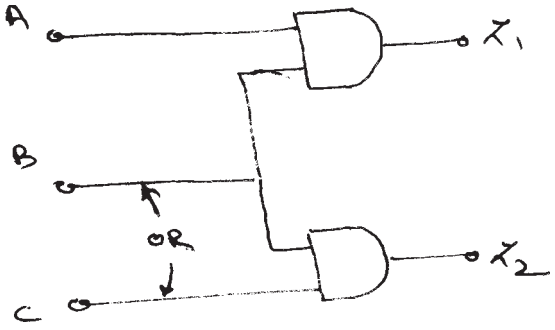

Fig - (2)

b) Explain with step by step process the procedure to test sequential circuit with and without faults. **[10]**

Q6) a) Differentiate between fault coverage and defect coverage. Explain 2 valued Deductive simulation to compute fault list of a AND gate. **[8]**

b) Compare Parallel and Concurrent simulation techniques w.r.t. following:- **[8]**

i) Speed
ii) Storage requirements
iii) Use of logic value
iv) Processing of delay models

Q7) a) What is Binary Decision diagram? Explain step by step process to draw Binary Decision diagram for a JK flip-flop **[8]**

b) Define and explain Controllability / Observability using scan based DFT technique method. **[8]**

Q8) a) With neat diagram explain in detail the compression technique which provides excellent fault and error coverage. **[8]**

b) List out the various functions carried out by BIST Controller. Draw and explain with neat diagram the Generic OFF-line BIST architecture. **[10]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1672

[3865]-616
M.E. (E & T/C) (Signal Processing)
VLSI IN SIGNAL PROCESSING
(2008 Course) (504509)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) For the DFG shown below find the Loop bound and Iteration bound. Explain LPM algorithm. **[10]**

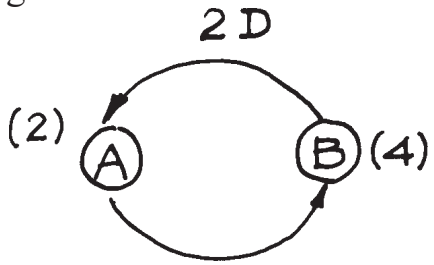

Fig. 1 (a)

b) Explain algorithm for constructing an equivalent SRDFG from a MRDFG. Give an example for the same. **[8]**

Q2) a) Consider the following recursive filter x(n) = a.x(n-2) + u(n). Pipeline this filter with two stages and redistribute the delay elements in the loop.**[8]**

b) Explain the advantages of Pipelining and Parallel processing on account of Power consumption and Justify the same. **[8]**

P.T.O.

Q3) a) Unfold the DFG given below with a factor of 3. **[8]**

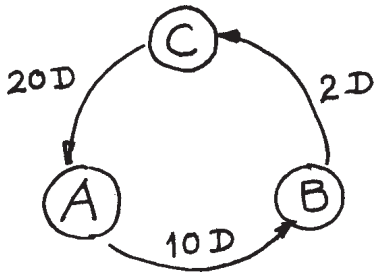

Fig. 3 (a)

b) Explain the properties of Unfolding. **[8]**

Q4) Write short notes on any TWO : **[16]**

a) Register minimization techniques.

b) Design B1 for FIR systolic arrays.

c) The Bellman Ford algorithm.

SECTION - II

Q5) a) Describe Bit Serial Multiplier using systolic Mappings. **[8]**

b) Explain the Parallel Carry save and Carry-ripple Array multipliers with sign bit extension. Draw Dependence Graph for each. **[10]**

Q6) a) With the help of neat diagrams explain architecture of any one FPGA. **[8]**

b) What are the issues related to Clock Distribution for SoC designs? Explain the trade offs for solving each. **[8]**

Q7) a) Explain how floating point arithmetic is implemented on FPGAs. **[8]**

b) Explain the applications of DCM available on FPGAs. **[8]**

Q8) Write short notes on any TWO : **[16]**

a) Features available on latest FPGA.

b) VLSI Design flow.

c) Retiming Techniques.

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1672

[3865]-616
M.E. (E&T/C) (Signal Processing)
VLC IN SIGNAL PROCESSING
(2008 Courses)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) For the DFG shown below find the bound and Interation bound. Explain LPM algorithm. **[10]**

b) Explain algorithm for constructing an equivalent SRDFG from a MRDFG. Give an example for the same. **[8]**

Q2) a) Consider the following recursive filter x (n) = a.x (n-2) + u (n). Pipeline this filter with two stages and redistribute the delay elements in the loop. **[8]**

b) Explain the advantages of Pipilining and parallel processing on account of Power consumption and Justify the same. **[8]**

Q3) a) Unfold the DFG given below with a factor of 3 **[8]**

P.T.O.

b) Explain the properties of Unfolding. **[8]**

Q4) Write a short notes on any TWO:

a) Register minimization techniques.

b) Design B 1 for FIR systolic arrays.

c) The Bellman ford algorithm.

SECTION - II

Q5) a) Describe Bit Serial Multiplier using systolic Mappings. **[8]**

b) Explain the Parallel Carry save and Carry-ripple Array multipliers with sign bit extension. Draw Dependence Graph for each. **[10]**

Q6) a) With the help of neat diagrams explain architecture of any one FPGA. **[8]**

b) What are the issues related to Clock Distribution for SoC designs? Explain the trade offs for solving each. **[8]**

Q7) a) Explain how floating point arithmetic is implemented of FPGAs. **[8]**

b) Explain the applications of DCM available on FPGAs.

Q8) Write short notes on any TWO:

a) Features available on latest FPGA.

b) VLSI Design flow.

c) Retiming Techniques.

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Total No. of Questions : 6] **[Total No. of Pages : 3**

P1673

[3865]-624
M.E. (Electronics - Digital Systems)
SIGNAL PROCESSING ARCHITECTURES
(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer papers.***
2) ***Q1 from section I and Q4 from section II is compulsory.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) A) Select the right answer from the given multiple choices. **[18]**

a) The transfer function of FIR filter is

i) $y[n]=\frac{1}{M}\sum_{k=0}^{M} b_k z^{-k}$ ii) $y[n]=\frac{1}{M}\sum_{k=-\infty}^{\infty} b_k z^{-k}$

iii) $y[n]=\sum_{k=0}^{M} b_k z^{-k}$ iv) $y[n]=\sum_{k=-\infty}^{\infty} b_k z^{-k}$

b) The linear convolution of $x[n]$ = {-1, 2, 3} and $h[n]$ = {0.2, 1,4} is

i) {-0.2, -0.6, 1.3, 10, 1, 2} ii) {-0.2, -0.6, 1.4, 10, 1, 2}

iii) {-0.2, -0.6, 1.4, 11, 1, 2} iv) {-0.2, -0.6, 1.4, 13, 1, 2}

c) The correlation of sequence $x[n]$ = {-1, 4, 5, 6} is

i) {-6, 19, 46, 78, 46, 19, -6} ii) {-6, 19, 46, 78, 46, 19, 6}

iii) {-6, 19, 45, 87, 45, 19, 6} iv) {-6, 19, 46, 78, 46, 19, -6}

d) A digital filter structure is said to be canonic if the number of delays in the block diagram representation is _____ to the order of the transfer function.

i) $\leq$ ii) $=$

iii) $\geq$ iv) $\neq$

e) An M-point moving average filter is defined as

i) $y[n]=\frac{1}{M}\sum_{k=0}^{M-1}x[n-k]$ ii) $y[n]=\frac{1}{M}\sum_{k=1}^{M-1}x[n-k]$

iii) $y[n]=\sum_{k=0}^{M-1}x[n-k]$ iv) $y[n]=\frac{1}{M}\sum_{k=-\infty}^{\infty}x[n-k]$

f) The circular convolution is an _____ version of the linear convolution.

i) shifted ii) advanced

iii) delayed iv) Aliased

g) The samples in the frequency domain are spaced by

i) $\Delta f = 1/N$ ii) $\Delta f = 1/Fs$

iii) $\Delta f = 1/f$ iv) $\Delta f = 1/\omega$

h) The FFT computation requires _____ number of stages

i) logN ii) $\log_{10}N$

iii) $\log_2 N$ iv) $\log N^2$

i) The up-sampler and the down-sampler are _____ discrete-time systems.

i) linear but time-varying ii) linear but time-invarying

iii) non-linear but time-invarying iv) non-linear but time-varying

B) Explain frequency sampling technique for FIR filter design. **[7]**

Q2) a) Prove that radix-2 DIT FFT algorithm is computationally efficient as compared to simple DFT computation. **[10]**

b) How multirate systems are described using dataflow graphs. **[8]**

c) Compare FIR and IIR filters. **[7]**

OR

Q3) a) Determine 8 point.FFT using DIF, radix-2 algorithm of
$x[n] = \{0.5, 0.5, 0.5, 0.5\}$ **[9]**

b) What is the need of multirate DSP? Explain two examples of multirate DSP in detail. **[8]**

c) Write short note on : **[8]**

i) Fast linear cross-correlation.

ii) Discrete Wavelet transform.

SECTION - II

Q4) a) Deign band pass filter using Kaiser window with following specification. **[9]**

Minimum attenuation for $0 \le \omega \le 100 : 45\,db$

Pass band ripple for $200 \le \omega < 500 : 0.2\,db$

Minimum attenuation for $600 \le \omega \le 8000 : 45\,db$

Sampling frequency = 2000 rad/sec.

b) What are important features of TMS320C67XX DSP processor? Draw and explain the block diagram of TMS320C67XX. **[8]**

c) Explain how linear convolution can be implemented on DSP processor with necessary logic and flow chart. **[8]**

Q5) a) Explain real time implementation considerations with respect to **[9]**

i) Signal converters

ii) Stream processing

iii) Block processing

b) Discuss tools used in implementation of DSP algorithms. **[8]**

c) With respect to DSP processors explain how MAC and barrel shifter are important. **[8]**

OR

Q6) a) Explain the architecture of Blacfin processor. **[7]**

b) Write short notes on : **[18]**

i) Quadrature mirror filter.

ii) DTMF generation.

iii) Important features of TMS320C54XX.

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Total No. of Questions : 10] **[Total No. of Pages : 2**

P1676

[3865]-642
M.E. (Production Engg.)
ADVANCE MANUFACTURING PROCESSES
(Revised 2008 Course) (511103)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use non-programmable electronic calculators is allowed.***

SECTION - I

Q1) a) What are the inspection tests for detecting the defects in casting process? Explain in brief. **[10]**

b) Determine the solidification time of a slab shaped iron casting 10 mm thick when poured, with no superheats, into sand moulds at the initial temperature 28ºC. **[6]**

Given data : for Iron $\theta_f = 1540\ 0c$, $L = 272kJ/kg$, $\rho_m = 7850kg/m^3$, and for sand C =1.17kJ/kg-K, k = 0.8655 W/m-K, ρ = 1600 kg/m^3.

Q2) a) Explain the process of mold filling. Also state the mold filling defects. **[8]**

b) What are the controlling parameters in Fusion welding? Explain the effect of these parameters on welded joint? **[8]**

Q3) a) Explain destructive testing in welding. **[8]**

b) Explain the types of metal transfer in fusion welding. **[8]**

Q4) a) Explain with suitable sketch the different feeding arrangements for ultrasonic machining unit. **[8]**

b) How the process of Electro Chemical Machining takes place? Give the applications and limitations of ECM. **[8]**

P.T.O.

Q5) Write short note on following (Any three) : **[18]**

a) Weld pool characteristics.

b) Vacuum coating.

c) Nano-technology.

d) Gating design.

e) Mechanism of Laser beam machining.

SECTION - II

Q6) a) Explain upper bound analysis in material forming. **[8]**

b) Explain the strain rate and effect of temperature in material forming. **[8]**

Q7) a) How the explosive forming is carried out? State the applications of the same. **[8]**

b) Explain the process of High speed hot forging. **[8]**

Q8) a) Explain the characteristic features of high velocity extrusion process. **[8]**

b) Explain the process of High speed hot forging. **[8]**

Q9) a) Define formability. How it affects the sheet metal forming operation? Explain in brief. **[8]**

b) Explain sheet bending operation with controllable parameters. **[8]**

Q10) Write short notes on (Any three) : **[18]**

a) Fine Blanking.

b) Electromagnetic Forming.

c) Plastic instability in material forming.

d) Slip line Field Theory.

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Total No. of Questions : 12] **[Total No. of Pages : 3**

P1677

[3865]-646

M.E. (Production)

ADVANCE MACHINE TOOL DESIGN

(511104) (Revised Course 2008) (Elective - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Attempt one question from each UNIT of Section-I and Section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non-programmable electronic pocket calculator and statistical tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

UNIT - I

Q1) a) Explain in brief the concept of high speed machining in machine tools. **[8]**

b) Deduce the expression for power in milling machine and show diagrammatically the forces acting on milling cutter during machining. **[10]**

OR

Q2) a) What is meant by building block concept in machine tool design? **[6]**

b) What are the distinctive features of machining and turning centers? Why are they so versatile? **[6]**

c) Illustrate with a neat sketch the kinematic structure of a pillar type drilling machine. **[6]**

UNIT - II

Q3) a) Explain why is the stiffness of machine tool important during machining. **[8]**

b) Discuss in detail the design procedure of machine tool housing. **[8]**

OR

P.T.O.

Q4) a) What is the function of spindle unit of a machine tool? Discuss the importance of following elements in spindle design : **[8]**

i) Diameter of front journal bearing.

ii) Additional spindle support.

iii) Location of bearing and drive element.

iv) Balancing.

b) Explain with neat sketches the methods of preloading a ball screw. **[8]**

UNIT - III

Q5) a) What is meant by regenerative chatter? Explain it with reference to any one type of machine tool. **[8]**

b) What do you understand by hydraulic power pack in machine tool? Explain the factors used for selecting fluids for hydraulic system. **[8]**

OR

Q6) a) A six speed gear box is to be designed for the minimum speed of 90 rpm and maximum speed of 1000 rpm. It is to be driven by an induction motor rotating at 1440 rpm. Draw best structural diagram, optimum ray diagram and gear box layout. **[10]**

b) With the help of schematic diagram explain the working principle of any one type of electrical control system incorporated in machine tool. **[6]**

SECTION - II

UNIT - IV

Q7) a) How does a 180° rotation tool changer work? How does a pivot insertion tool changer work in CNC machine? **[8]**

b) What procedure is used by the operator to determine the tool length offsets? **[8]**

OR

Q8) a) Compare CNC machine tool and conventional machine tool with respect to : **[8]**

i) Accuracy.

ii) Rigidity.

iii) Productivity.

iv) Economy.

b) Explain with neat sketches the five basic types of tool changers. **[8]**

UNIT - V

Q9) a) Why is damping of machine tools important? How is it accomplished? **[8]**

b) Explain with suitable example dynamic characteristic of the cutting process. **[10]**

OR

Q10) a) What do you understand by stick-slip motion in machine tool? Explain with a suitable example. **[8]**

b) With suitable sketches explain the procedure followed in performing acceptance tests on milling machine. **[10]**

UNIT - VI

Q11) a) Discuss in detail modern trends in design of machine tools. **[8]**

b) Enumerate the different CAD techniques applied in design of machine tool structures. **[8]**

OR

Q12) a) Explain with a suitable example the importance of aesthetics in machine tool design. **[8]**

b) Discuss the role of ergonomics in manufacturing of machine tools. **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1681

[3865]-665

M.E. (Computer)

ADVANCED SOFTWARE ENGINEERING

(Elective - I) (510104 A) (2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***

SECTION - I

Q1) a) What are the differences between generic software product development & custom software development? **[3]**

b) What is the difference between software process model & software processes. Suggest two ways in which a software process model might be helpful identifying possible process improvements. **[6]**

c) What are essential characteristics of socio-technical systems? **[3]**

d) Explain the term 'systems engineering'. With example also explain role of software engineers in systems engineering. **[6]**

Q2) a) Explain main three categories of critical systems. **[4]**

b) i) Explain the term availability & reliability.

ii) Give one example system where availability is more important than reliability.

iii) Give one example system where reliability is more important than availability.

[8]

c) In computer security context explain the difference between an attack & a threat. **[2]**

d) Explain the term 'functional requirements' & 'non functional requirements'. **[2]**

P.T.O.

Q3) a) Explain with block diagram the requirement engineering process. **[6]**

b) Based on your experience with a bank ATM, draw a data-flow diagram modelling the data processing involved when a customer withdraws cash from the machine. **[6]**

c) Write suitable scope statement for library information system & draw sequence diagram. **[4]**

Q4) a) Model the object/classes that might be used in an e-mail system & describe the similarities & differences between the data processing model & the object model. **[6]**

b) Suggest why the architectural design of a system should be precede the development of a formal specification. **[4]**

c) Explain the client-server model with architecture perspective. **[6]**

SECTION - II

Q5) a) Testing often consumes more resources than any other phase in software development. Describe three major factors that make testing so expensive. **[6]**

b) Can a program be correct and still not exhibit good quality? Explain. **[4]**

c) What is configuration management? Why is it important? **[6]**

Q6) a) With neat diagram explain the cleanroom process model. **[8]**

b) Explain any two agile process model. **[8]**

Q7) a) Describe the difference between process and product metrics. **[4]**

b) What are the different risk components? Explain them in brief. **[4]**

c) Suggest some ways to detect software errors when implementation is not complete. **[4]**

d) Explain in brief types of software maintenance. **[4]**

Q8) Write short notes on : **[18]**

a) Formal methods.

b) Software process improvement.

c) COCOMO model.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1683 **[3865]-687**

M.E. (Computer)
ADVANCED SOFTWARE ENGINEERING
(Computer Networking)
(2008 Course) (510310) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***

SECTION - I

Q1) a) Explain the following terms related to safety critical systems. **[6]**

i) Accident. ii) Hazard. iii) Damage.

iv) Hazard severity. v) Hazard probability. vi) Risk.

b) Explain the meaning of 'Business processes' with example. **[4]**

c) Define reliability. Explain three complementary approaches that are used to improve reliability of system. **[6]**

Q2) Explain in detail following distributed object architectures (DOA). **[18]**

a) CORBA.

b) Service Oriented Architecture.

With suitable example compare client server approach with DOA.

Q3) a) Explain waterfall model. Compare it with prototyping & explain how both are accommodated in the spiral process model. **[10]**

b) What are the five components of design method? Take any method & describe its components. **[6]**

Q4) Write short notes: **[16]**

a) User interface design.

b) Requirements engineering.

P.T.O.

SECTION - II

Q5) a) With a suitable example explain how to find cyclomatic complexity? **[8]**

b) Explain how software cost estimation is done? **[8]**

Q6) a) What is Extreme Programming? Explain. **[8]**

b) What is meant by formal methods? Why formal methods have not been widely used? **[8]**

Q7) a) Explain software process improvement. **[8]**

b) Explain in detail Risk management. **[8]**

Q8) Write short notes on: **[18]**

a) Critical system validation.

b) Adaptive software development.

c) Object constraint language.

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Total No. of Questions : 8] **[Total No. of Pages : 03**

P1685

[3865] - 709

M.E. (Chemical)

MATHEMATICAL METHODS IN CHEMICAL ENGINEERING

(New 2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Attempt any three out of four from each section.***
2) ***Assume suitable data, wherever necessary.***

SECTION - I

Q1) a) Find eigen values and eigen vectors of a matrix. **[8]**

i) $\begin{bmatrix} 3 & 0 & 0 \\ 5 & 4 & 0 \\ 3 & 6 & 1 \end{bmatrix}$

ii) $\begin{bmatrix} -1 & 2 \\ 1 & -2 \end{bmatrix}$

b) Use Gauss seidal method to solve **[6]**

$20.9\,x_1 + 1.2x_2 + 2.1\,x_3 + 0.9\,x_4 = 21.7$

$1.2\,x_1 + 21.2x_2 + 1.5x_3 + 2.5\,x_4 = 27.46$

$2.1\,x_1 + 1.5\,x_2 + 19.8\,x_3 + 1.3\,x_4 = 28.76$

$0.9\,x_1 + 2.5\,x_2 + 1.3\,x_3 + 32.1\,x_4 = 49.72$

c) What are Sources of error in numerical methods? Explain each in brief by using suitable example. **[4]**

Q2) a) Use Gauss elimination to solve **[4]**

$4x_1 + x_2 - x_3 = -2$

$5x_1 + x_2 + 2x_3 = 4$

$6x_1 + x_2 + x_3 = 6$

P.T.O.

b) Use the multiple equation Newton Raphson method to determine roots of following eq^n. Note that a correct pair of roots is $x = 2$ and $y = 3$. Initiate computation with guesses of $x = 1.5$ and $y = 3.5$ **[6]**

$$u(x, y) = x^2 + xy - 10 = 0$$
$$v(x, y) = y + 3xy^2 - 57 = 0.$$

c) Use fixed point iteration to determine the roots of equations in example *Q.2)* b). Note that a correct pair of roots is $x = 2$ and $y = 3$. Initiate the computation with guesses of $x = 1.5$ and $y = 3.5$. **[6]**

Q3) a) Write the properties of tensor (At least five). **[6]**

b) What is **[10]**

i) Scalar product of two tensors

ii) Tensor product of two tensors.

iii) Vector product of a tensor with vector.

iv) Tensor Product of a tensor with a vector.

v) Divergence of a tensor field.

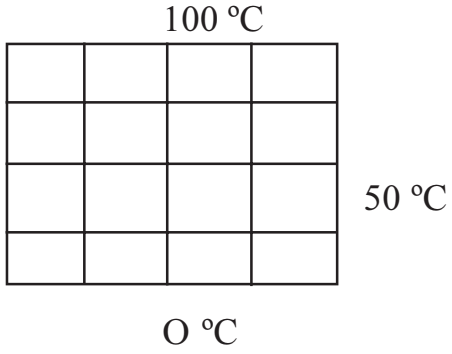
Q4) a) What do you mean by phase portrait? Explain in brief with suitable diagram. **[4]**

b) What are various five types of critical points? Explain each in brief with suitable diagram. **[8]**

c) Write short note of Green's Theorem. **[4]**

SECTION - II

Q5) Use Liebmann's method (Gauss Seidal) to solve for the temp. Distribution of the heated plate as shown in the following figure. Note that left edge of the plate is insulated. Use only one iteration. **[18]**



Q6) Use explicit method to solve for the temp. distribution of a long, thin rod with a length of 10 cm and following values K' = 0.49 cal/s.cm.c, $\Delta x = 2$ cm and $\Delta t = 0.1$ sec. At t = 0 the temp. of the rod is zero and boundary conditions are fixed for all the times at T(0) = 100°C and T(10) = 50°C. Note that the rod is of aluminium with C=0.2174 Cal/g°C and $\rho = 2.7 g / cm^3$. Therefore $K = 0.49 / (2.7 \times 0.2174) = 0.835$ cm^2/s and $\lambda = 0.020875$.

Do only of three iterations. **[16]**

Q7) Employ following equation to develop the element equations for a 10 cm rod with boundary conditions of T(0, t) = 40 and T(0, t) = 200 and a uniform heat source of f(x) = 10. Employ four equal size elements of length = 2.5cm. **[16]**

$$\underbrace{\frac{1}{x_2 - x_1}\begin{Bmatrix} 1 & -1 \\ -1 & 1 \end{Bmatrix}\{T\}}_{\text{element stiffness matrix}} = \underbrace{\begin{Bmatrix} \dfrac{-DT(x_1)}{dx} \\ \dfrac{DT(x_2)}{dx} \end{Bmatrix}}_{\text{Boundary Condition}} + \underbrace{\begin{Bmatrix} \int_{x_1}^{x_2} f(x)\, N_1(x)\, dx \\ \int_{x_1}^{x_2} f(x)\, N_2(x)\, dx \end{Bmatrix}}_{\text{External effects}}$$

Q8) Write short note on **[16]**

a) Applications of portial differential equations in chemical engineering.

b) Singular and regular Perturbation.

c) Stochastic simulation techniques.

d) Boundary conditions applied in portial differential eq^{n}s such as derivative fixed etc.

Total No. of Questions : 8] **[Total No. of Pages : 3**

P1686

[3865]-733
M.E. (Petroleum Engineering)
HORIZONTAL MULTILATERAL AND INTELLIGENT WELLS
(New) (2008 Course) (512103)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Question numbers One and Five are compulsory. Out of the remaining solve 2 questions from Section I and 2 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts and electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss casing depth selection procedure considering, differential sticking point & kick tolerance aspect, in detail. **[10]**

b) Calculate burst load on 13-3/8" casing shoe depth at 9750 ft., while cement displacement **[4]**

Data given as,

Mud weight = 11 ppg., 5000 ft. of 16 ppg cement, 2000 ft. of 13 ppg. spacer.

c) Calculate burst pressure on 9-5/8" casing. **[4]**

Data given as :

Casing shoe depth = 2500 m, mud weight = 1.3 gm/cc, formation fracture gradient = 1.5 gm/cc, formation fracture gradient depth of next phase i.e 2500 m = 2.20 gm/cc.

Q2) Explain geometrical planning of type-II profile and find the measured depth of a well for the following data. **[16]**

Horizontal displacement = 6000 ft., Target depth TVD = 12000 ft.
TVD kop = 1500 ft., Build up rate = 2° per 100 ft.
Drop off rate = 1.5° per 100 ft., TVD at end of drop off = 11000 ft.
Final inclination = 20°.

P.T.O.

Q3) a) Write function and working of different sensors used in LWD tool. **[8]**

b) A drill string consist of 600 ft. of 8.25" × 2-13/16' drill collar & rest 5" drillpipe of 19.5 ppf grade- ×95. If required MOP is, 100,000 lb and mud weight is, 10 ppg. **[8]**

Calculate maximum depth of hole that can be drilled when,

i) Using, new drill pipe, P_t = 501,090 lb.

ii) Using, class 2 drill pipe having, yield strength, P_t = 394,000 lb, steel density = 489.5 ppf, Buoyancy factor = 0.847.

Q4) a) Discuss different types of multilateral wells and their completion technique. **[8]**

b) Radius of the build up curve is 1045 ft, **[8]**
Horizontal section = 1500 ft,
WOB = 31000 lbs,
Mud weight = 9.2 ppg,
BHA–HWDP weight = 50 ppf,
O.D. of the tool joint = 6.5",
Buoyancy factor = 0.86.
Calculate torque & drag while drilling.

SECTION - II

Q5) a) Calculate no. of sacks, water required for gel slurry & tail slurry for 13-3/8" casing cementation job, if rise of cement is 600 m from bottom; height of gel slurry is 200 m and tail slurry is 400 m. Distance between float shoe and float collar is 25 m. **[9]**

Data given :

Capacity 17.5" hole × 13-3/8" casing = 0.1237 bbls/ft,
Capacity of 13-3/8" casing = 0.1521 bbls/ft,
Gel slurry yield = 1.66 cuft/sack,
Water requirement 8.77gal/sack,
Tail slurry = 1.15 cuft/sack,
Water requirement 5 gal/sack.

b) A slurry weighing 15.6 ppg. Calculate percentage of water if slurry contains 10% salt. Absolute volume of salt = 0.0394 gal. One sack of class G cement weight = 94 lbs., absolute volume is 3.60 gallons and water weight = 8.33 ppg. **[6]**

c) Discuss data required for cement slurry design. **[3]**

Q6) Write short notes on : **[16]**

a) Under balance drilling.

b) Coil tubing drilling.

Q7) a) Discuss radius of curvature method in detail. Find increment in TVD, increment in north, increment in east. Use following data. **[10]**

Measured depth	**Inclination**	**Azimuth**
2000m	2.0	45
2090m	4.5	50

b) Write short note on intelligent wells. **[6]**

Q8) a) For a following data of a wellbore, find, **[8]**

i) Original mud weight.

ii) Nozzle size.

Hole depth = 2350 m,
Pump pressure = 2220 psi,
Flow rate = 600 gpm,
ECD = 11 ppg,
Bit nozzle pressure drop = 1032 psi,
Annular pressure loss = 44.3 psi.

b) Discuss different pressure losses in circulation system with suitable sketch. **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1687

[3865]-739
M.E. (Petroleum)
WELL DESIGN AND ENGINEERING
(2008 New Course) (Elective - II (b)) (512105)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Q.No.1 and Q.No.5 are compulsory. Out of the remaining attempt two questions from Section - I and two questions from Section - II***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of Mollier charts, non-programmable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) What are the different types of casings? Explain casing design considerations along with equations and discuss the method to determine, 'casing seat position' for a well in brief. Draw a typical pressure Vs depth graph and show formation pressure, mud pressure, fracture pressure along with casing seat for number of casing strings. Indicate all the features of this diagram. **[18]**

Q2) a) What is well planning? Describe Geo-Technical Order? How it is different for exploratory and development well? Explain in brief, how will you obtain or calculate various parameters required for it. **[10]**

b) Discuss in brief DST. **[6]**

Q3) a) Draw a typical layout for an offshore drilling rig. Indicate various features and explain important aspects from the point of safety and highest operational efficiency. **[10]**

b) What is the basis for design of a typical well completion program? Explain. **[6]**

Q4) Write a short note on : **[16]**

a) Types of Drilling fluids Bit design.

b) Merits of horizontal wells.

c) Rig components.

d) Cementation equipments.

P.T.O.

SECTION - II

Q5) a) Describe various factors to be considered in drilling cost estimation and explain AFE preparation in brief. **[10]**

b) Explain and draw the generic nature of following graphs. **[8]**

i) Depth Vs Penetration rate.
ii) Depth Vs Cumulative drilling time.
iii) Depth Vs trip time.

Q6) a) What are the different types of BHA's? Draw the schematic sketch and explain the principle of each. Also explain variation of torque and drag forces applicable to these BHA's. **[10]**

b) List various reservoir parameters to be considered in the selection of various well geometries. Explain one in detail. **[6]**

Q7) Write short note on : **[16]**

a) Types of directional wells.

b) Window cutting operation.

c) Mud hydraulics.

d) Well control.

Q8) Discuss in detail any one case study pertaining to well planning of multilateral well. Explain various factors to be considered, in the design and planning of this well. Write various equations and show graphs to justify the design.**[16]**

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Total No. of Questions : 6] **[Total No. of Pages : 3**

P1689

[3865] - 744

M.E. (Petroleum Engineering)

ADVANCED NATURAL GAS ENGINEERING

(2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Answer two questions from each section.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of a non-programmable calculator is allowed.***
6) ***Assume suitable data if necessary and clearly state it.***

SECTION - I

Q1) Explain the PT diagram for a gas reservoir. Explain how Bg, cg, μg vary with pressure. **[25]**

OR

Following surface conditions are given:

a) API gravity of condensate = 52
b) GOR in the first separator = 20,000 scf/stb
c) Pressure in the first separator = 550 psi.
d) Temperature in the first separator = 90 deg F
e) Specific gravity of gas in the first separator = 0.7

Calculate the wellstream specific gravity, and critical properties of gas.

Q2) Derive the pipe line flow equation.

OR

The following data are provided for air-water flow. Estimate the slip and no-slip mixture properties. Estimate the gravitational and frictional pressure gradients using both slip and no-slip properties **[25]**

a) Ql = 0.1 ft3/sec
b) Qg = 0.2 ft3/sec
c) Rho-l = 62.4 lbs/ft3
d) Rho-g = 1.5 lbs / ft3
e) Mu-1 = 1 cp
f) Mu-g = 0.015 cp
g) D = 3.5 inches
h) Hl = 0.45
i) Theta = 90 degrees
j) Roughness = 0.00006 ft

P.T.O.

Q3) Explain centrifugal compressors.

Explain how any one of the design formulas is obtained.

OR

Natural gas with the following properties and conditions is to be compressed by a centrifugal compressor

a) Gamma-g = 0.62

b) Ps = 256 psia

c) Pd = 665 psia

d) k = 1.26

e) ts = 99 deg F

If the desired flow rate is 45 MMSCFD, what horsepower is required to compress the gas assuming 75% adiabatic efficiency and 95% mechanical efficiency? **[25]**

SECTION - II

Q4) Explain phase behaviour of a gas reservoir and material balance equation.

OR

For water drive reservoirs (with no water production at the wells), derive the following equation

P/Z = (Pi/Zi) [(1-(Gp/Gi)] / [(1-(WeBw/GiBgi))] **[25]**

Q5) Draw a process flow diagram to show two methods how CO_2 is removed from a natural gas stream.

OR

Draw and explain process flow sheet for H_2O removal. **[25]**

Q6) Derive the equation used to calculate flow rate in a orifice meter. Explain all the constants.

OR

Following data were provided for a multi-rate isochronal test. Generate inflow performance relationship using the analytical m(p) method and the empirical m(p) method. **[25]**

a) Pr = 352.4 psia

b) M(p) = m(Pr) = 9.9714 x 10 ^6 psia^2/cp

Time (hours)	Qg (MMSCF/D)	Pwf (psia)	M(pwf)
0.5	0.983	344.7	9.6386 x 10^6
0.5	2.631	329.5	9.0027 x 10^6
0.5	3.654	318.7	8.5674 x 10^6
0.5	4.782	305.5	8.0534 x 10^6
1	0.977	342.4	9.5406 x 10^6
1	2.588	322.9	8.7351 x 10^6
1	3.565	309.5	8.2071 x 10^6
1	4.625	293.6	7.6136 x 10^6
2	0.97	339.5	9.4179 x 10^6
2	2.533	315.4	8.4371 x 10^6
2	3.453	298.6	7.7922 x 10^6
2	4.438	279.6	7.0990 x 10^6
3	0.965	337.6	9.3381 x 10^6
3	2.5	310.5	8.2458 x 10^6
3	3.39	291.9	7.5435 x 10^6
3	4.318	270.5	6.7797 x 10^6

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1690

[3865]-754
M.E. (Information Technology)
ADVANCED OPERATING SYSTEMS
(Revised 2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***

SECTION - I

Q1) a) What are the factors influencing block size selection in a DSM system? What are the advantages of using the page size as the block size in a DSM system? **[8]**

b) Explain any two address space transfer mechanisms which are suitable for a process migration facility with high performance and high reliability goals. **[8]**

Q2) a) What is the primary motivation behind the development of a light weight RPC system? Describe the four techniques used in a LRPC system that makes it more efficient than a conventional RPC system. **[8]**

b) Describe the implementation of logical clocks using : **[8]**

i) Counters.
ii) Physical clocks.

Q3) a) What is a stub? How are stubs generated? Explain how the use of stubs helps in making an RPC mechanism transparent. **[8]**

b) Explain the desirable features of a good message passing system. **[8]**

Q4) a) Explain in detail the design issues of a distributed operating system. **[10]**

b) Describe four distributed computing system models with the help of neat diagrams. **[8]**

P.T.O.

SECTION - II

Q5) a) A system uses the preemption method for deadlock prevention. Suppose the system currently has five transactions T_1, T_2, T_3, T_4 and T_5, their timestamp values being t_1, t_2, t_3, t_4 and t_5, respectively ($t_1 > t_2 > t_3 > t_4 > t_5$). Explain what happens if : **[8]**

i) The system uses the wait-die scheme and T_2 requests for resource held by T_5.

ii) The system uses the wait-die scheme and T_4 requests for resource held by T_1.

iii) The system uses the wait-wound scheme and T_3 requests for resource held by T_4.

iv) The system uses the wait-wound scheme and T_5 requests for resource held by T_2.

b) What are the main causes of thrashing in a DSM system? What are the commonly used methods to solve the thrashing problem in a DSM system? **[8]**

Q6) a) How does the Gifford Quorum based protocol handle the network partition problem and increase the availability of write operations at the expense of read operations? **[8]**

b) What are the differences between replication and caching? What are the advantages of replication of data in a distributed file system? **[8]**

Q7) a) State the desirable features of a good global scheduling algorithm. **[8]**

b) Explain the system architecture of Amoeba with the help of a neat diagram. State in brief the design goals of Amoeba. **[8]**

Q8) Write short notes (Any three) : **[18]**

a) Group communication in Chorus.

b) Task assignment approach.

c) Ring algorithm.

d) Client Server binding.

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1691

[3865]-755

M.E. (Information Technology) (CSE (IT))
SOFTWARE ARCHITECTURE
(Elective - I) (514404) (Theory) (Revised Course 2008)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Write in brief on ALL of following : **[18]**

a) Class Inheritance and its use in software design.

b) Product line architectures and reference architectures.

c) Software design.

d) Identity field : (Hint : an object relational structural EAI pattern).

e) UML class diagrams and their use in documenting design patterns.

f) Global Analysis begins with identifying and analyzing factors that influence architecture. What are the organizational factors analyzed in Global Analysis.

Q2) Explain the following concepts with examples. **[16]**

a) Creational Design patterns and 'factory method' as example.

b) Distribution pattern : client proxy.

c) Four views of architecture : code, execution, conceptual, module.

d) Architecture style : Pipes and Filters.

P.T.O.

Q3) a) Write short notes on documentation of Design Patterns using template given below with suitable examples from one or more design patterns. Pattern Name and Classification, Intent, Motivation (Forces), Structure, Participants, Collaboration, Consequences, Implementation, Sample Code, Known Uses, Related Patterns. **[10]**

b) Write short notes on ANY ONE of the following : **[6]**

i) Adaptor pattern.

OR

ii) Message brokers as preferred engine for EAI.

Q4) a) What do you understand by terms :

Identity Field (Hint : EAI pattern), Middleware. **[4]**

b) What do you understand by terms in context of PRODUCT archetype pattern : Price, features, package, catalog. **[4]**

c) In context of EAI, what do you understand by following terms Application Programming Interface (API), CORBA. **[4]**

d) What do you understand by resource management pattern : pooling. **[4]**

SECTION - II

Q5) In brief state the concept/term; illustrate with good examples for ANY FOUR of the following concepts. **[16]**

a) Presentation layer in three tier client server system (Hint UI).

b) Client Server Systems.

c) Software development life cycle (and place of software architecture in it).

d) User Interfaces, and user friendliness of software systems.

e) Concurrency, and its control using locks.

f) RPC as middleware.

Q6) Write short notes on ANY THREE. **[18]**

a) INTERNET (WWW) based software systems and applications.

b) In context of web based systems : Nonfunctional requirements, specifically : performance of website, reliability of website.

c) MVC Architecture.

d) Java and Java middleware.

e) Types of databases : Relational databases, XML based, object relational databases.

f) Design patterns (definition, need, known examples, classification....).

Q7) What do you understand by the following concepts : **[16]**

a) JDBC or ODBC as database oriented middleware.

b) Web services as software services (components).

c) Legacy applications.

d) Importance of Customer relationship management in today's world.

Q8) Write in brief on ALL of the following : **[16]**

a) What is software architecture and why do we need it?

b) In context of distributed computing what do you understand by distributed system, object request broker, remote objects.

c) What is XML, why do we need it and IN context of XML, what is XSL and DOM?

d) What are software components, what are their advantages, use.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1692

[3865]-762
M.E. (IT)
ADVANCED TRENDS IN DATABASE SYSTEM
(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Make suitable assumptions whenever necessary.***

SECTION - I

Q1) a) Explain the difference between a remote SQL statement and a distributed SQL statement. **[8]**

b) Discuss the transparency issue in distributed database. **[8]**

Q2) a) How is OLTP (Online Transaction Processing) different from DSS (Decision Support System). How can DBMS meet the challenges of the principally different requirements of these two systems? **[8]**

b) Discuss data warehouse life cycle. **[8]**

Q3) a) Explain predictive data mining technique. List the various assumptions that make predictive modelling successful. **[8]**

b) Explain the concept of data mining. Explain K nearest neighbour. **[8]**

Q4) Write short notes on : **[18]**

a) Multimedia Database.

b) Neural Networks.

c) Business intelligence.

d) Temporal data mining.

P.T.O.

SECTION - II

Q5) a) Discuss the design and implementation issues in active database. **[8]**

b) How is active DB different from normal/passive databases? Explain with example. **[8]**

Q6) a) Compare relational database. Object Oriented database, and Object relational database with respect to their strength, applications and limitations. **[8]**

b) With a diagram explain the architecture of a TP system. What are the functions of TP monitor? **[8]**

Q7) a) Explain what a web crawler is. Describe the characteristics and the crawling policies. **[8]**

b) Describe the web crawler architecture with the help of a case study. **[8]**

Q8) Write short notes on : **[18]**

a) OR mapping in object database.

b) Information retrieval techniques for exploring data in databases.

c) Applications of Active database.

d) ECA concept in active Database.

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1694

[3865]-796
M.E. (Instrumentation & Control)
COMMUNICATION PROTOCOLS FOR INSTRUMENTATION
(2008 Course) (5061103)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Compare Foundation Fieldbus H1 and HSE, Profibus DP and PA, DeviceNet and HART with respect to the following points: **[16]**

a) Maximum cable length.

b) Communication Methods.

c) Communication Speed.

d) Maximum number of stations.

Q2) Explain the following with neat diagrams/ waveforms: **[16]**

a) Manchester Data Encoding.

b) NRZ.

Q3) With neat diagrams wherever necessary, explain how Fieldbus implements the following functions and at which levels. **[18]**

a) Cyclic Data exchange.

b) Asynchronous traffic.

c) Messaging system.

Q4) Write short notes on: **[16]**

a) ControlNet.

b) Zigbee Protocol.

P.T.O.

SECTION - II

Q5) a) Explain the steps involved in calibration of the HART Field devices. **[10]**

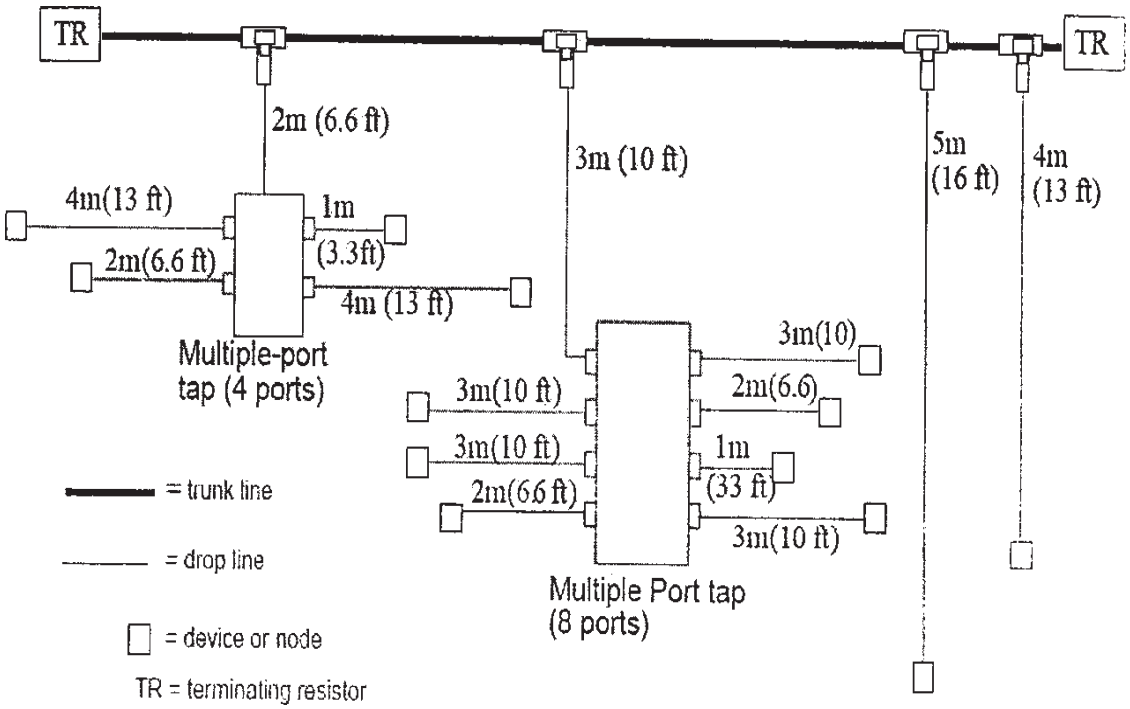
b) Explain the role of DD files in HART networks. Also explain the physical layer of HART. **[8]**

Q6) a) Explain the different grounding schemes for IC 61158-2 segment. **[10]**

b) If the following table shows the allowable data rates for the cumulative drop line length in a devicenet based system, what will be the allowable data rate for the system shown below. **[6]**

Data rate in kbps	Cumulative drop line length
125	156m (512 ft)
250	78m (256 ft)
500	39m (128 ft)

System:



Q7) a) Discuss any four advantages and disadvantages of Fieldbus. **[8]**

b) With neat diagrams explain the installation of Profibus DP and PA nodes. **[8]**

Q8) Write short notes: **[16]**

a) MODBUS.

b) RS 232.

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Total No. of Questions : 10] **[Total No. of Pages : 3**

P1695

[3865]-819
M.E. (Polymer Engg.)
POLYMER PROCESSING AND TESTING
(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Q. No. 1 from Section - I and question No. 6 from Section - II are compulsory. Attempt any other two from Section - I and attempt any other two from Section - II.***
2) ***Figures to the right indicate full marks.***
3) ***Answers to the two sections must be written in separate answer books.***
4) ***Use of pocket calculator, log-log graph paper is allowed.***
5) ***Assume suitable data, if required.***

SECTION - I

Q1) Attempt any four: **[20]**

a) Explain the effect of channel depth on specific energy consumption of single screw extruder.

b) Explain the concept of 'starve feeding' with reference to extrusion process.

c) Explain how pressure profile generated in injection moulding by melt pressure probe in cavity and runner system can be used to find gate freezing time.

d) Explain the use of parison programming in continuous extrusion blow moulding machines

e) Explain vacuum snap-back forming.

Q2) a) Discuss time, pressure, clamp force and screw position based v-p switch over techniques. Discuss the merits, demerits and applications of each velocity-pressure based switch over technique. **[10]**

b) Refering to figure No. 1, show that thickness distribution in thermoforming of cylindrical shape is given by. **[5]**

$$h = \frac{h_o}{2} \; e^{-S/R}$$

P.T.O.

Figure 1 Cylinder thermoforming

Q3) a) Draw a complete cycle time chart of plug assist, cut sheet vacuum thermoforming process. Explain each operational step with its significance in processing. **[7]**

b) Obtain an expression for pressure at operating point for extruder die combination in case of **[8]**

i) Capillary die.

ii) Any other generalized die geometry.

Q4) a) Discuss Tadmor's melting model for single screw extruder. **[7]**

b) Write in short about reactive extrusion. **[8]**

Q5) a) Draw a neat sketch of coat hanger die and explain design procedure. **[8]**

b) Explain the method of making a corrugated plastic sheet. **[7]**

SECTION - II

Q6) Attempt any four: **[20]**

a) Discuss spiral flow test and cup flow test for thermosetting moulding compounds and powders.

b) Discuss Izod-charpy impact test method.

c) Discuss limitations of fatigue tests and factors affecting test results.

d) With the help of generalised creep curve, explain creep behaviour of plastics.

e) Discuss solvent stress cracking resistance.

Q7) a) Explain the test method for environmental stress cracking resistance **[8]**

b) Explain test procedure for measurement of volume and surface resistivity. **[7]**

Q8) a) What do you understand by 'oxygen index'? Explain oxygen index test. **[10]**

b) Give any three reasons for conditioning specimen prior to testing. **[5]**

Q9) Write short notes on (Any three) **[15]**

a) Dielectric strength and dissipation factor.

b) Arc resistance.

c) Out-door weathering of plastics.

d) Vicat softening point.

Q10) a) Explain methods of measurement of creep properties. Discuss the use of isochronons and isometric graphs in design of plastics. **[10]**

b) Write in short about barrier properties. **[5]**

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Total No. of Questions : 10] **[Total No. of Pages : 4**

P1696

[3865]-824
M.E. (Polymer Engineering)
MOULD AND DIE DESIGN
(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Q.No.1 from Section I and Q.No.6 from Section II are compulsory. Attempt any other two questions from Section I. Attempt any other two questions from Section II.***
2) ***Answers to the two sections must be written in two separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of pocket calculator, graph paper etc. is allowed.***
5) ***Assume suitable data, wherever required.***

SECTION - I

Q1) Answer any two : **[20]**

a) Draw different cross sections of at least four types of runners. How will you determine runner efficiency considering its cross section.

b) Explain the requirements for material of construction for core and cavity inserts of injection mould based on the plastic material being processed.

c) Explain mould polishing techniques. Write down the factors affecting polishability of moulds. Describe polishing problems like orange peel and pitting.

Q2) For a component shown in fig. 1, draw a neat sectional elevation to bring out the details of split cavity, finger cam and wear plate. Calculate also the working length the finger cam. **[15]**

P.T.O.

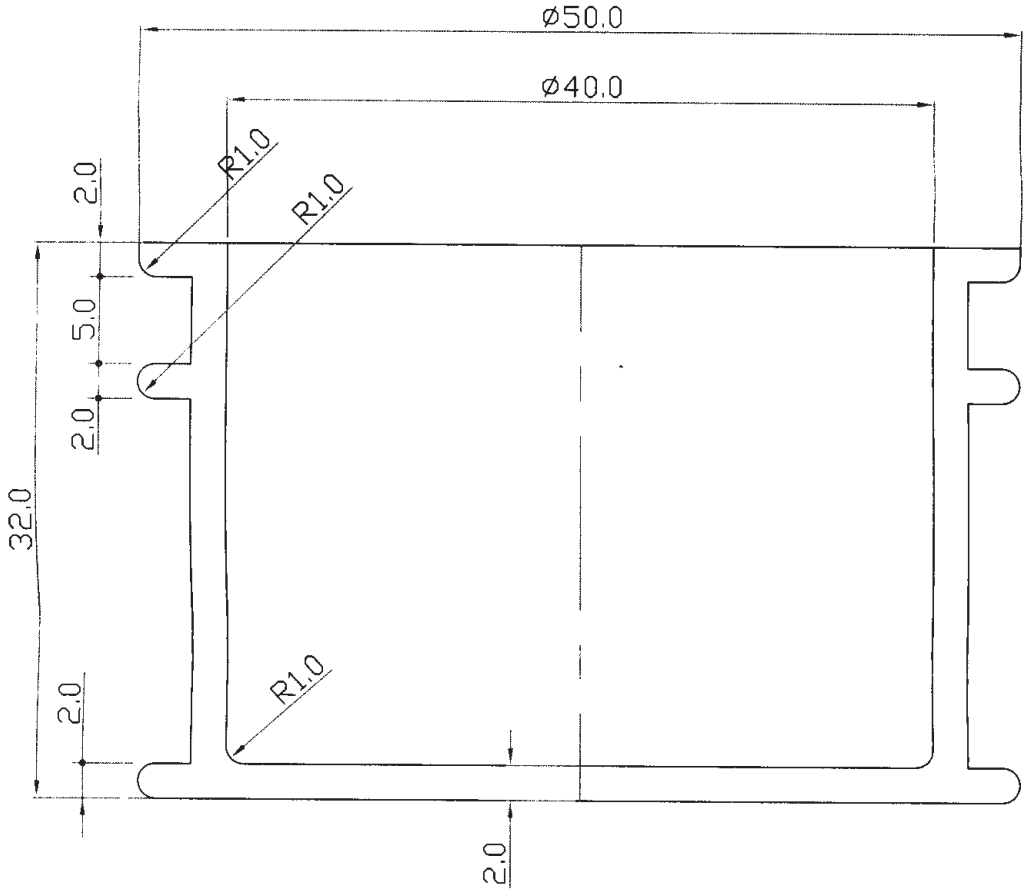

Figure -1

Q3) For the component shown in figure 2, sectional view of the details of cooling system in both core and cavity side. Draw also a sectional view to bring out details of feed system if mould designed is under feed mould. Indicate the relevant design formulae for finding the size of pin point gate. **[15]**

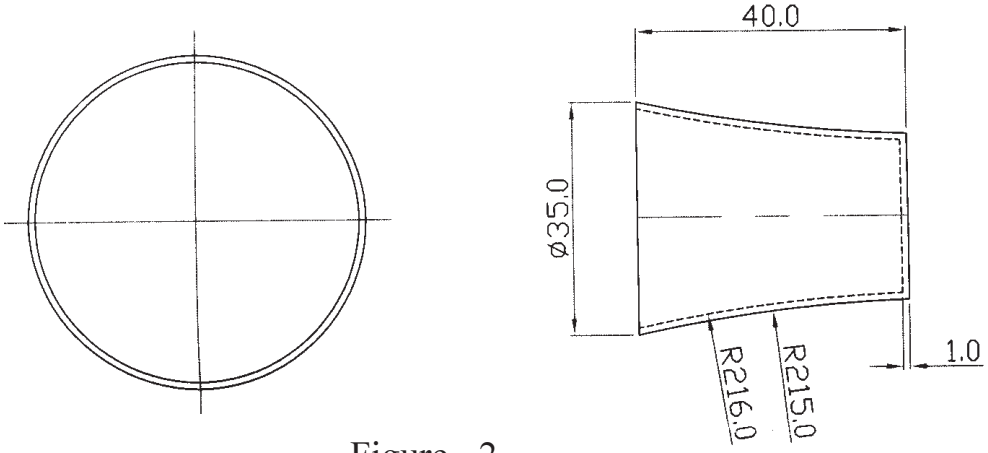

Figure - 2

Q4) Explain with neat sketches, the mechanism of collapsible core used in ejection of internal threads. **[15]**

Q5) For the component shown in fig 3, draw sectional view indicating sleeve ejection mechanism. **[15]**

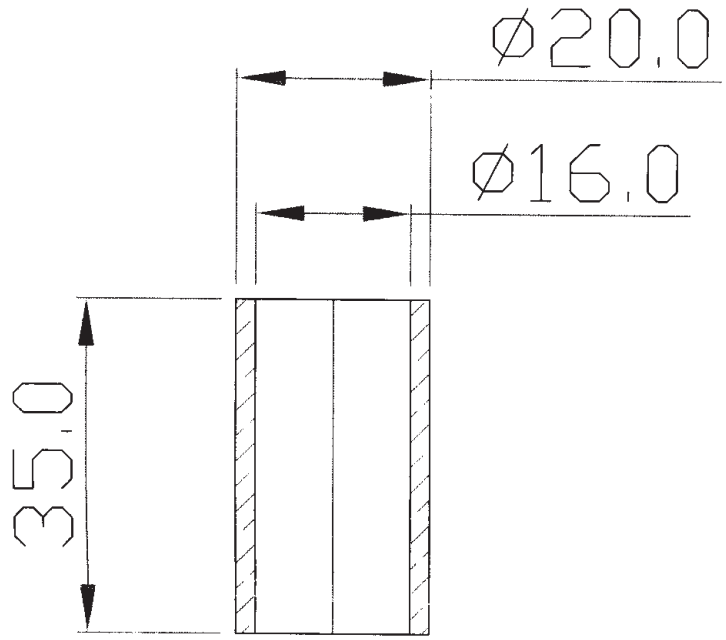

Figure - 3

SECTION - II

Q6) Attempt any two : **[20]**

a) Explain the set up of Electro discharge Machining (EDM) with a neat sketch. Write down the requirement for the tool material and name few of them. Explain also the term wear ratio.

b) Explain following type of secondary nozzles for hot runner moulds.
   i) Standard type secondary nozzle.
   ii) Direct feed sliding type.
   iii) Direct feed secondary nozzle.

c) With a neat sketch, explain the construction of a standard manifold type flat film die.

Q7) a) Derive expression for establishing machining time for face milling operation in terms of feed, speed and length of travel. **[9]**

b) Write down complete process sheet for manufacture of guide bush. **[6]**

Q8) a) Explain with a neat sketch, the construction of center fed blown film die. **[10]**

b) Draw a neat sketch of in-line pipe die. **[5]**

Q9) Write down complete design procedure for designing a rod die. Derive expressions for pressure drop for flow through various sections of the rod die. **[15]**

Q10) Draw a neat sketch parison die head assembly of continuous extrusion blow moulding and explain the function of major parts from rheological angle. **[15]**

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1697

[3865]-838

M.E. (Printing Engineering and Graphic Communication)

WORKFLOW MANAGEMENT IN PRINTING INDUSTRY

(508104 A) (2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Describe conventional workflow of printing process with neat diagram. **[10]**

b) What is a digital prepress? How will you change over your workflow from conventional prepress to digital prepress? **[15]**

Q2) Short Notes :

a) Trapping. **[6]**

b) File conversion to PS or PDF. **[7]**

c) Archiving. **[6]**

d) Job Ticket. **[6]**

Q3) a) Describe CIP3. **[10]**

b) What is the importance of approval of proof? **[7]**

c) What is the process error trapping and notification? **[8]**

P.T.O.

SECTION - II

Q4) a) What is OPI server? Describe its working. **[10]**

b) Describe the machine configuration requirements for digital workflow. **[8]**

c) Write on networking requirements in digital workflow. **[7]**

Q5) a) Write notes on :

i) Different types of digital proofs. **[8]**

ii) Electronic imposition and pagination. **[7]**

b) Explain PDF, PJTF and CIP4. **[10]**

Q6) a) In printing workflow, what needs to be considered for the benefits from investment? Explain with example. **[12]**

b) Explain and compare different printing workflows. **[13]**

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1698

[3865]-841

M.E. (Printing Engineering and Graphic Communication)

DIGITAL PRINTING

(2008 Course) (508105 A)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain with neat diagrams, the working principle of continuous flow inkjet and drop on demand inkjet technology. What are the advantages and drawbacks of these technologies? **[15]**

b) Write a note on thermography. **[5]**

c) Explain CTP technology and its advantages. **[5]**

Q2) a) How RIP works? **[10]**

b) Describe different image scanning technologies. **[15]**

Q3) Write notes on :

a) Hard proofing. **[7]**

b) Remote proofing. **[5]**

c) Halftone dot simulation. **[7]**

d) Preflight. **[6]**

SECTION - II

Q4) a) What are print quality verification methods and tools? **[11]**

b) Short Notes :

i) GRACoL. **[7]**

ii) ISO. **[7]**

P.T.O.

Q5) a) How 3D printing is done with inkjet printing technology? What are the possible applications? **[6]**

b) Write notes on : **[6]**

i) Web2Print.

ii) VDP. **[6]**

c) What is Print on Demand? Which technologies are used for it? Who gets its benefits? **[7]**

Q6) a) Which technologies are incorporated in modern digital presses to improve the quality and speed up the operations? **[15]**

b) Why the eco-friendliness in digital printing is of concern? What are people doing about it? **[10]**

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1699 **[3865]-144**

M.E. (Electronics) (D S & Comp.)
DSP AND APPLICATIONS
(2002 Course) (504302)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare Linear and Circular convolution? How Linear convolution is calculated using circular convolution? Obtain the linear convolution using circular convolution for following sequence **[8]**

$x_1(n) = \{\underset{\uparrow}{2}, 2, 2\}$

$x_2(n) = \{\underset{\uparrow}{2}, 2, 2\}$

b) Determine the Inverse z – Transform of **[10]**

i) $x(z) = \dfrac{1+3z^{-1}}{(1+3z^{-1}+4z^{-2})}$

ii) $x(z) = \dfrac{(4-8z^{-1}+6z^{-2})}{(1-2z^{-1})\,(1+2z^{-1})}$

Q2) a) What is Fourier Transform? Find the DFT of the following sequence

i) $x(n) = \{2, 1, 2, 1\}$

ii) $x(n) = \{0, 2, 4, 6\}$

iii) $x(n) = \{1, 2, 3, 4\}$

[12]

P.T.O.

b) Obtain Direct Form I & II realization

$$y(n)=\frac{1}{2}y(n-1)+\frac{3}{4}y(n-2)+x(n)+x(n-1)$$ **[4]**

Q3) a) Explain in place computations and bit reversal in FFT algorithms? Explain number of computations for 16 point DFT and 16 point FFT? **[8]**

b) Using kaiser window, design a low pass filter with following specifications. **[8]**

Passband cutoff frequency = $w_p = 0.22\ \pi$

Stopband cutoff frequency = $w_s = 0.28\ \pi$

Stopband ripple $\delta_s = 0.003$

Q4) Write notes on: **[16]**

a) Jury's stability test.

b) Least square filter design.

c) Goertzel algorithm.

SECTION - II

Q5) a) Given the desired transfer function of LPF as

$Hd(w) = 1 \qquad -\pi \le w \le \pi$

$= 0 \qquad$ elsewhere

Find out corresponding hd (n) and using Hanning and Hamming window find out h (n). The length of the window is 09. **[10]**

b) What are QMF filters? How, QMF filter provide perfect reconstruction? Give mathematical explaination? **[8]**

Q6) a) What is predictive Deconvolution? Explain the same with suitable example? **[8]**

b) Explain how ARMA mode is used for Power Spectrum Estimation? **[8]**

Q7) a) How DSP processor is different than Microprocessor? Explain the advantages of MAC and Barrel Shifter in DSP processors? **[8]**

b) What is the need of Multirate signal processing and how it can be done in Analog Domain? Explain sampling rate conversion by factor I/D? **[8]**

Q8) Write short notes on: **[16]**

a) Gibbs Phenomenon.

b) Wavelet Transform for Image Compression.

c) Barlett Method for Power Spectrum Estimation.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1700

[3865]-204
M.E. (Computer)
MOBILE COMPUTING
(2002 Course) (Theory)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer 3 questions from Section I and 3 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Find the spectral efficiency in bps/Hz of the GSM system assuming a channel capacity of 200 kHz and a channel data rate of 280 bps. What will be the spectral efficiency if the bandwidth is increased by 50%? Why is Gaussian band filter used in the GSM raw data?

b) State the particulars of mobile which are kept in the VLR data base. **[16]**

Q2) With respect to a MS explain the meaning of the following terms: **[16]**

a) IMSI attached.

b) Roaming.

c) Location updating.

d) Handover.

e) Locating.

Q3) Write short notes on the following : **[18]**

a) Wired Equivalent Privacy (WEP).

b) Base Station System (BSS)

c) SMS security.

P.T.O.

Q4) a) What is the problem of location management?

b) What are the basic operations involved in it?

c) What is meant by static and dynamic update schemes?

[16]

SECTION - II

Q5) a) Draw a diagram showing the expanse of frame, multi-frame, super-frame and hyper-frame for a GSM network. Show the links expanding one unit of a bigger frame into constituent parts of the next smaller frame in the hierarchy of frames. **[8]**

b) State what are the following different types of logical control channels intended for. **[8]**

i) BCCH
ii) CCCH and
iii) DCCH

Q6) a) Draw a frequency versus time plot showing time and frequency domain access for GSM cellular radio. Show horizontal channel strips and frequency distance between channel strips. On a given channel strip show time segments for frames and physical time slots for a typical frame. Assume 25 MHz band and state how many carriers are actually used in practice. **[8]**

b) State how a logical channel for digital speech is mapped to a physical channel. State what are the different types of TCH. **[8]**

Q7) State what are the various multiple access procedures with respect to the communication medium using radio channels. Describe with suitable diagrams the functions and properties of any TWO the following : **[16]**

a) FDMA

b) TDMA

c) CDMA

Q8) Write short notes on the following : **[18]**

a) Access Router.

b) Mobile Adhoc Network.

c) BLUE TOOTH.

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Total No. of Questions : 10] **[Total No. of Pages : 2**

P1701

[3865] - 525

M.E. (Mechanical) Mechatronics - II

AUTOMOTIVE ELECTRONICS

(2008 Course) (502811C)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Attempt any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of scientific calculator is allowed.***

SECTION - I

Q1) a) Write a short note on "Antilock Breaking Systems" used in Luxury Cars. **[8]**

b) Explain Engine RPM sensors with principle of working, resolution and repeatability. **[8]**

Q2) a) Explain construction of battery and two protections provided for it in automobiles. **[8]**

b) Explain the sensors employed in Air conditioning systems in modern cars. **[8]**

Q3) a) Explain wiper systems in luxury cars with two significant features. **[8]**

b) Explain two important safety provisions and sensors incorporated in power windows. **[8]**

Q4) a) Explain Head light dazzling preventive methods in modern cars. **[8]**

b) Explain tests of batteries w.r.t. need, procedure of test and result of test. **[8]**

Q5) Write short notes on any two **[18]**

a) Modern trends in Spark Ignition Systems.

b) Anti fog provisions in Modern automobiles.

c) Distributor less ignition.

P.T.O.

SECTION - II

Q6) a) Explain significance of wheel alignments. Explain in brief the sensors used in the process with their significance. **[8]**

b) Discuss in brief the electronic spark ignition control. **[8]**

Q7) a) Explain the role of throttle position sensor in Engine Control Unit. **[8]**

b) Compare Hydraulic power steering with Electronic power steering. **[8]**

Q8) a) Explain in brief the construction of sealed beams in modern automobiles. **[8]**

b) Explain two important features of central locking system used in luxury cars. **[8]**

Q9) a) Discuss in brief the sensors related to crank shaft. **[9]**

b) Explain the sensors used in Exhaust systems. **[9]**

Q10)a) Discuss in brief the preventive maintenance of Batteries. **[8]**

b) Explain the advantages of On Board Diagnostics. **[8]**

Total No. of Questions : 8] **[Total No. of Pages : 02**

P1703

[3865] - 679

M.E. (Computer) (Theory)

ADVANCED INTERNET PROGRAMMING

(2008 Course) (510111 (D)) (PICT)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer 3 questions from Section I and 3 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) With reference to the JMS API architecture, state the functions of the following: **[16]**

i) JMS provider.
ii) JMS Client.
iii) Messages.
iv) Administered object.
v) Native Clients.

b) Draw a diagram showing the way the parts in (a) above interact in a JMS application.

Q2) a) With respect to Remote Procedure Call state if the following is TRUE or FALSE **[6]**

i) RPC is only interaction based. It does not offer any flexibility in terms of hardware architecture.
ii) RPC is a standard. It can be implemented in only one way.
iii) Remote Procedure Call preserves business logic of the application.
iv) RPC is server independent.
v) RPC does not require TCP/IP.
vi) Sun Micro System's Open Network Computing (ONC) is one of the implementations of RPC.

P.T.O.

b) Explain the functions of RPC in terms of the following steps: **[10]**

i) What does the client code do?

ii) What does the server do after it receives the request?

iii) What does the remote procedure do after it gets request from server stab?

iv) After the remote procedure is complete what steps are taken to return the data to the client?

Q3) Write suitable code skeleton to achieve the following: **[16]**

a) Access LDAP server using JND from Java.

b) Populate LDAP with suitable data

Highlight important classes, interfaces, constructors, methods and packages.

Q4) With reference to the IBM portlet API, explain the characteristics functions of the following objects: **[18]**

a) Portlet request.

b) Portlet Response.

c) Portlet Session.

SECTION - II

Q5) Suitably explain the architectural pattern called MVC as implemented in the Java EE framework. **[16]**

Q6) Write short notes on the following: **[18]**

a) SOAP

b) JSR 168 API

c) JSTL

Q7) a) State the sequence of steps that are needed to go through to create a bean.

b) What is meant by a manifest file?

c) How is a ready bean packed in a jar file?

d) Develop a suitable IDE for beans development?

[16]

Q8) a) State the purpose of DOM standard. What different types of documentation are covered by DOM?

b) With the help of a suitable example show DOM can present an XML document as a tree structure.

c) How do most browsers read and manipulate XML?

d) Write a short script to load a typical XML document into the DOM parser.

[16]

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1704

[3865]-668
M.E. (Computer)
MOBILE COMPUTING
(510104(D)) (2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer 3 questions from Section I and 3 questions from Section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State the reasons for frequency hopping in GSM system.

b) Describe an appropriate frequency hopping algorithm. **[18]**

Q2) What are the five different types of bursts used in a GSM system? Describe the functions of any two of them. **[16]**

Q3) a) What are the steps in the establishment of a MS (Mobile Station) to MS call within the same BSC (Base Station Controller). Explain the call set up drawing a suitable signal and response diagram.

b) Define the functions performed within the following procedures :

i) IMSI attach IMSI detach.

ii) Location Update.

[16]

P.T.O.

Q4) a) Permanent data associated with the mobile are those that do not change from one area to another. State what permanent data about the mobile are stored in the home location register and also what information is stored in the AUC. **[8]**

b) State what information is stored in the AUC database and what is it's purpose. **[8]**

SECTION - II

Q5) a) Draw a diagram showing the various components of a GPRS architecture. **[8]**

b) With reference to the session management of a GPRS network explain what is meant by the following : **[8]**

i) Packet Data Protocol Address.

ii) Static and dynamic PDP address allocation.

iii) PDP context activation.

Q6) Draw the basic reference architecture of 3GPP-R99 network. Show the architecture of the core network in it. Give a concise meaning of 3GPP-R99 and discuss the basic network architecture and the key network elements and interfaces. Particularly state in short the functions of Um interface to access GSM Bcc and Un interface to access UTRAN.
State functions of Authentication Center, Equipment Identity Register, SGSN, GMSC, GGSN and MSC. **[16]**

Q7) Draw a schematic diagram of the GSM network and show the location of the following components in it : **[16]**

a) MSC/VLR
b) HLR
c) EIR
d) AUC
e) GMSC
f) BSC
g) BTS
h) MS
i) OMS

Q8) Write short notes on the following : **[18]**

a) Cell Splitting.

b) Functions of MSC.

c) Echo Cancellor.

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1706

[3865]-569
M.E. (E & TC) (Microwave)
ELECTROMAGNETICS AND ANTENNA THEORY
(2008 Revised Course) (504222) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Explain the following characteristics in relation to FDTD. **[15]**

i) Accuracy.
ii) consistency.
iii) Stability.

b) Derive friis transmission equation and hence define free space loss factor. **[10]**

Q2) a) Define Green's function. Explain its properties construct the integral equation corresponding to Poisson's equation in three dimensions, using Green's function. **[10]**

b) Explain the following terms related to antenna. **[15]**

i) Radiation pattern.
ii) Radiation efficiency.
iii) Gain.
iv) Half power beam width.
v) Antenna temperature.

Q3) a) A 20cm long cylindrical conductor of 1-mm radius is maintained at potential of 1V. Determine the charge distribution along the conductor, using method of moments. **[15]**

b) Write note on 'Yee's FD Algorithm'. **[10]**

P.T.O.

SECTION - II

Q4) a) Derive expression for radiation resistance and directivity of Loop Antenna. **[10]**

b) Find the radiation efficiency of single turn and an 8 turn small circular loop at f = 100MHz. The radius of the loop is $\lambda/25$ and the radius of the wire is $10^{-4}\lambda$. The turns are spaced $4 \times 10^{-4}\lambda$ apart. Assume the wire is copper with conductivity of 5.7×10^7 s/m and the antenna is radiating into free space. **[15]**

Q5) a) Explain the design procedure of the rectangular microstrip antenna. Derive the necessary formulae used. **[10]**

b) Design a rectangular microstrip antenna using a substrate, with dielectric constant of 2.2, h = 0.1588 so as to resonate at 10GHz. **[15]**

Q6) a) Derive expression for directivity of broad side end fire arrays. **[10]**

b) Write notes on the following : **[15]**

i) Yagi-Uda antenna.
ii) Helix antenna.
iii) Duality Theorem.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1707

[3865]-597
M.E. (E & TC) (VLSI & Embedded Systems)
REAL TIME OPERATING SYSTEMS
(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Attempt any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are various software architectures commonly used in embedded systems? **[12]**

b) What are the characteristics of RTOS? **[4]**

Q2) a) What are the reasons for deadlock situations? Justify the answer with suitable example. **[10]**

b) Describe the concepts of Priority inversion. **[6]**

Q3) a) What are the various techniques used for inter process communication? **[10]**

b) Describe the operation of preemptive type scheduler. **[6]**

Q4) Write short notes on the following (any three) : **[18]**

a) Memory management in RTOS.

b) OS Structures.

c) Traditional OS Vs. RTOS.

d) Interrupt handling in RTOS.

SECTION - II

Q5) a) How many tasks can be defined in μCos-II and what type of scheduler is used? What are the other features of μCos-II? **[10]**

b) What are interrupt handling functions supported in μCos-II? **[6]**

P.T.O.

Q6) a) What is meant by the term dynamic priority? How it is useful in solving priority inversion problem? **[8]**

b) What are the different operations involved in porting μCos-II? **[8]**

Q7) a) List and explain the various functions supported by the Linux/RT Linux? **[10]**

b) Draw and describe architecture of Linux kernel? **[6]**

Q8) Write short notes on the following : **[18]**

a) Delay generation mechanism in RTOS.

b) IPC functions supported by μCos-II.

c) Program writing technique using μCos-II.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1708

[3865] - 623

M.E. (Electronics) (Digital System)

MICROELECTRONICS

(2008 Course) (504195) (Sem. - I)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers any three questions from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Use of electronics pocket calculator is allowed.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Design a CMOS logic gates for the following functions

i) $\overline{F = ((A.B.C) + D)}$.

ii) $\overline{F = (((A.B) + C).D)}$ **[8]**

b) Explain the working of transmission gate. Design 4:2 multiplexer using transmission gates. **[8]**

Q2) a) Derive the expression for power dissipation in the CMOS Inverter. **[10]**

b) What is Domino logic? Explain the operation of domino OR Gate. What is the need of inverter at the output of it? **[8]**

Q3) a) What is clock Skew? Explain types of physical clocking Networks. **[8]**

b) Which are the various CMOS parasitic? Explain. **[8]**

Q4) a) Explain MOS implementation of a current sink along with its IV Characteristics. **[8]**

b) Write a VHDL code for FSM which detect the sequence 101 by Mealy method. **[8]**

P.T.O.

SECTION - II

Q5) a) What is use of attributes in VHDL? Explain with examples any two attributes. **[8]**

b) Explain various routing techniques in detail. **[8]**

Q6) a) Draw stick diagram of CMOS two input NOR gate. **[6]**

b) Draw and Explain CMOS inverter DC transfer characteristic with operating regions. What is effect of size ratio? **[10]**

Q7) a) Design 1 kΩ NMOS as active resistor using following data

Gate voltage = 5v, source voltage = 2v,

$|V_{BS}| = 2v$, $V_{DS} < (V_{GS} - V_T)$

Native Threshold voltage = 0.7v

Transconduction parameter = 110 $\mu A/V^2$

Bulk threshold parameter = $0.4\sqrt{V}$

Channel length modulation parameter = 0.04/v

Surface potential at strong inversion = 0.7v **[6]**

b) Explain subsystem design principles. How Barrel shifter can be design as a part of subsystem component. **[10]**

Q8) Write a note on **[18]**

a) VHDL data Objects.

b) Pad design.

c) Lambda based design rule.

Total No. of Questions : 8] **[Total No. of Pages : 2**

[3865] - 11

P1711

M.E. (Civil) (Construction and Management)

ADVANCED CONSTRUCTION ENGINEERING

(2002 Course)

Time : 4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) List out the major items involved in deciding "Bridge Management System". Explain in details any one of them. **[8]**

b) Explain the purpose of "Inspection and Documentation in bridge management system. **[8]**

Q2) a) List out the reasons and factors on which failure of Earth Dam may occur. Explain in details any one of them. **[8]**

b) List out and explain any one of them in detail, the factors considered in designing Earthquake Resistance structure system. **[8]**

Q3) A diaphragm wall alternative was proposed for a station building near sanchetti Hospital for proposed Metro railway track between sanchetti to Deccan Gymkhana along Jangli Maharaj road in Pune. Following alternatives were proposed.

a) Prestressed concrete diaphragm wall panels.

b) Use of precast R.C.C. panels.

c) Use of large diameter touching piles.

To achieve economy which alternative you will select? Explain in details giving its advantages over the other methods. **[16]**

Q4) Write short notes on any three of the following: **[18]**

a) Factors affecting the stability of the earth dam.

b) Use of tower cranes in high rise buildings.

c) Use of Geosynthetics in river training works.

d) Safety measures in Metro Railway.

e) Rock anchors in Underground Power House construction.

P.T.O.

SECTION - II

Q5) a) What are measures you will adopt in ensuring full leak tightness in Nuclear containment structures. **[8]**

b) Prepare a 'Method Statement' giving sequence of construction adopted in "Natural Draught Cooling Towers". **[8]**

Q6) a) Explain in details what is "MCA in Nuclear Containment Structures". **[8]**

b) Explain in details use of slipforming and climbing shutters" in construction of chimneys. **[8]**

Q7) a) Which are the different type of vibratory loads for which Machine foundations are designed. **[8]**

b) Explain different construction methods used to carry out river training works. **[8]**

Q8) Write short notes on any three of the following: **[18]**

a) List out and explain the function of each component of the Earth dam.

b) Tremie concreting in Diaphragm Walls.

c) Construction method adopted in single flue chimney.

d) River training works - purpose and explain methods adopted.

e) Explain type of cracks in concrete bridges observed which causes distress to the bridge.

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1713

[3865]-41

M.E. (Civil - Structure)

HIGH RISE STRUCTURES

(2002 Course)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Attempt any two questions from Section I and II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams should be drawn wherever necessary.***
5) ***If necessary, assume suitable data.***
6) ***Use of nonprogrammable electronic pocket calculator, IS code and steel table are allowed.***

SECTION - I

Q1) a) Describe the different forces acting and stresses induced in case of self supporting steel stack. Also mention the design consideration. **[13]**

b) State the various methods of analysis for lateral loads in case of steel multistoried building and describe any one method of analysis in details. **[12]**

Q2) A 60 m high steel tower is to be erected for transmission line for single circuit three phase, 50 cycle per second. Suggest the suitable geometry and determine the various forces acting on tower under normal operating conditions. **[25]**

Q3) Design the R C chimney for the following data.

Outer diameter = 4.5 m

Wall thickness linearly varying = 450 mm at bottom and 200 mm at top

Firebrick lining = 100 mm thick

S B C of soil = 350 kN/m^2. **[25]**

P.T.O.

SECTION - II

Q4) a) Describe the drag and shielding effect due to wind in the design of building. **[13]**

b) Explain with suitable sketches the effect of vertical settlement of foundation in tall building. **[12]**

Q5) a) Describe the parameter, which influence the geometry of transmission tower. **[8]**

b) Describe the parameter, which influence the physical dimension of R C chimney. **[7]**

c) Compare the overall structural performance of shear wall, coupled shear wall and bracing in tall building during the earthquake excitation. **[10]**

Q6) Design a self supporting steel chimney as per IS : 6533 for the following data. **[25]**

Height of chimney = 80 m.

Diameter of chimney = 3.5 m.

Brick lining = 120 mm.

Location - Pune.

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Total No. of Questions : 10] **[Total No. of Pages : 4**

P1714

[3865] - 70

M.E. (Mechanical Engg.) Design Engg.

RELIABILITY ENGINEERING

(2002 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non programmable electronic calculators is allowed.***

SECTION - I

Q1) a) Define Failure density, Hazard Rate and Reliability. Table shows the results of life tests carried out on 1000 components simultaneously. Evaluate Failure density, Hazard Rate and Reliability and plot these functions against time. **[8]**

Operating time (Hrs)	0	1	2	3	4	5	6	7	8	9	10
Number of Surviving components	1000	870	787	712	644	582	526	475	429	388	351

b) Calculate the reliability of the system shown in Fig. 1 . The values show the reliability of individual components in the system. **[8]**

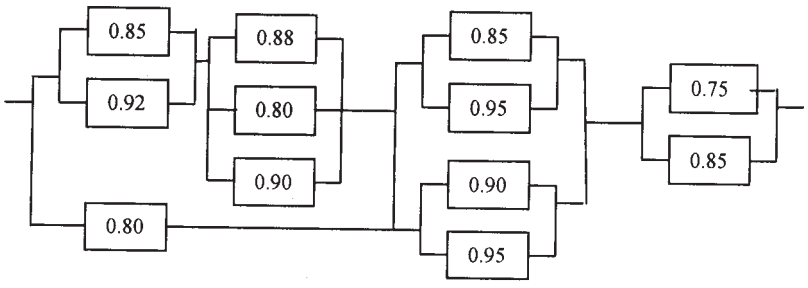

Fig. 1

P.T.O.

Q2) a) What is Bayes' rule? **[8]**

In an engineering manufacture plant, 60% of the crankshafts are ground by machinist R and 40% by machinist S. It is known from past experience that the crankshafts ground by machinists R and S contain 4 percent and 6 percent defective units respectively. If a randomly selected crankshaft is found to be defective, find the probability that it was ground by the machinist R.

b) Explain the active, partially active and passive redundancy with suitable example. **[8]**

Q3) a) Derive an expression for reliability of the system shown in Fig.2 using conditional probability method. If the reliability values of each element is given as R_1=0.98, R_2=0.97, R_3=0.99, R_4=0.95, R_5=0.80 find system reliability. Also use star -delta method to find system reliability. **[8]**

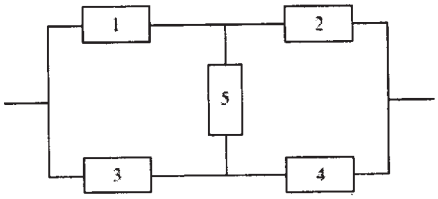

Fig.2

b) Construct a fault tree for the system failure shown in Fig.3 and write the statement. **[8]**

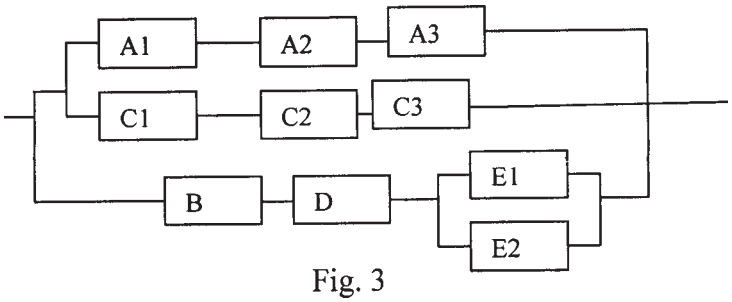

Fig. 3

Q4) a) Explain normal and weibull probability distributions stating their significance. **[8]**

b) For a mechanical component following Weibull distribution with $\beta = 2.5$, $\eta = 3000$ and $l = 1500$, find the reliability of the component and the failure rate for an operating time of 2500 hours. **[8]**

Q5) Write short note on following (Any three) **[18]**

a) Elements in FMECA analysis.

b) Matrix method of Reliability evaluation.

c) Risk Priority Number.

d) Chebyshev inequality.

e) Center line theorem.

SECTION - II

Q6) a) Explain Cut set and Tie set methods for reliability evaluation **[8]**

b) Explain ARINC Method of reliability allocation. **[8]**

Q7) a) State the assumptions to be made while using AGREE Method. Find out the failure rates of the components so that the system reliability becomes 0.99 using AGREE method. The data being given below. **[8]**

Sr.No. Components	No.of Component Modules (n_i)	Optg Time (t_i)	Importance factor (w_i)
1	55	10	1.0
2	80	9	0.97
3	45	10	1.0
4	65	7	0.93
5	77	10	1.0
6	25	10	0.95

b) In a short sample testing of a system following data is recorded. Plot the variation of reliability against time using

i) Mean ranking and

ii) Median Ranking Method. **[8]**

Failure No	1	2	3	4	5	6	7	8	9
MTTF (Hrs)	20	12	24	25	30	39	38	36	23

Q8) a) The mean strength and the standard deviation of a bolted joint are 3000Kg/cm^2 and 250 Kg/cm^2 respectively. The joint is loaded such that stress induced has a mean value of 2500 Kg/cm^2 with a standard deviation of 40 Kg/5cm^2. Assuming that shear strength and the induced stresses are independent and normally distributed, find out the probability of survival of the bolted joint. Extract of data from statistical table is given below. **[8]**

Z	1.2	1.3	1.4	1.5	1.6	1.7	1.8
$\Phi(Z)$	0.8849	0.9032	0.9192	0.9331	0.9452	0.9550	0.9640

b) Explain Vibration Signature analysis in condition monitoring of the equipment. **[8]**

Q9) a) Explain the load -strength interaction in design based reliability. **[8]**

b) What are the factors in fatigue design of machine components? **[8]**

Q10) Write Short notes on (Any three) **[18]**

a) Event Tree Diagram.

b) Life cycle cost model.

c) Highly Accelerated life testing.

d) Loading roughness & safety margin.

e) Reliability effort function.

f) Bath tub Curve.

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1715 **[3865]-133**

M.E. (VLSI & Embedded System) (E&TC)

FAULT TOLERANT SYSTEM DESIGN

(2002 Course)

Time : 3 Hours] [***Max. Marks : 100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***All questions are compulsory.***
4) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Classify different compression techniques. Explain with neat diagram one's count compression algorithm. **[8]**

b) Explain how to measure fault coverage using fault simulation method. **[8]**

Q2) a) Differentiate between different fault models. Explain bridging fault model in detail. **[8]**

b) Explain with neat block diagram the self checking system for error detection and correction. **[8]**

Q3) a) Define the following terms :- **[8]**

i) Path sensitization.

ii) Fault Efficiency.

iii) Zoom Table.

iv) Binary Decision Diagram.

b) Construct a Truth table for a two input NAND gate using 3-valued logic. Differentiate between 6-valued and 8-valued logic. **[10]**

P.T.O.

SECTION - II

Q4) a) Classify and define logic simulation. Explain with neat diagram the event driven logic simulation method. **[10]**

b) Describe Fault Equivalence and Fault Dominance Theorem for a combinational and sequential ckts. **[8]**

Q5) a) What is the importance of Generating test points and Partitioning large ckts in Design for Test? **[8]**

b) Explain in detail the fault propagation algorithm to generate test vectors. **[8]**

Q6) a) Explain in detail the On-line BIST architecture. Compare On-line and Off-line BIST. **[8]**

b) Write a short note for Testing of PLAs. **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1716

[3865]-161

M.E. (Electronics) (Computer)

COMPILER CONSTRUCTION

(504408) (Elective - II) (Revised 2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define the following : **[8]**

i) Bootstrap compiler.

ii) Cross compiler.

iii) Incremental compiler.

iv) Interpreter.

b) Draw a block diagram showing various phases of a compiler. What do you mean by a front-end and the back-end of a compiler. **[8]**

Q2) For the following CFG G = (N, T, S, P) where N = {S, A} is the set of non-terminals, T = {a, b} is the set of terminals, S is the start symbol and P = {S $\rightarrow$ AS | b, A $\rightarrow$ SA | a} is the set of productions. Is the grammar ambiguous? Construct SLR parser for the grammar given. Construct LALR parsing table as well. **[18]**

Q3) a) What is LEX and YACC? Write Lex specification to read a text file and convert each lowercase letter to upper case. **[10]**

b) Construct DFA for the following regular expression. **[6]**

$(l^* / d^*) \cdot ldd$

P.T.O.

Q4) a) Write a syntax directed translation scheme to parse and convert the given infix expression to on equivalent postfix expression. **[8]**

b) Explain any code generation algorithm in detail. **[8]**

SECTION - II

Q5) Write short note on (Any Two) : **[16]**

a) Error recovery in predictive parsers.

b) Problems with top-down parsers.

c) Symbol table.

Q6) a) Translate the expression.

d = (a + b) * (c + d) where '+' & '*' are arithmetic operators into

i) quadruple ii) triple iii) 3-address code. **[9]**

b) Write the semantic action to generate the three-address code for 'switch' statement. **[9]**

Q7) a) What is an activation record? Explain various fields of a typical activation record. **[8]**

b) What mechanism is provided in YACC to resolve conflicts in the LR parsers? Explain with suitable example. **[8]**

Q8) a) What is "peep-hole" optimization? Explain with suitable examples. **[8]**

b) Explain with suitable example, various transformations that can be performed on a basic block. **[8]**

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Total No. of Questions : 6] **[Total No. of Pages : 1**

P1717

[3865]-176
M.E. (Electrical) (Power Systems)
POWER SYSTEM MODELLING
(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***All questions carry equal marks.***

SECTION - I

Q1) Why it is necessary to make a model of power system? Describe the components and their functions which need to be modelled.

Q2) Describe Park's transformation. Develop a flux linkage model of synchronous machine starting from fundamentals.

Q3) What is the necessity of excitation control in synchronous machine. Discuss the effect of saturation.

SECTION - II

Q4) Develop and discuss simple models for boiler and turbine.

Q5) Write notes on :

a) Load modelling

b) Auto transformer modelling.

Q6) Draw a block diagram of modern excitation system. Describe the function of each block.

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Total No. of Questions : 6] **[Total No. of Pages : 1**

P1718

[3865]-177
M.E. (Electrical) (Power Systems)
POWER SYSTEMS PLANNING AND RELIABILITY
(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Explain short term, medium term and long term planning in power system. Describe the role of engineer in long term planning. **[25]**

Q2) Explain the importance of load forecasting. Describe methods used for forecasting. State merits and demerits of each method. **[25]**

Q3) Describe :

a) Transmission system planning and **[12]**

b) Distribution system planning. **[13]**

SECTION - II

Q4) Describe two state model of reliability and show that MTTF is reciprocal of failure rate. **[25]**

Q5) Write notes on :

a) Classification and characteristics of electric loads. **[15]**

b) Continuous Markov process. **[10]**

Q6) a) Explain concept of LOLP. **[10]**

b) A generation station has four units of 100MW and for of 0.025 for each. Develop capacity outage probability table for the system. **[15]**

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Total No. of Questions : 8] **[Total No. of Pages : 02**

P1720

[3865] - 208

M.E. (Computer)

NETWORK SECURITY

(Revised Course 2002)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain a 'Model for Network Security' for designing particular security services. **[8]**

b) Explain the following classes of Intruders with example **[8]**

i) Masquerader
ii) Misfeasor
iii) Clandestine user.

Q2) a) What are the roles of the Ookley Key determination protocol and ISAKMP in IPSec? Explain. **[8]**

b) Discuss in brief any method for key management in Public key encryption. **[8]**

Q3) a) Briefly explain the idea behind RSA crypto system. What is one way function and trapdoors in the system. **[8]**

b) Explain the original three way authentication procedure for x.509 authentication service. **[8]**

Q4) Write short notes on any three **[18]**

a) OSI security architecture.

b) Advanced Encryption standard.

c) E mail Security.

d) Trusted system.

P.T.O.

SECTION - II

Q5) a) What are the security facilities in the TCP/IP protocol stack. Explain the advantages of network level, transport level & application level security approaches. **[8]**

b) Describe the sequence of events that are required for Secure Electronic Transaction i.e. SET with diagram. **[8]**

Q6) a) What is a dual signature? Explain the process of construction of dual signature. **[8]**

b) List four techniques used by firewall to control access and enforce a security policy. **[8]**

Q7) What are the reasons making it essential to have implemented the disaster recovery or business continuity plan. **[16]**

Q8) Write short notes on any three **[18]**

a) Smart card security.

b) Modern symmetric key ciphers.

c) Shared secret data authentication.

d) Routing algorithm vulnerabilities.

Total No. of Questions : 6] **[Total No. of Pages : 1**

P1721

[3865] - 227

M.E. (Petroleum Engineering)

WELL TESTING AND ANALYSIS

(Revised 2002 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Answer two questions from each section.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non-programmable calculator, log-log, semi-log paper is allowed.***
6) ***Assume suitable data, if necessary and clearly state it.***

SECTION - I

Q1) Derive the diffusivity equation in radial coordinate system. **[25]**

Q2) Write an essay on DST and its interpretation. **[25]**

Q3) Derive the line source solution to the diffusivity equation. **[25]**

SECTION - II

Q4) State the complete methodology in analysis of a Pulse Test. **[25]**

Q5) State the complete methodology in analysis of horizontal wells. **[25]**

Q6) Explain theoretical and empirical methods of Gas well testing with reference to Isochronal and modified isochronal tests. **[25]**

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1722

[3865] - 445
M.E. (Civil-Hydraulics)
HYDROPOWER
(2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the advantages and limitations of hydropower against other power sources. **[12]**

b) The load on a hydel plant varies from a minimum of 20,000 kW to 45,000 kW. Two turbo generators of capacity 30,000 kW each have been installed Calculate. **[8]**

i) Total installed capacity of the plant.

ii) Plant factor.

iii) Load factor.

iv) Maximum demand.

v) Utilization factor.

c) State various objectives of planning for water power development. **[5]**

Q2) a) State and explain various components of storage power plant. **[10]**

b) Briefly explain the economics of hydroelectric power plants. **[5]**

c) With the help of a load curve discuss the combined efficiency of a power generation scheme shared by thermal and pumped storage plant. **[10]**

P.T.O.

Q3) a) Define powerhouse and explain following parts of a powerhouse with neat diagram **[12]**

i) Superstructure.

ii) Intermediate structure.

iii) Substructure.

b) Write a short note on

i) Merits and demerits of underground powerhouse. **[8]**

ii) Structural design of powerhouse. **[5]**

SECTION - II

Q4) a) What do you understand by 'economic diameter' of a penstock? Discuss various factors which govern it's determination. **[10]**

b) What is meant by water hammer? Does it affect long penstocks? If so why? **[5]**

c) What is a surge tank? What are its functions? What are the different loading conditions to determine the height of surge tank? **[10]**

Q5) a) Determine number of turbines and diameter of runner for a power plant having 20 cumec inflow and 20 m head. Turbine has 80% efficiency and 150 rpm speed. Assume specific speed as 250 and speed ratio of runner as 0.85. **[8]**

b) Explain in detail two advantages of draft tube. **[10]**

c) Describe governing of an impulse turbine with neat sketch. **[7]**

Q6) a) Write a short note on micro hydel power plant. Also comment on its potential and future in India. **[15]**

b) It is proposed to develop a micro hydel power plant on a small stream having minimum flow of 2 cumec and net head of 2.5 m. It is desired to develop power for peak load demand of 8 hours a day. Determine firm power output of the plant with and without pondage. Assume plant efficiency as 85% and water loss of 10% on account of evaporation. **[10]**

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1723

[3865] - 463

M.E. (Civil-Structures)

DESIGN OF INDUSTRIAL STEEL STRUCTURES

(2008 Course) (Elective - II)

Time : 4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non programmable calculator, IS800, IS 875, IS Handbook of steel sections is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) A knee braced industrial shed has following data:

a) Span of truss = 17m and Rise of truss = 4.5 m

b) Length of shed = 32m with spacing of trusses =4m

c) Type of truss = Fink type with four equal parts of the slope on each side.

d) Height upto eaves level = 7m

e) The basic wind speed is 40 m/s and the building is located in industrial area of plain terrain.

f) A knee brace is parallel to principal rafter which connects panel points of tie member next to support.

g) Column bases are partially fixed.

Determine the loads at the various panel points of the truss and the columns due to dead load, live load and the wind load. **[25]**

Q2) Design the column section for the industrial building in which the span and rise of the roof truss are 18 m and 5 m respectively. Use following data:-

a) Reaction from roof truss including weight of purlins, roof covering etc. = 14 kN

b) Reaction from side rails and sheeting = 10 kN.

c) Reaction due to live load = 17 kN.

P.T.O.

d) Reaction from crane gantry girder and rails = 7kN acting at distance 250 mm from the face of column.

e) Basic wind pressure = 1.0 kN/m^2.

f) Height of column upto eaves level = 7m and the crane level is 5m above the base.

g) Weight of crane = 170kN, Weight of trolly = 75 kN and Crane capacity = 250 kN.

h) Minimum approach of the crane hook = 1m.

i) Distance between centre of crane wheels = 3m and spacing of gantry = 16m. **[25]**

Q3) A gable portal frame is having span of 22m. Height upto eaves level is 8m and apex is at 12m above base. Wind pressure intensity is 1.2 kN/m^2. Column ends are fixed. The gable rafter is supported by five columns. The spacing between roof trusses is 4.5m. Design gable rafter, side rails (girts), gable wind girder. **[25]**

SECTION - II

Q4) a) A Castellated beam is to be fabricated from ISMB 350 section. Draw neat sketch of cutting pattern, castellated section and elevation. Find safe uniformly distributed load it can carry over 7m simply supported span. **[18]**

b) Explain the design considerations of "Trussed purlin". **[7]**

Q5) Design a simply supported gantry girder to carry one overhead traveling crane for the following data:-

a) Weight of trolley, motor, hook etc = 60 kN.

b) Weight of crane girder = 110 kN.

c) Crane capacity = 180 kN.

d) Minimum approach of the crane hook = 1.0m

e) Distance between centre of crane wheels = 2.8m and spacing of gantry = 15 m.

f) Self weight of rail section = 300 N/m. **[25]**

Q6) a) Design the vertical side bracing and the rafter bracing for the industrial building explained in Question 1. The side bracing is located in central bay of building. The frames are tied in longitudinal direction at eaves level and 3 m above ground. **[20]**

b) Explain design considerations of "Machine foundation". **[5]**

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1724

[3865] - 470

M.E. (Civil-Structures)

NONLINEAR ANALYSIS OF STRUCTURES

(2008 Course) (Elective - III)

Time : 4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non programmable calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Find the solution for a moment curvature by non linear analysis of a cantilever beam subjected to a tip load. Plot load-deflection curves. **[12]**

b) Derive the equation of geometrical non linearity of beam due to stretching. **[8]**

c) State and Explain types of nonlinearities, with examples, in case of beams. **[5]**

Q2) a) Derive Material Nonlinearity of plates using Ramberg-Osgood relation. **[7]**

b) Using stress function approach, derive a system of 13 governing equations of geometrically non linear behaviour of plate. **[18]**

Q3) a) Derive the equation for maximum deflection of rectangular plate by nonlinear analysis. Also show that the deflection for the linear case is always higher than that for the nonlinear case. **[17]**

b) State different out of plain and in plain boundary conditions for the analysis of plates. **[8]**

P.T.O.

SECTION - II

Q4) Obtain the equations governing post-buckling non linear behaviour of cantilever column. **[25]**

Q5) a) Obtain nonlinear stiffness matrix for a truss element. **[7]**

b) Explain with diagrams and derivation, the deformation of square pinned-fixed frame for tensile loading. **[18]**

Q6) a) Obtain the displacement transformation matrix for a member with a hinge. **[12]**

b) Write procedure for elastic plastic analysis of **[13]**

i) Frames.

ii) Propped cantilever.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1725

[3865] - 482

M.E. (Mech. - Heat Power)

INTERNAL COMBUSTION ENGINES

(2008 Course) (Elective - II) (502105-A)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) A 2.8 liter four cylinder square engine with two intake valves per cylinder is designed to have a maximum speed of 7500 RPM. Intake temperature is 60ºC. Calculate

i) Intake valve area.

ii) Diameter of intake valves.

iii) Maximum valve lift.

For intake valve area, sonic speed and piston speed to be considered. **[12]**

b) Write a note on firing order of engines. **[4]**

Q2) a) Define following terms:-

i) Equivalence ratio (ϕ) & Lambda (λ) Value.

ii) Specific emission and Emission index (E.I) **[6]**

b) A single cylinder four-stroke petrol engine has a bore of 75 mm and a stroke of 100 mm. The clearance volume is 70 cm^3 (C.C.). The engine develops a torque of 68.6 Nm at 3000 rpm. The mechanical efficiency is 80% and relative efficiency based on brake thermal efficiency is 45% and the heating value of the fuel is 42000 kJ/kg. (42 MJ/kg). Calculate the brake sp. fuel consumption and the mean effective pressure. **[10]**

P.T.O.

Q3) a) Enlist the materials used for the following components with their properties:-

i) cylinder head ii) piston
iii) crank shaft iv) connecting rod
v) cylinder head **[10]**

b) What is the general material selection criteria for I.C. Engine components. **[6]**

Q4) Write short notes on (any three):- **[18]**

a) Hartridge smoke meter.
b) Supercharging.
c) Over cooling & undercooling of engines.
d) Thermostat.

SECTION - II

Q5) a) Explain in detail the electronic diesel injection system with a neat sketch. What are its advantages? **[8]**

b) Dry exhaust gas from a CI engine had the following composition by volume: CO_2 = 10%, CO = 2%, O2 = 6%, N2 = 82%. The fuel has 84% carbon, 14% Hydrogen and 2% oxygen content. Determine the Air to Fuel ratio for the fuel and mass of carbon per kg of dry flue gas. **[8]**

Q6) a) Discuss the construction of an oxidation catalytic converter with a neat sketch and explain its working. **[9]**

b) Discuss the advantages and disadvantages of using biodiesel in CI engines. **[7]**

Q7) a) What are the health effects of air pollution from IC engines. **[3]**

b) Discuss the MPFI system with a neat sketch. **[8]**

c) A diesel truck uses 80 gm of synthetic diesel fuel ($C_{12}H_{24}$) per km of travel. 1% of carbon in the fuel ends up as smoke. If the truck travels 12000 km/Yr, estimate the annual smoke emission in kg/year. **[5]**

Q8) Write short notes on: **[18]**

a) Exhaust gas Recirculation.
b) Diesel Particulate Filter.
c) Performance Maps.
d) Recent Trends in IC Engine.
e) Hybrid vehicles.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1726

[3865] - 484

M.E. (Mech. -Heat Power)

CONVENTIONAL POWER PLANTS

(2008 Course) (Elective - II) (502105-c)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) A steam power plant operating on the ideal regenerative Rankine-cycle with one open type feed water heater. Steam enters the turbine at 150 bar & 600ºC and condensed at 10 kPa. Steam is bled at 12 bar and enters the open FWH. Determine the fraction of steam extracted from the turbine & thermal efficiency of the cycle. Also find the specific steam consumption. Consider pump work. **[12]**

b) What are various governing methods in steam turbines? Explain. **[6]**

Q2) Explain:- **[16]**

a) Fluidized bed combustion

b) High pressure boilers.

c) Impulse & reaction steam turbines.

Q3) a) A combined gas turbine & steam turbine cycle has a gas turbine cycle as a topping cycle having a pressure ratio of 8. Air enters the compressor at 300 K and the turbine at 1300K. The isentropic efficiency of the compressor is 80 percent and that of gas turbine is 85 percent. The bottoming cycle is a simple ideal Rankine cycle operating between the pressure limits of 70 bar and 5 kPa. Steam is heated in a heat exchanger by the exhaust gases to a temperature of 500ºC. The exhaust gases leave the heat exchanger at 450K. Determine the ratio of mass flow rates of steam to that of combustion gases and the thermal efficiency of the combined cycle. **[12]**

b) In a combined cycle, topping cycle & bottoming cycle have efficiencies as 50% & 40%, respectively. Find the overall efficiency of the combined cycle. **[4]**

P.T.O.

Q4) Write short notes on (any three):- **[16]**

a) Turning gear
b) STIG plant
c) Cooling towers
d) Losses in steam turbines.

SECTION - II

Q5) a) What are advantages and disadvantages of a hydroelectric power plant over thermal power plant. **[4]**

b) Enlist the factors required for the selection of a site for a hydropower plant. **[4]**

c) What are the various equipments provided in the power house? **[4]**

d) Write a note on Mini and microhydal power plants. **[4]**

Q6) a) The incremental fuel costs for two generating units "a" and "b" of a power plant are given by the following relations;

$$\frac{dF_a}{dP_a} = 0.065\ P_a + 25, \text{ and}$$

$$\frac{dF_b}{dP_b} = 0.08\ P_a + 20.$$

Where F is the fuel cost in rupees per hour and P is the power out put in MW. Estimate:-

i) Economic loading of the two units when the total load supplied by the power plants is 200 MW,

ii) The loss in fuel cost per hour if the load is equally shared by both units. **[12]**

b) Write a note economic feasibility of power plants. **[4]**

Q7) a) What is a CANDU - type reactor? Explain with a sketch. **[8]**

b) What are the functions of the followings in a nuclear power plant:- **[8]**

i) Moderator ii) Control rods iii) Coolant.

Q8) Write short notes on (any three):- **[18]**

a) Fuel-cells.
b) Clean energy technology.
c) Latent heat storage systems.
d) Load management

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1727

[3865] - 489

M.E. (Mechanical - Heat Power Engineering)

I.C. ENGINES - FUELS AND COMBUSTION

(502111 - A) (2008 Course) (Elective - III)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary and mention it clearly.***

SECTION - I

Q1) a) Why the fuel additives are required? Describe the various fuel additives used in CI engines. **[8]**

b) Explain the effect of high sulphur content on the performance of SI and CI engine. **[8]**

Q2) a) What are the basic requirements of combustion chamber design in SI engine? Explain the few combustion chamber design principles. **[8]**

b) A taxicab is equipped with a flexible fuel four stroke SI engine running on mixture of methanol (CH_3OH) and gasoline (C_8H_{15}) at an equivalence ratio of 0.95. How must the air-fuel ratio change as fuel flow to the engine shifts from 10% methanol to 85% methanol? **[8]**

Q3) a) Explain the combustion stages in a CI engine with the help of p-θ diagram. **[6]**

b) Can Ethanol be an alternate fuel for SI engine? Explain its merits and demerits. **[6]**

c) Explain in brief: Biodiesel as alternate fuel for CI engine. **[4]**

Q4) Write short notes on (any three) **[18]**

a) CI engine fuel rating.

b) MPFI gasoline injection system.

c) CNG engine.

d) Alternate fuels for CI engine.

P.T.O.

SECTION - II

Q5) a) With the help of sketch explain the effect of the following parameters on bsfc. **[6]**

i) Engine speed.

ii) Fuel equivalence ratio.

iii) Engine displacement.

b) What are the factors that affects the power output of an engine? Explain how the supercharging helps to improve the power output. **[6]**

c) Explain any two methods of air-fuel ratio measurement. **[4]**

Q6) a) Why is the compression ratio of SI engine is often reduced when the engine is redesigned to be used with a turbocharger? Explain the effect of reducing compression ratio on brake power and thermal efficiency. **[8]**

b) Explain DI combustion chambers with the help of sketches. **[8]**

Q7) a) A six cylinder, 4.8 L, supercharged engine operating at 3500 rpm has an overall efficiency of 158%. The supercharger has an isentropic efficiency of 92% and a mechanical efficiency in its link with the engine of 87%. Its is desired that the air be delivered to the cylinder at 65ºC and 180 kPa, while ambient conditions are 23ºC and 98 kPa. Calculate: **[8]**

i) amount of aftercooling needed.

ii) engine power lost to run supercharger.

b) Compare air-swirl in CI engine with turbulence in SI engine. **[8]**

Q8) Write short notes on (any three) **[18]**

a) Methods of turbocharging and its limitations.

b) Factors affecting the delay period.

c) Hydrogen engine.

d) Modern starting aids for CI engines.

Total No. of Questions : 10] **[Total No. of Pages : 2**

P1728

[3865] - 505

M.E. (Mechanical) (Design Engg.)

ANALYSIS AND SYNTHESIS OF MECHANISMS

(2008 Course) (502210)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rules, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***
7) ***Solve Graphical Problems on drawing sheets.***

SECTION - I

Q1) a) Give 2 examples each of: **[6]**
   i) Spatial Mechanisms,
   ii) Mechanisms with Multiple Degrees of Freedom,
   iii) Un-constrained kinematic pairs.

b) What is the difference between Degrees of freedom of a kinematic pair and that of a mechanism? How the two are interconnected? **[6]**

c) What are the standard assumptions made in the 'Kinematic Analysis of Mechanisms' **[4]**

Q2) A disc with radius 'R' is rotating in vertical plane, clockwise, with constant angular velocity 'ω' about a fixed center. 'P' is an arbitrary point on its periphery. Derive expression for finding out instantaneous vertical component of linear velocity of point 'P', 't' seconds after the disc starts rotating. **[16]**

Q3) a) Explain the 'Matrix Method' of analysis of mechanisms. **[10]**

b) Can the 'Matrix Method' be applied for analyzing the mechanisms involving springs? If YES, How? If NO, Why? **[6]**

Q4) a) What is the use of 'Bobillier's Constructions'? Explain all Bobillier's constructions with supporting sketches. **[10]**

b) Explain the significance of 'Inflection Circle'. What is its use in Kinematics. **[7]**

P.T.O.

Q5) a) Differentiate between ICR & Center of curvature. How the center of curvature of arbitrary point on an ellipse that is being traced using an elliptical trammel, can be found out using Euler savary equation. **[10]**

b) Write a short note on 'Balls Point and its significance'. **[7]**

SECTION - II

Q6) a) Write a short notes on: **[10]**

i) 'Circle point curve and Center point curve'

ii) Bermester points.

b) Derive 'Freudenstein's Equation' and explain its use. **[6]**

Q7) a) A four bar mechanism is to be synthesized by using three precision points, to generate the function $y = x^{1.5}$, for the range $1<x<4$, Input link is to start from 30° and is to have a range of 90°. The output link is to start at 0° and is to have a range of 90°. Find out values of x, y, θ (input angles) & ϕ (output angles) corresponding to the five precision points. **[8]**

b) Explain the method of synthesis of mechanism for path generation. **[8]**

Q8) a) If Link1, Link2, Link3 & Link4 are Input, Coupler, Output and Ground links respectively and if at a particular instant ω_1, ω_2, ω_3, 0 and α_1, α_2, α_3, 0 are their instantaneous angular velocities and instantaneous angular accelerations respectively, explain how to find out link lengths to satisfy given conditions using Complex Number Method. Hence find link lengths if $\omega_1=5^c/s$, $\omega_2=1^c/s$, $\omega_3= -2^c/s$, $\omega_4=0$ and $\alpha_1=0$, $\alpha_2=10^c/s^2$, $\alpha_3= \alpha_4=0$. **[10]**

b) Explain different defects possible in the synthesized mechanisms. How to overcome these defects. **[6]**

Q9) a) What is the difference between 'Roberts Chebychev Theorem' as applied to Four bar and that to Slider crank mechanism? **[4]**

b) A slider crank mechanism consists of 40mm long crank and obliquity ratio 3. At a particular instant the crank is at 35° with respect to IDC position. 'P' is midpoint of Connecting rod. Draw its cognate mechanisms to trace the coupler curve as traced by point 'P'. **[12]**

Q10)Write Short Notes on: (**Any Three**) **[18]**

a) Point Position Reduction.

b) Denavit-Hartenberg Parameters.

c) Dyad Method.

d) Dwell mechanisms.

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Total No. of Questions : 10] **[Total No. of Pages : 2**

P1728 **[3865]-505**

M.E. (Mechanical-Design Engineering)

ANALYSIS AND SYNTHESIS OF MECHANISMS

(502210) (2008 Course)

Time : 3 Hours] [***Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections mustd be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data wherever necessary.***
7) ***Solve Graphical problems on drawing***

SECTION - I

Q1) a) Give 2 examples each of : **[6]**

i) Spatial Mechasnisms

ii) Mechanisms with Multiple Degrees of Freedom,

iii) Un-constrained kinematic pairs.

b) What is the difference between Degrees of freedom of a kinematic pair and that of a mechanism? How the two are interconnected? **[6]**

c) What are the standard assumptions made in the 'Kinematic Analysis of Mechanism'? **[4]**

Q2) A disc with radius 'R' is rotating in vertical plane, clockwise, with constant angular velocity 'ω' about a fixed center. 'P' is an arbitrary in vertical component of linear velocity of point 'P', 't' seconds after the disc starts rotating. **[16]**

Q3) a) Explain the 'Matrix Method' of analysis of mechanisms. **[10]**

b) Can the 'Matrix Method' be applied for analyzing the mechanisms involving springs? If YES, How? IF NO, Why? **[6]**

P.T.O.

Q4) a) What is the use of 'Bobillier's Constructions'? Explain all Bobillier's constructions with supporting sketches. **[10]**

b) Explain the significance of 'Inflection Circle'. What is its use in Kinematics? **[7]**

Q5) a) Differentiate between ICR and Center of curvature. How the center of curvature of arbitrary point on an ellipse that is being traced using an ellipse that is being traced using an elliptical trammel, can be found out using Euler savary equation. **[10]**

b) Write a short note on 'Balls Point and its significance'. **[7]**

SECTION - II

Q6) a) Explain **[12]**

b) Discuss **[4]**

Q7) a) Explain **[8]**

b) Discuss **[8]**

Q8) a) Explain **[8]**

b) Discuss **[8]**

Q9) a) Explain **[8]**

b) Discuss **[8]**

Q10)Explain in detail the following : **[6×3]**

a) Vanaz

b) Ports

c) New

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Total No. of Questions : 6] **[Total No. of Pages : 1**

P1730

[3865] - 542

M.E. (Electrical Engg.) (Control System)

ADVANCED TOPICS IN CONTROL SYSTEMS

(2008 New Course) (Elective - I) (503105)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Solve any TWO questions from EACH section.***
2) ***Each Question carries equal Marks.***
3) ***Assume suitable data if necessary.***
4) ***Draw neat diagram wherever required.***

SECTION - I

Q1) Explain Continuous Sliding Mode controller in details with its advantages and disadvantages. Also explain the chattering phenomenon. **[25]**

Q2) Explain model reference adaptive control system (MRAC) for plants with unknown relative degree. Also explain robustness of MRAC system. **[25]**

Q3) Consider a system $x(k+1) - G.x(k) + H.u(k)$ **[25]**

$$y(k) = C.x(k)$$

Where $G = \begin{bmatrix} 0 & 1 \\ -0.16 & -1 \end{bmatrix}$ & $H = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$

Determine the suitable state feedback gain matrix such that the system will exhibit deadbeat response. Use Ackerman's formula method.

SECTION - II

Q4) Explain Periodic Output Feedback (POF) and Fast Output Sampling Feedback (FOS) Technique with neat example in details. **[25]**

Q5) What is Artificial Neural network? Explain the structure and function of Biological Neurons. Also explain advantages and disadvantages of ANN.**[25]**

Q6) Explain Training of Artificial Neural Network in details. Give one application of ANN in details. **[25]**

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Total No. of Questions : 12] **[Total No. of Pages : 4**

P1731

[3865] - 546

M.E. (Electrical) Control Systems

SYSTEM IDENTIFICATION AND ADAPTIVE CONTROL

(2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, unprogrammable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define identification of a system. Explain the procedure of identification, with flow-chart. **[8]**

b) Consider the estimate, with usual notations. **[8]**

$$\hat{\theta} = (\phi^T \phi)^{-1} \phi^T y.$$

Assuming that the data satisfy

$$y(t) = \phi^T(t)\theta_0 + e(t)$$

Where e(t) is the stochastic variable with zero mean and variance λ^2.

Prove that the covariance matrix of $\hat{\theta}$ is given by $\text{cov}(\hat{\theta}) = \lambda^2 (\phi^T \phi)^{-1}$

OR

Q2) Consider the FIR model

$y(t) = b_0\, u(t) + b_1\, u(t-1) + e(t)$; $t = 1, 2, ...N$

Where $e(t)$ is a sequence of independent normal random variables with zero mean and standard deviation σ.

a) Determine the regressor vector and parameter vector of the linear regression model. **[6]**

b) Assume input signal is a unit step defined by

$u(t) = 0$ for $t \leq 0$ and $u(t) = 1$ for $t > 0$. **[10]**

Then determine the least square estimate of the parameters b_0 and b_1.

P.T.O.

Q3) a) What conditions must be imposed on the input signal for uniqueness of least square estimate? **[6]**

b) Are the following signals persistently exciting signals? **[12]**

i) Pulse,

ii) Step,

iii) Sinusoid, and

iv) Random signal.

Justify your answer.

OR

Q4) a) Explain how an appropriate model structure is chosen for estimation of the parameters. Draw the relationship between the loss function and the model structure. **[6]**

b) An experiment conducted on a dynamic system gave the following observations:- **[12]**

Samples : k	1	2	3	4	5
Input : u(k)	0	1	0.1667	–0.5	2
Output : y(k)	1	1.25	0.75	0	1.5

Assume model structure as

$$y(k) + a_1\, y(k–1) = b_0\, u(k) + e(k)$$

Where $e(k)$ is the white noise.

Estimate the parameter vector $\hat{\theta} = [a_1\ b_0]^T$.

Q5) a) Classify the different technique of identification of a system. **[8]**

b) Find the prediction error model for the following system: **[8]**

$$y(k) + a_1\, y(k–1) = b_1\, u(k–1) + e(k) + c_1\, e(k–1)$$

OR

Q6) Write detailed notes on any two of the followings:

a) Parametric and non-parametric training methods. **[8]**

b) Learning systems with and without supervision. **[8]**

c) Instrumental Variable Method. **[8]**

SECTION - II

Q7) a) What are the different ideas used while designing the gain-scheduling controller? Explain any one of them. **[8]**

b) Explain Ziglar-Nichol's step response method to determine the parameters of the PID controller. **[8]**

OR

Q8) Consider the process $G(s) = \dfrac{1}{s(s+a)}$

Wher *a* is an unknown parameter.

a) Determine a controller that can give the closed loop system

$$G_m(s)=\frac{w^2}{s^2+2\xi ws+w^2}$$

(Assume here that the parameter "*a*" is known). **[8]**

b) Determine a model-reference adaptive controller based on the MIT rule. **[8]**

Q9) Use Lyapunov theory to show that the following systems are globally asymptotically stable.

a) $\dot{x}_1 = -x_2; \qquad \dot{x}_2 = x_1 - x_2$ **[8]**

b) $\dot{x}_1 = -x_1^3 + x_2; \quad \dot{x}_2 = -2x_1 - 2x_2 - 4x_1^3$ **[8]**

Assume the Lyapunov function candidate as

$V(x) = 4x_1^2 + 2x_2^2 + 4x_1^4$

OR

Q10)a) Define and explain the term "Adaptive controller" and discuss the various adaptive schemes. **[8]**

b) Explain, with neat diagrams, the "Model Reference Adaptive Scheme" (MRAS). **[8]**

Q11) An integrator $Gp(s) = \frac{b}{s}$ is to be controlled by a zero order continuous time controller **[18]**

$u(t) = -s_0 y(t) + t_0\, u_c(t)$.

The desired response model is given by

$$G_m(s) = \frac{b_m}{s + a_m}.$$

Derive, using the Lyapunov theory, a parameter update law of an MRAS guaranteering that the error $e=y-y_m$ goes to zero.

Try the Lyapunov function:

$$V(x) = \frac{1}{2}(e^2 + \frac{1}{b}(bs_0 - a_m)^2 + \frac{1}{b}(b\, t_o - b_m)^2)$$

Where $e(t) = y(t) - y_m(t)$.

OR

Q12) Write detailed notes on any two of the followings:

a) Self-Tuning Regulators(STR) **[9]**

b) The MIT Rule. **[9]**

c) Proof of Matrix Inversion Lemma. **[9]**

$[A+BCD]^{-1} = A^{-1} - A^{-1}B[C^{-1}+DA^{-1}\,B]^{-1}\,DA^{-1}$.

Total No. of Questions : 12] **[Total No. of Pages : 4**

P1732

[3865]-552
M.E. (Electrical) (Control System)
ADVANCED DRIVES AND CONTROL
(2008 Course) (503112) (Elective - IV)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Compare A.C.Drives with D.C.Drives on the basis of the following : **[18]**

a) Conditioning of supply available.

b) Solid state controllers role in the drive.

c) Range of speed control.

d) Torque abilities over the speed range.

e) Operation in closed loop and multiquadrant operation.

f) Maintainance of motor and controllers.

OR

Q2) a) Explain in detail thermal consideration of the given rating of the motor.**[4]**

b) Explain the thermal model. State its importance in the heating and cooling cycle followed in the industrial application like heavy-press-machine.**[6]**

c) Explain closed loop control of the drive. Derive the transfer function of the d.c. motor receiving feed back from the tacho-generator. Comment on the dynamic behaviour of the drive. **[8]**

Q3) a) Three-phase, SCR-converters are commonly used in the control of the d.c. motors for speeds below rated speed. Explain the torque pulsation and effect of wave form of armature voltage and current. **[8]**

P.T.O.

b) Can these converters find its applications for speed control above rated speed of d.c. motor? If yes explain the operation with reference to ability of production of torque of the motor. **[4]**

c) Why choppers are preferred for speed control of D.C. motors? State the applications. **[4]**

OR

Q4) a) Write short note on the "Discontinuous conduction" mode of the armature current in the chopper fed d.c. motor. Comment on the remedies. **[6]**

b) A 200 volts, 875 rpm, 150 Amp, separately excited d.c. motor has R_a = 0.06 ohm and L_a = 2.85 mH. It is fed by a single phase fully controlled bridge converter, with a.c. input of 220 volts, 50Hz calculate the speed of the motor if the delay angle of SCR is 120 degrees, and torque developed by the motor is 1200 N-m. **[10]**

Q5) a) A three-phase, squirrel-cage induction motor is driving certain load. It is to be supplied using one of the following controller.

i) Constant rated frequency, variable voltage.
ii) Variable frequency, variable voltage.

To control the speed below rated speed state the restrictions if any, on the load of the motor, to result wider range of speed variation, using one of the controllers each time. Also compare these controllers on the basis of cost, performance, torque abilities. **[6]**

b) In reference to the waveform of the output voltage of the controllers across the induction motor windings, explain, with the help of the equivalent circuit of induction motor, the effect of

i) The space harmonics.
ii) The time harmonics. **[10]**

OR

Q6) Explain with the help of circuit diagram the control strategy, the technique of reversal of direction of rotation, complexities, number of power components used in voltage source inverter. Also compare the same if current source inverter is employed in speed control of induction motor. **[16]**

SECTION - II

Q7) Explain the effect of variation of waveform of stator currents supplied to the windings of the induction motor by

a) P.W.M inverter with constant volts to frequency ratio.

b) Solid state variable voltage controller. **[16]**

OR

Q8) a) State the methods employed in the speed controller of slip ring induction motor as slip power recovery schemes. Explain with the help of circuit diagram the control strategy of static kramer drive. **[8]**

b) Explain, in connection with speed control of induction motor, the following terms (any two) : **[8]**

i) Scaler control.
ii) Dynamic D.q model.
iii) Direct vector control.
iv) Indirect vector control.

Q9) a) Write a note on "Synchronous Reluctance Motor". **[8]**

b) With the help of rotating frame-equivalent circuit show that the developed torque of synchronous reluctance motor is **[8]**

$$T_e = \frac{3}{2}\left(\frac{p}{2}\right)(\chi_{ds}\ i_{qs} - \chi_{qs}\ id_s)$$

OR

Q10) Explain with reference to synchronous motor.

a) Permanent magnet-motors with solid state controllers. **[8]**

b) Wound field machine drive. **[8]**

Q11) a) With the help of simplified block diagram explain the following in connection with the performance of the controllers in the closed drive system. **[12]**

i) Proportional control.
ii) Derivative control.
iii) Integral control.
iv) PID control.

b) Explain the following terms with reference to above. **[6]**

i) τ_d - Delay time derivative constant.
ii) K_i - Integral gain constant.

OR

Q12) a) Explain the application of phase locked loop (PLL) in closed loop control of the electric drive. **[6]**

b) Explain the industrial application of P.I.D. controller. **[6]**

c) Explain the effect of RMS voltage variation on the behaviour of the electric drive. **[6]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1734

[3865]-590
M.E. (E & TC) (VLSI & Embedded Systems)
EMBEDDED SYSTEM DESIGN
(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are seven operating modes of the ARM-7 Processor? **[10]**

b) Why ARM processor is not perfect RISC architecture but is an embedded processor? **[6]**

Q2) a) How the memories are classified based on write ability and storage permanence? **[8]**

b) What different techniques are used to retain data in NVRAM? **[8]**

Q3) a) What is the significance of market window? How it provides information about percentage of revenue loss? **[8]**

b) Describe the operation of following ARM instructions. **[8]**

i) BX
ii) MLA
iii) MRS
iv) LDR

Q4) Write short notes on the following (any three) : **[18]**

a) Cache replacement policies.

b) Signal Integrity.

c) FPGA programming technologies.

d) ARM bus.

P.T.O.

SECTION - II

Q5) a) In case of UART based serial communication. Explain whether synchronization between transmitter and receiver is essential? Justify your answer. **[10]**

b) What is meant by the term Design Methodology? What are its benefits? **[6]**

Q6) a) What is meant by the term architecture exploration? **[6]**

b) What are the different steps employed in design methodology/design flow? **[10]**

Q7) a) What does a fault simulator do? **[4]**

b) What are the key areas those are needed to be optimized? What are various optimization techniques used? **[12]**

Q8) Write short notes on the following (any three) : **[18]**

a) Boundary scan.

b) Design for test.

c) Built –In-Self Test.

d) Functional design.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1735

[3865]-604

M.E. (E & T/C) (VLSI & Embedded Systems)

SYSTEMS ON CHIP

(Elective - IV) (504192) (2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any THREE questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What do you mean by clock skew? How it can be rectified? Explain it with neat waveform(s) for cases when **[8]**

i) clk1 > clk2

ii) clk1 < clk2 for following Fig. 1a.

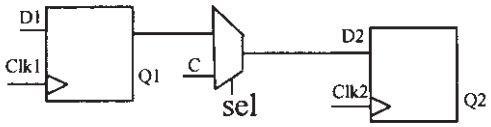

Fig1a

b) Explain "dogleg" algorithm with an example. What are advantages of this algorithm on its other counterparts? **[8]**

Q2) a) Explain significance of CAD tools in SoC design. What kind of improvements you can suggest? **[8]**

b) Define layout routing. How automatic layout routing is playing important role in CMOS fabrication? **[8]**

Q3) a) What kind of economic turbulence is taken place in evaluation of IC technology with respect to Moors law. **[8]**

b) How hot electrons are formed? What is its effect on CMOS operation? **[8]**

P.T.O.

Q4) Explain with an example following adders and compare them over lookahead carry.

a) Carry slip adder. **[6]**

b) Carry select adder. **[6]**

c) Manchester carry chain. **[6]**

SECTION - II

Q5) a) Compute and plot the Elmore delay for metal-1 wire of size 4000 $\lambda \times 4\lambda$ using : **[8]**

i) 2-sections. ii) 4-sections.

iii) 8-sections.

b) Differentiate : RC Vs RLC model for interconnect. Explain Ismile and Fredman's contribution in regard to inductive delay. **[8]**

Q6) a) Differentiate MTCOMS over VTCMOS. How VTCMOS overcome problem of MTCMOS? **[8]**

b) Explain : **[8]**

i) Dynamic latch. ii) Static latch.

iii) Multiplexed latch. iv) Re-circulating latch.

Q7) a) Show how bit serial adder adds the two nibble, A = "0101" and B = "0110" (fist bit is MSB). Show the adders input and outputs for every clock cycle until the addition is complete. **[8]**

b) What are requirements of clocking in pipeline? Explain it with waveforms. **[8]**

Q8) a) Why an output pad does not require electrostatic discharge protection circuitry? **[3]**

b) Determine the present state, next state and output Y = '1' and Z = '1' for either of "10001" or "10010" string recognizer respectively with finite state machine having the input string for example X = "10010101110 ....." Assume the machine starts in state bit 1.**[15]**

i) Draw FSM which can detect both strings.

ii) Write VHDL code for above FSM.

iii) Write Test Bench for above VHDL code which will cover all test conditions.

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Total No. of Questions : 10] **[Total No. of Pages : 3**

P1736

[3865] - 628

M.E. (Electronics) (Digital Systems)

MACHINE INTELLIGENCE

(2008 Course) (Elective - II) (504198)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare and contrast conventional artificial intelligence and machine intelligence. List the characteristics of the soft computing. **[8]**

b) With the help of suitable example explain the process of membership formulation. What are different classes of parameterized membership function of one dimension? **[8]**

Q2) a) Develop a reasonable membership function for the following fuzzy sets based on age parameter **[8]**

i) Old
ii) Young
iii) Very old
iv) Not young
v) Not old

b) Draw and explain the block diagram of Mamdani type fuzzy inference system. **[8]**

Q3) a) Discuss in detail concept of Max-Min and Max-Product composition. Let R and S be two fuzzy relations defined as **[10]**

$$R=\begin{bmatrix} 0.6 & 0.6 & 0.9 & 0.8 \\ 0.1 & 0.2 & 0.9 & 0.8 \\ 0.9 & 0.3 & 0.4 & 0.8 \\ 0.9 & 0.8 & 0.1 & 0.2 \end{bmatrix} \text{and} S=\begin{bmatrix} 0.1 & 0.2 & 0.7 & 0.9 \\ 1 & 1 & 0.4 & 0.6 \\ 0 & 0 & 0.5 & 0.9 \\ 0.9 & 1 & 0.8 & 0.2 \end{bmatrix}$$

Where, R is fuzzy relation between P and D, S is fuzzy relation between D and M. Obtain the degree of relevance between P and M using Max-Product composition. Compare the result with Max-Min Composition.

P.T.O.

b) Discuss with suitable example the process of fuzzy reasoning used for multiple rules with multiple antecedents. **[6]**

Q4) a) Discuss in detail the working of defuzzifier used to convert fuzzy set to Crisp value. Compare various defuzzification schemes used for obtaining the crisp output. **[8]**

b) With suitable examples explain the process of constructing composite linguistic terms. **[8]**

Q5) Write short notes on (Any Three) **[18]**

a) Set Theoretic operations.

b) Derivative based optimisation.

c) Tsukamoto fuzzy models.

d) Least squares estimator.

e) System identification process.

SECTION - II

Q6) a) What is perceptron? With suitable inputs explain how two layer perceptron can be used to solve 2-input XOR problem. Assume step function as the activation function for each node. **[8]**

b) Describe in detail the backpropagation learning rule for multilayer perceptron (MLP). What are different methods used for speeding up of MLP training? **[8]**

Q7) a) What is dynamic programming? Describe the process of formulation of classical dynamic programming. **[8]**

b) What is Kohonen self organizing networks? Give the sequential description of how to train a Kohonen self organizing network. **[8]**

Q8) a) Describe in detail Learning Vector Quantization (LVQ) data classification method. What are the steps involved in LVQ implementation? **[8]**

b) Describe in detail the content addressable nature of the Hopfield network. Compare and contrast between binary Hopfield networks and continuous Hopfield networks. **[8]**

Q9) a) Draw and explain Adaptive Neuro-Fuzzy Inference System (ANFIS) architecture for two input first order Sugeno fuzzy model with two rules. Describe in detail the two passes in the hybrid learning procedure for ANFIS. **[8]**

b) What are different data clustering algorithms? Discuss in detail K-means clustering algorithm. **[8]**

Q10) Write short notes on (Any Three) **[18]**

a) Adaptive networks.

b) Radial Basis Function Network.

c) Neuro Fuzzy control

d) Principal Component Analysis.

e) Reinforcement Learning.

P1737

[3865]-644
M.E. (Production Engg.)
RELIABILITY AND FAILURE ANALYSIS
(Revised Course 2008) (511104)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable electronic calculators is allowed.***

SECTION - I

Q1) a) Referring to Fig.1, if the lifetimes of the body, power train electrical and chassis subsystems are exponentially distributed with $\lambda_1 = 5.1 \times 10^{-4}$, $\lambda_2 = 6.3 \times 10^{-4}$, $\lambda_3 = 5.5 \times 10^{-5}$ and $\lambda_4 = 4.8 \times 10^{-4}$ failures per 1000 miles, respectively. Calculate the reliability of the vehicle at 36,000 miles and the mean mileage to failure. **[8]**

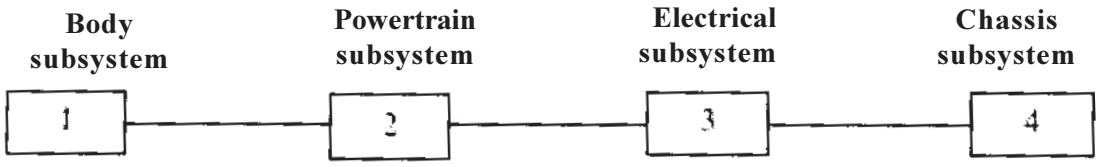

Fig.1

b) Fig.2 shows mixed configuration system. The reliability of elements are given as $R_1 = 0.88$, $R_2 = 0.85$, $R_3 = 0.92$, $R_4 = 0.96$, $R_5 = 0.86$, $R_6 = 0.99$, $R_7 = 0.95$, $R_8 = 0.98$. Find the system reliability. **[8]**

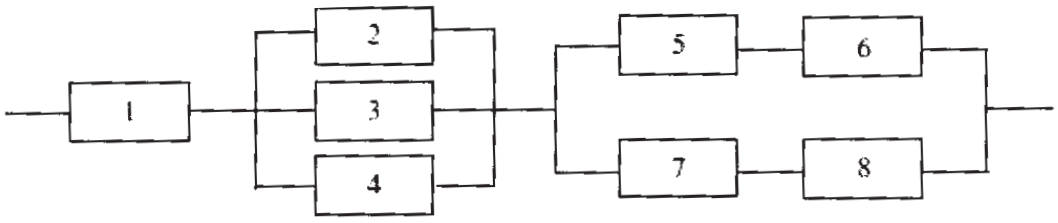

Fig. 2

Q2) a) A web host has five independent and identical servers connected in parallel. At least three of them must operate successfully for the web service not to be interrupted. The server life is modeled with the exponential distribution with $\lambda = 2.7 \times 10^{-5}$ failures per hour. Calculate the mean time between failures (MTBF) and the reliability of the web host after one year of continuous service. **[8]**

b) Construct a fault tree for the circuit shown in Fig.3, where the top event is "blackout". Convert the fault tree to a reliability block diagram. **[8]**

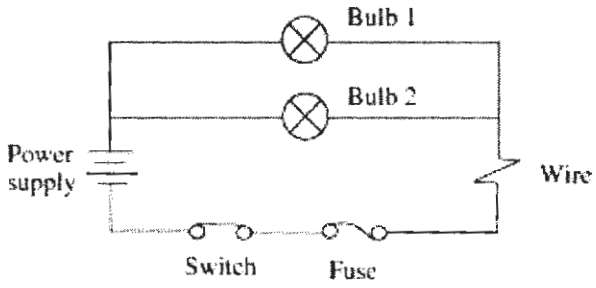

Fig.3

Q3) Derive an expression for reliability of the system shown in Fig.4 using conditional probability method. If the reliability values of each element is given as $R_1 = 0.98$, $R_2 = 0.95$, $R_3 = 0.99$, $R_4 = 0.96$, $R_5 = 0.88$ find system reliability. Also use star-delta method to find system reliability. Compare the results obtained by these two methods. **[16]**

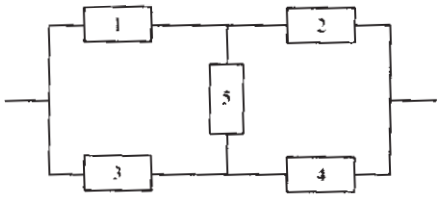

Fig.4

Q4) a) Explain the correlations and differences between the following terms used in design FMEA and FTA : **[8]**

i) Failure mode and top event.
ii) Failure mechanism/cause and basic event.
iii) Failure effect and intermediate event.
iv) Occurrence and failure probability.

b) The system consists of sensing, diagnosis, and indication subsystems, where the sensing and diagnosis subsystems are essential for the system to fulfill the intended functions. Failure of the indication subsystem causes the system to fail at an estimated probability of 0.85. In the case of indicator failure, it is possible that a component failure is detected by the driver due to poor drivability. Determine the reliability targets for the subsystems in order to satisfy the system reliability target of 0.99 in a driving cycle of 12 hours. Table gives the data necessary to solve the problem. **[8]**

Subsystem Number	Subsystem	Number of Modules	Importance	Operating Time (h)
1	Sensing	12	1	12
2	Diagnosis	38	1	12
3	Indication	6	0.85	6

Q5) Write short note on following (any three) : **[18]**

a) Graph Theory.

b) Matrix method of reliability evaluation.

c) Risk Priority Number.

d) Probability distributions.

e) Symbols in fault tree construction.

SECTION - II

Q6) a) A power-generating plant is installed with five identical generators running simultaneously. For the plant to generate sufficient power for the end users, at least three of the five generators must operate successfully. If the time to failure of a generator can be modeled with the exponential distribution with $\lambda = 3.7 \times 10^{-5}$ failures per hour, calculate the reliability of the plant at 8760 hours. **[8]**

b) The following data refer to predicted reliability of eight components in series. In case the desired reliability of the system is not fall below 0.85 find the reliability goal for individual components. **[8]**

Components	1	2	3	4	5	6	7	8
Predicted reliability	0.992	0.995	0.990	0.996	0.990	0.985	0.95	0.98

Q7) a) The following data refer to a short sample reliability test of an engineering instruments : **[8]**

Failure No.	1	2	3	4	5	6	7	8	9	10
MTTF (Hrs)	10	15	8	13	20	22	21	32	28	35

Calculate the reliability by

i) Mean and

ii) Median ranking methods and also plot the variation of reliability against time.

b) A system consists of three subsytems A, B, C having failure rates 0.002, 0.004 and 0.008 respectively per hour. If the mission time is 25 hours and the system reliability required is 0.95, find the failure rate as well as reliability of each subsystem for the entire mission period, using ARINC method. State any assumptions used. **[8]**

Q8) a) The mean strength and the standard deviation of a bolted joint are 3000kg/cm^2 and 300kg/cm^2 respectively. The joint is loaded such that stress induced has a mean value of 2500kg/cm^2 with a standard deviation of 50kg/cm^2. Assuming that shear strength and the induced stresses are independent and normally distributed, find out the probability of survival of the bolted joint. Extract of data from statistical table is given below : **[8]**

Z	1.2	1.3	1.4	1.5	1.6	1.7	1.8
Φ(Z)	0.8849	0.9032	0.9192	0.9331	0.9452	0.9550	0.9640

b) Explain K-statistic method for reliability evaluation. **[8]**

Q9) a) State the method to predict the condition of machine based on ferrography. **[8]**

b) Explain Spectroscopic Oil Analysis Program (SOAP) in condition monitoring. **[8]**

Q10) Write short notes on (any three) : **[18]**

a) Vibration signature analysis.

b) Life cycle cost model.

c) Accelerated life reliability testing.

d) Loading roughness and safety margin.

e) Reliability effort function.

Total No. of Questions : 10] **[Total No. of Pages : 2**

P1738

[3865]-659

M.E. (Production Engg.)

RESEARCH METHODOLOGIES

(511112) (Revised Course 2008)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable electronic calculators is allowed.***

SECTION - I

Q1) a) Explain with example descriptive and experimental research. **[8]**

b) Explain the process of carrying out the research. **[8]**

Q2) a) Why it is necessary to design a research problem? Explain in brief. **[8]**

b) Give the guidelines for designing experiment. **[8]**

Q3) a) Explain factorial design of experiment. **[8]**

b) Explain randomization and blocking in experimental design. **[8]**

Q4) a) Describe the devices used in data collection in research. **[8]**

b) What are the types of data to be collected for performing the research? **[8]**

Q5) Write short note on following (Any Three) : **[18]**

a) Primary & secondary data.

b) Good design features.

c) Objectives of research.

d) Pilot study & pretest of tools.

P.T.O.

SECTION - II

Q6) a) Explain the general regression significance test. **[8]**

b) How to determine the sample size for carrying out the test? **[8]**

Q7) a) Give the measures of central tendency. **[8]**

b) Explain the TOPSIS method for decision making. **[8]**

Q8) a) Explain the process of Analytical Hierarchy Process for carrying out decision making amongst alternative options. **[8]**

b) How the genetic algorithm tool is used for optimizing the decision making criteria and for getting the better result? **[8]**

Q9) a) Explain the techniques of interpretation. **[8]**

b) Explain the various steps followed while writing a report. **[8]**

Q10) Write short notes on (Any Three) : **[18]**

a) Chi-square test.

b) Data envelop analysis.

c) Significance of report writing.

d) Neural network method.

e) Simulated annealing.

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Total No. of Questions : 8] **[Total No. of Pages : 02**

P1739

[3865] - 676

M.E. (Computer)

SOFTWARE DESIGN AND ARCHITECTURE

(2008 Course) (Elective - III)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Question No.4 and 8 are compulsory. Out of the remaining attempt two questions from Section I and two questions from Section II.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain how maximizing cohesion and minimizing coupling leads to more maintainable systems? **[8]**

b) Explain how design reusability can be achieved. **[8]**

Q2) a) Describe and differentiate stepwise refinement and incremental design. **[9]**

b) Explain in brief Jackson Structured Programming. **[7]**

Q3) a) Explain with example functionality-based architectural design. **[10]**

b) Explain the simulation-based assessment of software architectures. **[6]**

Q4) a) What are goals of architecture assessment? **[3]**

b) Explain the following architectural styles **[5]**

i) Pipes

ii) Filters

c) Write short note on: **[10]**

i) Component-based design.

ii) Design notations.

P.T.O.

SECTION - II

Q5) a) With suitable diagram explain Global Analysis Activities. **[8]**

b) Explain in brief Execution Architecture view. **[8]**

Q6) a) What are traces? Explain any three trace-based notations. **[8]**

b) Who are the stakeholders of interface documentation? What information they require about interface? **[8]**

Q7) a) Explain Customer Relationship Management Archetype Pattern. **[8]**

b) What are the difference between Archetype patterns and analysis patterns? Explain in brief Pleomorphism. **[8]**

Q8) a) Why Architects prepare view packets? **[3]**

b) What is meant by trivialization of business requirements? **[3]**

c) What is Rule Element archetype? **[3]**

d) Write short notes on: **[9]**

i) Traceability of code architecture view.

ii) Usage of Conceptual Architecture view.

iii) The Product archetype pattern.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1740

[3865]-694
M.E. (Chemical)
MANAGEMENT OF RESEARCH AND DEVELOPMENT IN CHEMICAL INDUSTRY
(2008 Course) (509102)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Establish relation of R & D growth to G.D.P. growth of a country. Correlate growth in research in field of chemical fertilizer sector which had impact on GDP improvement of mankind. **[16]**

Q2) What is the role of manpower management in research and development in industry? What are the ways to prepare various skilled manpower needed for R&D? Explain with example. **[17]**

Q3) What is interdisciplinary research? Explain with at least one example, the nature of difficulties involved in managing interdisciplinary research than for a purely conventional chemical engineering field. **[17]**

Q4) What are PERT & CPM techniques? How can they be utilized to better the outputs in reactive membrane operation? **[16]**

SECTION - II

Q5) How according to you the chemical engineering research is poised for development in the coming decade. Discuss. **[16]**

Q6) What are the developments in research to save the earth planet from Green House effect? **[16]**

P.T.O.

Q7) What are vision and creativity? How a planned research be strengthened by visionary technocrats? What are the qualities to be a visionary? Give one example in Indian context. **[16]**

Q8) Write short notes (any three) : **[18]**

a) Developments in Hydro Fluoro Carbon research.

b) Research for modifications in existing chemical processes.

c) 'Fruitful' research.

d) Natural rate of growth of economy Vs Rate of growth of Chemical Industry.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1741

[3865]-701-A
M.E. (Chemical)
PROCESS OPTIMIZATION
(2008 Course) (Open Elective)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Minimize $f(x) = x^3 + x^2 + 24/x$. Use

a) Fibonacci Search Method

b) Golden Search Method.

Write complete algorithm for these methods and demonstrate at least 3 steps towards finding optimized solution for the above function $f(x)$. **[16]**

Q2) Minimize $f(x) = x^3 - x^2 - x$ in the interval [–3 3]. Use

a) Newton Raphson Method.

b) Secant Method.

Write complete algorithm for these methods and demonstrate at least 3 steps towards finding optimized solution for the above function. **[16]**

Q3) Why there is a need of optimization in Chemical processes? Give a few examples in Chemical process industry. Formulate a maximization problem for maximizing product C for reversible first order rate expressions $A \leftrightarrow B + C; \Delta H = -ve; C \leftrightarrow D \Delta H = +ve$ in a batch reactor. Assume other data. **[16]**

Q4) Write short notes on any TWO : **[18]**

a) Necessary Conditions.

b) Internal Halving Method.

c) Lagrangian Multipliers.

d) Parameters used in distillation column optimization.

P.T.O.

SECTION - II

Q5) How to decide whether a function is a convex or concave? Decide concavity/ convexity of $f(x) = 3x_1^2 + 4x_1x_2 + 2x_2^2 + 8x_1 + 9x_2 + 32.$ How it is useful in deciding numerical solution in optimization? **[16]**

Q6) Solve by linear proframming technique. **[16]**

Min $-x_1 - 4x_2 - 3x_3$

Constraints $2x_1 + 2x_2 + x_3 \leq 4$

$x_1 + 2x_2 + 2x_3 \leq 6$

$x_1 \geq 0;\ x_2 \geq 0; x_3 \geq 0$

Q7) Explain the Simplex Search Method and demonstrate for minimization of $f(x) = 2x_1^2 + 3x_2^2 + 3$ starting at $(x^0)^T = [1\ 1]$ in the direction $S^0 = [-4\ -1]^T$. Perform 4 steps. **[16]**

Q8) Write short notes on any TWO : **[18]**

a) Quadratic Programming.

b) Sensitivity Analysis.

c) Kuhn Tucker Conditions.

d) Positive Definite and Positive Definite Functions.

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Total No. of Questions : 8] **[Total No. of Pages : 02**

P1742

[3865] - 708

M.E. (Chemical)

ADVANCED REACTION ENGINEERING

(2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Derive an expression for the Shrinking core model and show the concentration profile at different times at inner core radius of the particle? **[16]**

Q2) The exothermic reaction

$$A \rightarrow B + C$$

was carried out adiabatically and the following data recorded:

X	0	0.2	0.4	0.45	0.5	0.6	0.8	0.9
$-r_A$(mol/dm^3.min)	1.0	1.67	5.5	5.5	5.5	5.5	1.50	1.01

The entering molar flow rate of A was 350 mol/min.

a) What are the PFR and CSTR volumes necessary to achieve 40% conversion?

b) Over what range of conversions would the CSTR and PFR reactor volumes be identical? **[16]**

Q3) The first-order reaction A→B is carried out in a 10cm diameter tubular reactor 6.36 m in length. The specific reaction rate is 0.25 min^{-1}. The results of a tracer test carried out on this reactor are shown in following table:

T (min)	0	2	4	6	8	10	12	14
C (mg/L)	0	5	10	6	3.5	2.0	0.82	0

Calculate conversion using

a) the closed vessel dispersion model,

b) the tanks-in-series model. **[18]**

P.T.O.

Q4) Write a note on (Any Three) **[18]**

a) Effective Diffusivity and tortuosity factor.
b) Analysis of non ideal reactor.
c) Hinshelwood model.
d) Tank in series model.

SECTION - II

Q5) A first order heterogeneous irreversible reaction is taking place within spherical catalyst pellet which is plated with platinum throughout the pellet. The reactant concentration halfway between the external surface and the center of the pellet is equal to one tenth the concentration of pellet's external surface. The concentration at external surface is 0.001 g mol/dm^3 the diameter is 2 x 10^{-3} cm and the diffusion coefficient is 0.1 cm^2/s. Reaction is :: $A \rightarrow B$

a) What is the concentration of the reactant at distance of 3 x 10^{-4} cm in from the external pellet surface.
b) To what diameter should the pellet be reduced if the effectiveness factor is to be 0.8? **[16]**

Q6) Explain the significance of the Mear's criterion for external diffusion and derive an expression for conversion in packed bed reactor. **[16]**

Q7) Derive the equation of a first-order reaction using the segregation model when the RTD is equivalent to

a) an ideal PFR,
b) an ideal CSTR, and
c) a laminar flow reactor.

Compare these conversions with those obtained from the design equation. **[18]**

Q8) Write a note on (Any Three) **[18]**

a) Slurry reactor
b) Significance of multiple reactor design
c) Two parameter Model
d) Isothermal Vs adiabatic fixed bed reactor.

Total No. of Questions : 8] [Total No. of Pages : 2

P1743

[3865]-711

M.E. (Chemical)

CATALYSIS AND SURFACE PHENOMENA

(2008 Course) (Open Elective) (509112)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) With neat sketch explain the steps which occur when gas molecule strikes the surface of a catalyst. **[6]**

b) Explain adsorption kinetics using Elovich equation. **[8]**

c) What is effective diffusivity? **[4]**

Q2) a) Explain gas adsorption method for estimating pore volume and diameter. **[8]**

b) What are the geometric pore model? Explain any two. **[8]**

Q3) a) Describe any two types of hysteresis loops. **[8]**

b) What is the importance of pore structure and pore surface area in heterogeneous catalysis? **[8]**

Q4) Explain any two of the following: **[16]**

a) X-ray photoelectron spectroscopy (XPS).

b) Nuclear magnetic resonance (NMR).

c) BET Theory.

P.T.O.

SECTION - II

Q5) a) What are spinels? State their characteristics. **[8]**

b) Explain effect of mass transfer on catalyst activity. **[8]**

Q6) a) Explain steady state model of catalyst deactivation. **[8]**

b) Explain catalyst deactivation in detail and state the reasons due to which deactivation may occur. **[8]**

Q7) a) Describe industrial catalyst preparation methods. **[8]**

b) Explain Fischer-Tropsch Catalysis. **[8]**

Q8) Write short notes on: **[18]**

a) Catalyst monolith.

b) Catalyst poisoning.

c) Langmuir Hinshelwood model.

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Total No. of Questions : 6] **[Total No. of Pages :1**

P1744

[3865]-736
M.E. (Petroleum Engineering)
OIL AND GAS FIELD DEVELOPMENT
(2008 New Course) (512104) (Elective - Ic)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answers to the two sections must be written in separate answer books.***
2) ***Answer two questions from each section.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams should be drawn wherever necessary.***
5) ***Use of a non-programmable calculator is allowed.***
6) ***Assume suitable data if necessary and clearly state it.***

SECTION - I

Q1) Explain how Geology and type of reservoir affect planning and development of the field? **[25]**

Q2) What field data is required for development of an oil field? **[25]**

Q3) What core data is required for an oil field development assuming one well is drilled where oil has been found? **[25]**

SECTION - II

Q4) What are the different numerical and analytical methods which affect field development? Which is the most powerful and why? **[25]**

Q5) Explain the special development of Offshore Marginal Oil Fields. **[25]**

Q6) What is EOR? Explain in brief any one method. At what stage is planning done for this in field development? **[25]**

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Total No. of Questions : 6] **[Total No. of Pages : 1**

P1745

[3865] - 740

M.E. (Petroleum Engineering)

WELL TESTING AND ANALYSIS

(New 2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer two questions from each section.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams should be drawn wherever necessary.***
5) ***Use of a non-programmable calculator, log-log, semi-log paper is allowed***
6) ***Assume suitable data if necessary and clearly state it.***

SECTION - I

Q1) Derive the diffusivity equation in cartesian coordinate system. **[25]**

Q2) Derive the formula for Skin from the Ei solution. **[25]**

Q3) Derive the Bessels solution to the diffusivity equation. **[25]**

SECTION - II

Q4) State the complete methodology in analysis of a Drill Stem Test. **[25]**

Q5) State the complete methodology in analysis of horizontal wells. **[25]**

Q6) Explain Pressure Build up test for gas wells using pseudo pressure, pressure squared and pressure analysis. Which is the best and why? **[25]**

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Total No. of Questions : 6] **[Total No. of Pages : 01**

P1746

[3865] - 745

M.E. (Petroleum Engineering)

ARTIFICIAL LIFT TECHNIQUES

(New Course 2008) (512111) (Elective - IIIa)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections must be written in separate answer books.***
2) ***Answer two questions from each section.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams should be drawn wherever necessary.***
5) ***Use of a non-programmable calculator is allowed.***
6) ***Assume suitable data, if necessary and clearly state it.***

SECTION - I

Q1) Explain in detail different workover operations. **[25]**

Q2) Draw the IPR, Outflow Performance and Tubing in-take Curves and explain in detail. **[25]**

Q3) Compare and contrast Continuous and intermittent gas lift. **[25]**

SECTION - II

Q4) Explain dynagraph card in SRP **[25]**

Q5) Explain Hydraulic Fracturing in detail. **[25]**

Q6) Explain Nodal analysis. **[25]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1747

[3865] - 760

M.E. (IT)

GEOGRAPHICAL INFORMATION SYSTEMS

(2008 Course) (Elective - II) (514405)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Question No.4 and 8 are compulsory. Out of the remaining attempt two questions from Section I and two questions from Section II.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the main software components of a geographical information system. **[4]**

b) Explain the stages involved in creating a GIS data model. **[4]**

c) Explain various types of Raster and Vector GIS Models. **[8]**

Q2) a) Explain the various approaches to represent spatio-temporal data. **[9]**

b) What are the factors affecting the quality of spatial data? **[7]**

Q3) a) Explain the various sensor parameters in detail. **[9]**

b) What is SAR imaging? Explain in detail with suitable diagram. **[5]**

c) Comment on interpretation of SAR images. **[2]**

Q4) Explain the following in brief: **[18]**

a) Grid system.

b) Radar scattering mechanism.

c) Topographical mapping.

d) Visual hierarchy.

e) Overlay.

f) Reclassification.

P.T.O.

SECTION - II

Q5) a) What are the basic elements of image interpretation in the systematic study of satellite imagery. **[8]**

b) Explain the image transformations relevant for remote sensing community. **[8]**

Q6) a) Explain the basic steps in kriging. Explain the variations of kriging. **[8]**

b) What is interpolation? What is its significance to spatial data. **[4]**

c) What are the common data transformations? Why they are necessary? **[4]**

Q7) a) Write a note on land cover system in India. **[8]**

b) Explain the role of satellite imagery in urban development. **[4]**

c) Considering any example, explain the spatial data processing. **[4]**

Q8) Explain the following

a) Types of maps with examples. **[6]**

b) Remote sensing data products. **[6]**

c) Uses of Digital Elevation models. **[6]**

Total No. of Questions : 10] **[Total No. of Pages : 2**

P1748

[3865]-854
M.E. (Civil) (Environmental Engg.)
AIR POLLUTION AND CONTROL

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is Air Pollution? Write about sources and classification of Air Pollutants. **[10]**

b) What are the effects of major air pollutants on human health? **[8]**

Q2) a) Write about Green house Gas effect. **[8]**

b) What are the effect of Air Pollution on material? **[8]**

Q3) a) Write about important meteorological parameters influencing air pollution. **[8]**

b) Explain with sketch any four types of plume behavior. **[8]**

Q4) a) Write about Gaussian Plume Model. **[8]**

b) Determine effective height of stack with following data. **[8]**

i) Physical stack height 205m with 1.07m inside diameter

ii) Wind Velocity 3.56 m/s

iii) Air Temp. $13^{o}C$.

iv) Barometric Pressure 1000 milibars.

v) Stack gas velocity - 9.14 m/s

vi) Stack gas temp. $140^{o}C$.

Q5) Write short notes (any four) **[16]**

a) Inversion

b) Windrose diagram

P.T.O.

c) Lapse Rate.

d) Wind speed recorder.

e) Smog.

SECTION - II

Q6) a) Explain with sketch working of gravitational settling chamber and calculate minimum size of particle which will be removed with 100 percent efficiency under following conditions, **[10]**

Air – Horizontal velocity – 0.3 m/s

Temp – 77°C,

Viscosity 2. 1×10^{-5} kg/ms

Specific gravity of particle is 1.5

Chambers - Length 8m

Height 1.5 m

b) Explain with sketch and proportion. Cyclone separators. **[8]**

Q7) a) Explain with sketch Bag House filters. **[8]**

b) An electrostatic precipitator is tobe constructed to remove fly-ash particles from stack gases flowing at $10m^3/s$ and drift velocity 3.0×10^5 dp m/s. Determine plate area required to collect a 0.5 μm particle with **[8]**

i) 90 percent efficiency.

ii) 95 percent efficiency.

Q8) a) Explain control methods of NOx. **[8]**

b) Explain control methods of SOx. **[8]**

Q9) a) Global problems of Air pollution. **[8]**

b) Air Act in India. **[8]**

Q10) Write short notes (any four) **[16]**

a) Air Quality standards.

b) Stack sampling.

c) Scrubbers.

d) Adsorption.

e) Automobile pollution.

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1749

[3865] - 860

M.E. (Civil) (Environmental Engineering)

PRINCIPLES AND DESIGN OF BIOLOGICAL TREATMENT SYSTEM

(501505) (Elective - II)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any THREE questions from each section.***
2) ***Answers to the two sections should be written in separate books***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables Moody diagram is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain objectives of biological treatment. **[6]**

b) Explain bacterial growth curve. **[6]**

c) Differentiate between suspended and attached growth system. **[4]**

Q2) a) Write note on wastewater sampling methods. **[6]**

b) Explain different factors affecting bacterial growth rate. **[6]**

c) Explain wastewater Flow measurement. **[4]**

Q3) a) A grit chamber is designed to remove particles with a diameter of 0.2 mm specific gravity 0.65, setting velocity of these particles had been found to range from 0.016 to 0.022m/s, depending on their shape factor. A flow through velocity of 0.3 m/s will be maintained by proportioning weir. Determine the channel dimensions for a Maximum wastewater flow of 10000 m^3/d. **[8]**

b) List different aeration system and explain any one in detail. **[8]**

Q4) a) Explain control of volatile organic compounds in wastewater. **[6]**

b) Explain different methods of odour control. **[6]**

c) Explain different types of screens. **[6]**

P.T.O.

SECTION - II

Q5) a) A municipal waste having a BOD_5 200 mg/L is to be treated by a two stage tricking filter. The effluent quality is 20 mg/L of BOD_5. If both of the filter depths are to be 2 M and the recirculation ratio is 2 : 1. Find the required filter diameters and hydraulic loading of each Filter. Assume Q = 7 MLD, Wastewater temperature = 20ºC and that E1 = E2. **[8]**

b) List the modification processes in activated sludge process and explain any two in detail. **[8]**

Q6) a) Estimate the size of anaerobic digester required to treat the sludge from a primary treatment plant designed to treat 40 MLD of waste water. Check the volumetric and estimate the percent stabilization and amount of gas produced per capita per day. For the wastewater to be treated, it has been found that the quantity of dry solids and BOD_L removed is 0.15 kg/m^3 and 0.14 kg/m^3 respectively. Assume that the sludge contains about 95% moisture and has a specific gravity of 1.02 other design assumptions are as follows. **[12]**

i) The hydraulic regime of the reactor is complete mix.

ii) θC = 10 day at 30ºC.

iii) Efficiency of waste utilization E = 0.60

iv) The sludge contains adequate nitrogen and phosphorus for biological growth.

v) Y = 0.05 kd = 0.03 d^{-1}

vi) Constants are for a temperature of 35ºC.

b) List the modifications in UASB process and explain any one in detail. **[6]**

Q7) a) Explain different sludge disposal methods. **[8]**

b) List the different operational maintenance problems for sewage treatment plant. **[4]**

c) Write note on - Trouble shooting. **[4]**

Q8) a) Wastewater flow from a small community averages 3000 m^3/d during the winter and 5000 m^3/d during the summer. The average temperature of the coldest month is 10ºC and the average temperature of the warmest month is 30ºC. The average BOD_5 is 200 mg/L with 70 percent being soluble. The reaction coefficient k is 0.23 d^{-1} at 20ºC and the value of Φ is 1.06. Prepare a preliminary design for a facultative pond treatment system for the community to remove 90 percent of soluble BOD. **[12]**

b) Explain different methods of disposal of digested sludge. **[4]**

Total No. of Questions : 8] **[Total No. of Pages :2**

P1750

[3865]-867
M.E. (E & T/E) (Communication Network)
ADHOC NETWORKS

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) What are the design issues of MAC protocol for Ad hoc wireless Network? **[9]**

b) What are the disadvantages of the binary exponential back-off mechanism used in MACA? How are they overcome in MACAW? **[9]**

Q2) Explain the following Routing Protocols. **[16]**

a) Cluster Head Gateway Switch Routing Protocol (CGSR).

b) Dynamic Source Routing Protocol (DSR).

Q3) a) What are the two approaches for maintenance of multicast tree in bandwidth efficient multicast routing protocol (BEMRP)? Which of the two perform better? Why? **[8]**

b) Explain the Multichannel MAC protocol? **[8]**

Q4) a) Explain the Dynamic core-based multicast routing protocol. **[8]**

b) Explain the application controlled transport protocol (ACTP). **[8]**

SECTION - II

Q5) a) What are the energy management schemes? Explain the battery management schemes? **[9]**

b) What are the battery scheduling techniques? Explain **[9]**

i) Round Robin technique.

ii) Random technique.

P.T.O.

Q6) a) What are the design issues of multicast routing protocol for Ad hoc wireless Network? **[8]**

b) Enlist various applications of Ad hoc wireless Network and explain any two of them in brief. **[8]**

Q7) a) Explain the network security attacks. **[8]**

b) Explain the QoS enabled on-demand distance vector Routing Protocol (AODV). **[8]**

Q8) a) Explain the INSIGNIA QoS framework. **[8]**

b) Explain the SWAN model. **[8]**

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Total No. of Questions : 8] **[Total No. of Pages : 3**

P1751

[3865] - 869

M.E. (E&TC) Communication Networks

NETWORK ARCHITECTURE AND DESIGN

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any THREE questions from each section.***
2) ***Answers to the two sections should be written in separate answer books***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What do you mean by system in contest to Network analysis, architecture, and design? What are different systems attributes? **[8]**

b) Define: **[8]**

i) Service metric
ii) Service request
iii) Service offering
iv) Service levels

Q2) a) What are key characteristics of a network architecture and design that affect the post implementation costs? Also give suitable their examples.**[8]**

b) Why is requirements analysis important to network architecture and design? Give three reasons. **[8]**

Q3) a) Which of the following customer requirements could be categorized as mission-critical? As rate-critical? As real-time? As none of these? Give reasons for each choice. **[8]**

i) Processing telemetry data from a space shuttle launch and providing that data to mission control during launch. (Customer: ISRO.)
ii) Processing requests from automated teller machines throughout a city. (Customer: bank)
iii) Processing requests for Web pages from your servers. (Customer: Internet service provider).

b) Consider a network project in which you cannot talk to users or staff. What resources can you use to gather user, application, device, and network requirements? Briefly outline a method for gathering and deriving requirements in the absence of user and staff involvement. **[8]**

P.T.O.

Q4) a) Explain role of security component architecture in contest to network architecture design. **[6]**

b) Explain in detail Flowspec algorithm and which rules it applies. **[6]**

c) Given an MTBCF requirement of 8000 hours and an MTTR requirement of 4 hours, calculate an availability requirement. **[6]**

SECTION - II

Q5) a) Compare and contrast **[8]**

i) Hierarchical client-server Vs Distributed computing

ii) DiffServ Vs IntServ

b) Which policies and procedures one should adopt for security of network. **[8]**

Q6) a) For each of the following situations, would you recommend routing or switching? Explain your choices. **[8]**

i) A workgroup of 100 workstations within a building using client-server applications and sharing a common IP subnet address.

ii) Connecting your customer's LAN to the internet via a dedicated T1 from an ISP:

iii) A backbone between several organizations within a corporation. Each organization wants to be secure from the other organizations and requires that traffic is monitored between organizational boundaries.

b) Define the terms : **[8]**

i) Hard boundary

ii) Soft boundary

iii) Rout filler

iv) Route aggregation

Q7) a) Explain in detail FCAPS model. **[8]**

b) List four types of problems that the performance architecture addresses. Give examples of each type of problem. **[8]**

Q8) a) Explain two guidelines for evaluating technologies based on capacity and service plans. **[3]**

b) Develop a variable-length addressing scheme that best fits the design, with the following numbers of users: (Given the network address 129.99.0.0/16) **[15]**

AS Number	Location	Department	Users
1	Mumbai Campus Building 1	Legal	100
		Accounting	370
	Mumbai Campus Building 2	Head Quarter	1250
		Engineering	150
2	Pune	Sales	50
	Calcutta	Sales	50
3	Delhi	Operations 1	1750
		Operations 2	575
		Sales	375

Total No. of Questions : 8] **[Total No. of Pages : 3**

P1752

[3865] - 872

M.E. (Production) (CAD/CAM)

COMPUTER AIDED MANUFACTURING

(New 2008 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the concept of high speed manufacturing. What are necessary requirement of machine tool for the same? **[8]**

b) What is DNC? Explain its hardware and software components. **[8]**

Q2) a) Write the various G and M Codes usually used in CNC programming on CNC machining centre. **[8]**

b) Write a CNC program in G and M code for a part shown in FigNo.1 Write a remark for each block. **[8]**

Q3) a) Write an APT program for the part shown in fig.1. Write a remark for each instruction. **[8]**

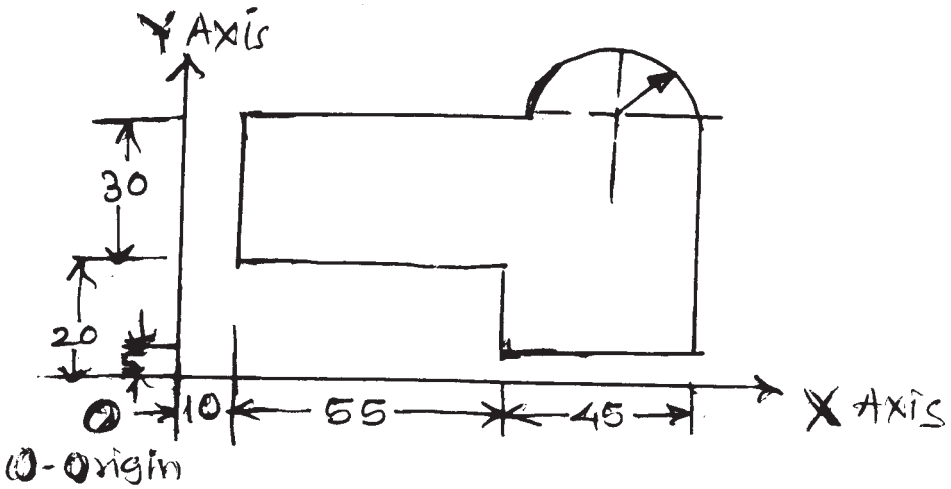

Fig No. 1 PLATE (Width 5 mm)

(All DIMENTIONS ARE IN mm)

P.T.O.

b) Explain with sketch the positioning of tool in CNC machines along with axis representation. **[8]**

Q4) a) Write a manualpart program for finishing a forsed component as shown in the fig. 2. Assume the speed and feed on the turning as 450 rpm and 0.4 mm/rev. Assume 1 mm material to be removed radially from external diameter. **[9]**

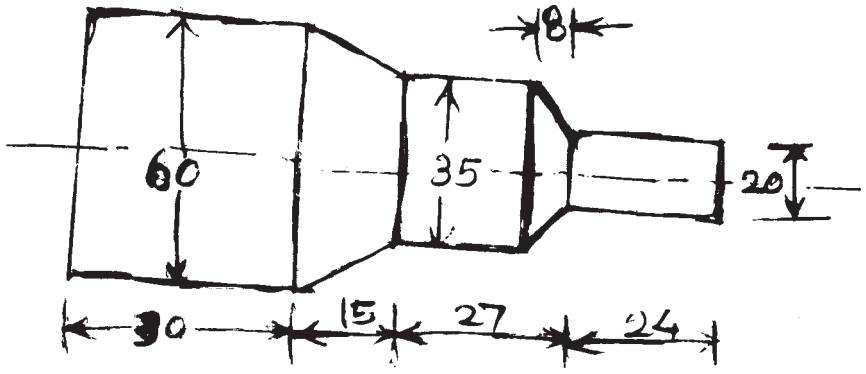

Fig. 2 Forged Bar
(All DIMENTIONS ARE IN mm)

b) Write in brief. **[9]**

i) CNC-WEDM.

ii) CNC-CMM

iii) Automated welding.

SECTION - II

Q5) a) Write a note on **[8]**

i) AGV system in FMS.

ii) ASRS.

b) A manufacturing cell consist of a machining and turning centre each connected by a robot for material handling and AGV for transport. Analyse various stages critically to exploreary possibility of deadlock in working.**[8]**

Q6) a) Describe the factors which affect the quality and performance of NC/ CNC machines. **[8]**

b) With a neat sketch explain. **[8]**

i) Contact and Noncontact inspection methods.

ii) Optical inspection methods.

Q7) a) Explain with neat diagram, computer aided shopfloor control system. **[8]**

b) What are the network requirements to establish a LAN network in a CNC shop? Explain in detail the components & their specifications. **[8]**

Q8) Write a note on any three. **[18]**

a) Various types of tool magazines on CNC.

b) Machine vision system in CNC.

c) Future automated factories.

d) Factory data management system.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1753

[3865]-873
M.E. (Production) (CAD/CAM)
OPTIMIZATION TECHNIQUES
(New) (2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define the following terms : **[8]**

i) Singlevariable & Multivariable optimization.
ii) Hessian matrix.
iii) Saddle point.
iv) Lagrage Multiplier.

b) Derive the necessary and sufficient conditions for optimization for multivariable problems. **[8]**

Q2) a) Maximize function $y(x) = x^4 - 6x^3 + 6x^2 - 2x + 4$ in the interval 0 to 10 by means of dichotomous search method with E = 0.5. **[8]**

b) Find the maxima and minima of the function. **[8]**

$f(x) = 4x^3 - 18x^2 + 27x - 7$

Q3) a) State and explain the various methods available for solving a multi-variable optimization problems with equality constraints. **[8]**

b) Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ starting from point $x_1 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$ by using conjugate gradient method. **[8]**

P.T.O.

Q4) a) What is the difference between Newton method & Quasi-Newton method of unconstrained optimization. **[8]**

b) Find the value of x in the interval (0, 1) which minimizes the function $f(x) = x\,(x - 1.5)$ to within ± 0.05 by Fibonacci method. **[10]**

SECTION - II

Q5) a) Discuss characteristics of a constrained problem. **[8]**

b) Differentiate between Interior Penalty function method and Exterior Penalty function method. **[8]**

Q6) a) Draw the flow chart for simulated annealing procedure for any optimization problem. **[8]**

b) Write atleast four fundamental differences of genetic algorithms with most traditional search methods. **[8]**

Q7) a) Represent design variables, objective functions & constraints for G.A. & optimization methods. **[8]**

b) Write different methods of artificial neural network method. **[8]**

Q8) a) What are the wine principals of O.P.T.? **[9]**

b) Compare T.O.C. with local optimization approaches. **[9]**

P1754

[3865]-874

M.E. (Production Engineering) (CAD/CAM)

ADVANCED STRESS ANALYSIS

(New Course) (511204) (Elective - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Square bracketed figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule and non-programmable electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain stress deviator tensor and its invariants. Express von Mises stress in terms of second invariant of stress deviator tensor. **[10]**

b) Define an octahedral plane. Write an expression of normal shear component of stress tensor on this plane. **[8]**

OR

Q2) a) Determine the stress fields that arise from the following stress functions:

(i) $\varphi = Cy^2$

(ii) $\varphi = Ax^2 + Bxy + Cy^2$

(iii) $\varphi = Ax^3 + Bx^2y + Cxy^2 + Dy^3$

where *A, B, C* and *D* are constants. **[10]**

b) Using castigliano's theorem, determine the deflection of point A of the step shaft as shown in figure 1. The second –area moment of the beam between points A and B is I_1, and from B to C the second –area moment is $I_2 = 2I_1$. The entire beam is made of a material with modulus of elasticity of E. **[8]**

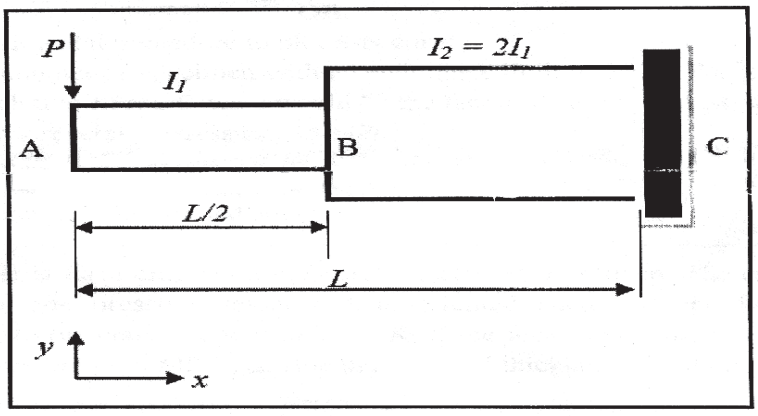

Figure 1 *(shaft fixed at end C)*

P.T.O.

Q3) Consider the complex potentials $\gamma(z) = Az$, $\psi(z) = Bz$, where A and B are complex constants. Derive the explicit expression for the displacements corresponding to a uniform stress field using fundamental stress combination– **[16]**

$$\sigma_x + \sigma_y = 2\left(\gamma'(z) + \overline{\gamma'(z)}\right) = 2(A + \overline{A}) + 4\,\mathrm{Re}\,A = 4A_R$$

$$\sigma_y - \sigma_x + 2i\tau_{xy} = 2\left(\bar{z}\,\gamma''(z) + \psi'(z)\right) = 2B = 2(B_R + iB_I)$$

OR

Q4) Explain how conformal mapping provides a convenient means to find elasticity solutions to interior and exterior problems of complex shape. **[16]**

Q5) Explain with sketch an experimental stress analysis using **[16]**

a) Brittle coat method and

b) X-ray techniques.

SECTION - II

Q6) a) Explain the mechanism of fatigue crack initiation and propagation in ductile metals. **[8]**

b) Consider a flat plate of some metal alloy that is to be exposed to repeated tensile-compressive cycling in which the mean stress is 25 MPa. If: a_0 = 0.25 mm, a_c = 5.0 mm, m = 4.0, A = 5 * 10^{-15}, Y = 2.0, and N_f = 3.2 * 10^5 cycles calculated using relation

$$\frac{1}{A\pi^{m/2}(\Delta\sigma)^m}\int_{a_0}^{a_c}\frac{da}{Y^m a^{m/2}}$$

Estimate the maximum tensile stress to yield the fatigue life prescribed. **[10]**

OR

Q7) a) Explain experimental procedure to plot S-N curve. **[8]**

b) Consider an unnotched specimen with an endurance limit of 255 MPa. If the specimen was notched such that *Kf* = 1.6, what would be the factor of safety against failure for $N > 10^6$ cycles at a reversing stress of 115 MPa. **[10]**

i) Solve by reducing S'_e.

ii) Solve by increasing the applied stress.

Q8) A semicircular surface crack in a pressure vessel is 10 mm deep. The crack is on the inner wall of the pressure vessel and is oriented such that the hoop stress is perpendicular to the crack plane. Calculate K_I if the local hoop stress = 200 MPa and the internal pressure = 20 MPa. Assume that the wall thickness >> 10 mm. **[16]**

OR

Q9) Using the Paris-Erdogan equation for fatigue crack propagation, calculate the number of fatigue cycles corresponding to the combinations of initial and final crack radius for a semicircular surface flaw tabulated below. Assume that the crack radius is small compared to the cross section of the structure.

$\frac{da}{dN} = 6.87 \times 10^{-12} (\Delta K)^3$, where da/dN is in m/cycle and ΔK is in MPa $\sqrt{m}$,

Also, $\Delta\sigma$ = 200 MPa.

Initial Crack radius (mm)	Final Crack radius (mm)
1	10
1	20
2	10
2	20

Discuss the relative sensitivity of N_{tot} to:

- Initial crack size and
- Fine crack size

(*Assume* $\Delta K = 0.663\ \Delta\sigma\sqrt{\pi a}$) **[16]**

Q10) A structural component made from a high strength steel is subjected to cyclic loading, with σ_{max} = 210 MPa and σ_{min} = 70 MPa. This component experiences 100 stress cycles per day. Prior to going into service, the component was inspected by nondestructive evaluation (NDE), and no flaws were found. The material has the following properties: σ_{ys} = 1000 MPa, K_{Ic} = 25 MPa $\sqrt{m}$. The fatigue crack growth rate in this material is the same as in problem 9. The NDE technique can find flaws > 2 mm deep. Estimate the maximum safe design life of this component, assuming that subsequent in-service inspections will not be performed. Assume that any flaws that may be present are semicircular surface cracks and that they are small relative to the cross section of the component. **[16]**

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Total No. of Questions : 12] **[Total No. of Pages : 2**

P1755

[3865]-876
M.E. Prod. (CAD/CAM)
INDUSTRIAL ROBOTICS & ARTIFICIAL INTELLIGENCE
(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer three questions from Section - I and three questions from Section - II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Your answers will be valued as a whole.***
7) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
8) ***Assume suitable data, if necessary.***

SECTION - I

Unit - I

Q1) a) Define Robot. How robots are classified? Explain with diagram four configurations of robot. **[8]**

b) What is degree of freedom? Explain six degrees of freedom in robot motion. **[8]**

OR

Q2) a) Explain how robots are specified? What is precision of movement? **[8]**

b) What are different applications of Industrial robots? **[8]**

Unit - II

Q3) a) How robot sensors are classified? Explain different tactile sensors used in robotics. **[9]**

b) Differentiate grippers and tools as grippers in robots. What are the different applications where tools used as end effectors in robots. **[9]**

OR

Q4) a) What are the different factors considered while selecting & designing the end effectors? **[9]**

b) Explain how images are processed and analysed in machine vision system? **[9]**

P.T.O.

Unit - III

Q5) a) Explain Wait, Signal and Delay commands with simple programming. **[8]**

b) What are the different generations of robot programming languages. **[8]**

OR

Q6) a) What is Branching in case of robot programming. **[8]**

b) Explain RAIL language features, locations and robot motion statements? What are industrial applications of RAIL language. **[8]**

SECTION - II

Unit - IV

Q7) a) What is AI? Explain foundations of AI in context with Philosophy, Mathematics, Economics, Neuro Science, Psychology & Computer Engineering. **[9]**

b) What are different problem solving agents? Explain each in brief. **[9]**

OR

Q8) a) Explain what are toy and real world problems? **[9]**

b) Formulate and define any problem as a state space approach. **[9]**

Unit - V

Q9) a) Explain Breath - first - search strategy. **[8]**

b) Explain Heuristic search problem of 8 puzzle? What is the effect of Heuristic accuracy on performance. **[8]**

OR

Q10) a) Explain Hill Climbing Search Algorithm with example. **[8]**

b) What is Genetic Algorithm? Explain. **[8]**

Unit - VI

Q11) a) Explain Prepositional Logic? What are syntax and semantics in prepositional logics. **[8]**

b) Explain Backward Chaining Control Structures used in Rule Based Systems. **[8]**

OR

Q12) a) Enumerate different interference rules. Explain any four with examples. **[8]**

b) Explain procedural knowledge with basic model of the learning process. **[8]**

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Total No. of Questions : 10] **[Total No. of Pages : 2**

P1756

[3865] - 878

M.E. (CAD/CAM)

MECHATRONICS

(2008 Course) (Elective - II) (511205)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is 'Mechatronics'? Explain with an example various components of a mechatronic system? **[8]**

b) What is an 'automatic control system'? What are its advantages and limitations? **[8]**

Q2) a) Compare the following: **[8]**

i) Analog and digital transducers

ii) Active and passive transducers

b) What are servo motors? Explain briefly the following: **[8]**

i) Moving coil motor

ii) Brushless DC motor

Q3) a) A mechatronic speed control system is used wherein the relationship between the angular velocity and the force applied is given by the expression:

$$\varpi = \sqrt{\frac{F}{m.r.}}$$

where F = force applied, newtons

r = radius of rotation

m = mass of the rotating weight

If $m = 200 \pm 0.01$ g, $r = 25 \pm 0.01$ mm, $F = 500 \pm 0.1\%$ (newtons), Determine the uncertainty in the rotational speed. **[8]**

b) Explain the principle of following transducers: **[8]**

i) Piezoelectric velocity transducer

ii) Eddy current transducer

P.T.O.

Q4) a) Explain the operation of a DC and AC signal conditioning system with neat block diagrams? **[10]**

b) Explain with a neat block diagram an operational amplifier? **[6]**

Q5) Write a short note on any three of the following: **[18]**

a) Analog to digital converter.

b) Scope of Mechatronics

c) Differential pressure flow meters

d) Fibre-optic sensors

SECTION - II

Q6) a) Draw the block diagram of PLC and explain the function of each block. **[8]**

b) Describe the following related to PLC programming: **[8]**

i) Input branching

ii) Output branching

Q7) a) Consider a chemical tank for which there are three variables to be monitored: level, pressure and temperature. Design a circuit such that an alarm is sounded when certain combinations of conditions of the variables occur. The alarm will sound if the liquid level is high and the temperature is high. Another condition for alarm is high liquid level with low temperature and high pressure. **[8]**

b) Explain with an example the role of PLC in automation? **[8]**

Q8) a) Distinguish between microprocessor and microcontrollers? Discuss the organization of microcontroller system? **[8]**

b) Explain the addressing modes used in 8051 microcontroller? **[8]**

Q9) a) What are the general components of data acquisition systems? Explain it with an engineering application? **[10]**

b) Explain the role of fuzzy logic in mechatronics applications? **[6]**

Q10) Write short note on any three of the following: **[18]**

a) Logic functions

b) Pin diagram of 8051

c) Interfacing of D / A converters

d) Micro-sensors

Total No. of Questions : 8] **[Total No. of Pages :3**

P1757

[3865]-54
M.E. (Mechanical) (Heat Power)
ADVANCED REFRIGERATION & CRYOGENICS
(2002 Course) (502109) (Elective - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, Mollier charts, electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain design & selection criteria for evaporators. **[8]**

b) Explain, the effect of condensing temperature, suction temperature, suction superheat and liquid sub-cooling on compressor performance. **[8]**

Q2) Discuss the factors contributing to food spoilage and the causes of food spoilages and spoilage agents. Explain the various freezing methods of food preservation and different freezers used in practice. **[16]**

Q3) Consider two -stage cascade refrigeration system operating between the pressure limits of 0.8 and 0.14 MPa. Each stage operates on an ideal vapor-compression refrigeration cycle with refrigerant R134a as working fluid. Heat rejection from the lower cycle to the upper cycle takes place in an adiabatic counterflow heat exchanger where both streams enter at about 0.32 MPa. If the mass flow rate of the refrigerant through the topping cycle is 0.05 kg/s. Determine **[16]**

a) The mass flow rate of refrigerant through the bottoming cycle.

b) The rate of heat removal from the refrigerated space and power input to the compressor, and

c) Coefficient of performance of this cascade refrigerator. State assumptions if any. Show the cycle on T-s and p-h diagram.

P.T.O.

Q4) Write short notes on (any three) **[18]**

a) Vortex Tube.

b) Thermoelectric refrigeration.

c) Boot strap air refrigeration system.

d) Pulse tube refrigeration system.

SECTION - II

Q5) a) Determine the ideal work requirement for the liquefaction of nitrogen beginning at 101.3 kPa and 300 K. From the T-s chart of nitrogen, following property values are given: **[8]**

h_l = 46.2 J/g at 101.3 kPa and 300 K

h_f = 29 J/g at 101.3 kPa and Sat. Liquid,

s_l = 4.42 J/g K at 101.3 kPa and 300 K

s_f = 0.42 J/g K at 101.3 kPa and Sat. Liquid

Derive the expression you use.

b) Explain the different types of compressors and expanders used in liquefaction systems. **[8]**

Q6) a) Explain the principle of working of vapour absorption system and discuss the working of a practical vapour absorption system. Compare vapour absorption system with vapour compression system. **[8]**

b) In a vapour absorption refrigeration system, heating, cooling and refrigeration takes place at temperature of 90 ^oC, 30 ^oC, -5 ^oC. Find the maximum C.O.P. of the system. Derive the expression you use. **[6]**

c) Explain limitations of reversed Carnot cycle with the help of T-s diagram. **[4]**

Q7) Write short notes on (any four) **[16]**

a) Cryogenic insulations.

b) Linde Dual pressure Cycle.

c) Simon helium liquefier.

d) Effect of low temperature on thermal properties of materials.

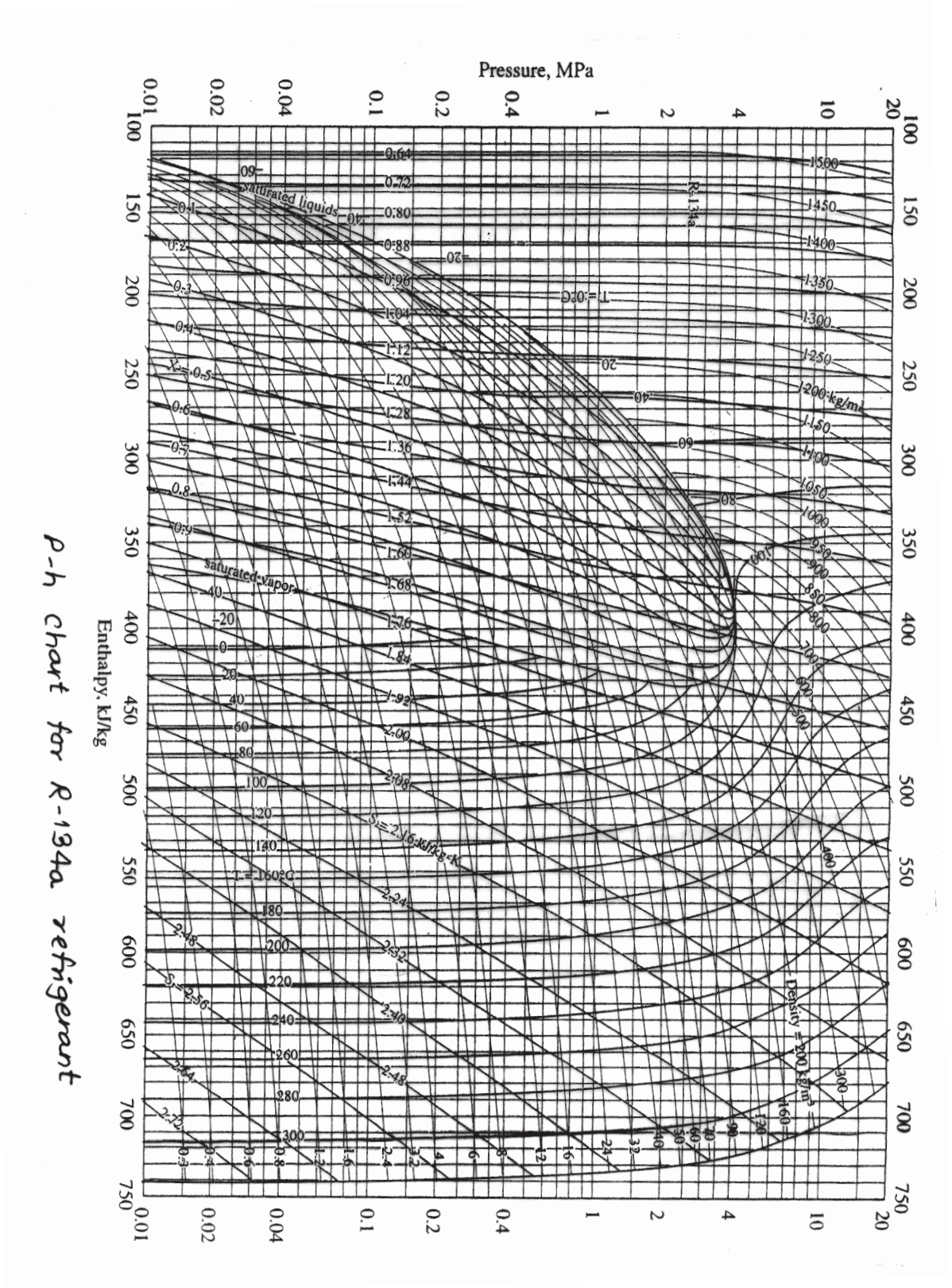
e) Claude system.

Q8) Explain- **[16]**

a) Various controls used on vapour absorption systems.

b) Electrolux refrigerator.

c) Liquid desicant absorption system.



P-h chart for R-134a refrigerant

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Total No. of Questions : 10] **[Total No. of Pages : 3**

P1758

[3865]-67
M.E. (Mechanical) (Design Engineering)
MACHINE TOOL DESIGN
(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable electronic calculator is allowed.***

SECTION - I

Q1) a) Discuss in brief how design considerations of feed gear box differ from speed gear box. **[4]**

b) A gear box for a machine tool has to be designed for speeds varying between 110 rpm to 695 rpm in 9 steps. Input source is a motor running at 1750 rpm and a pair of gears may be used to reduce the speed from 1750 rpm, unilaterally. Draw the best possible structural diagram and speed chart to design the speed box compact and economical. Sketch the schematic layout of the gear box. **[12]**

Q2) a) Give the classification of different stepless regulation used for machine tool drives. State the advantages and limitations of it. **[6]**

b) How can you make a conical friction variator, having driving roller in contact with internal conical surface work with positive self locking? Deduce the necessary expression. **[10]**

Q3) a) Enumerate the commonly used shapes of slideways. Draw neat sketches of them and discuss their salient features. **[6]**

b) Describe with sketches wear compensation methods for machine tool guides. **[4]**

c) Show that the rigidity of a hydrostatic slideways is 50% higher than that of the same slideways under hydrodynamic lubrication. **[6]**

P.T.O.

Q4) a) Error in the pitch of a lead screw may be denoted by **[6]**

$$\Delta = \Delta_1 \left[1 + \frac{1}{2\eta} \left(\frac{p}{D} \right)^2 \right],$$

where p is the pitch, η-efficiency, D-effective diameter and Δ1-direct stress in the lead screw due to axial thrust. Deduce the above equation and comment on the other possible errors that a lead screw may have, if the lead screw happens to work on sliding friction only.

b) What are the characteristic advantages of a recirculating ball screw in comparison to traditional sliding friction lead screw? **[4]**

c) What is meant by preloading? With neat sketches show any two methods of preloading a ball lead screw. **[6]**

Q5) Write short notes (any three) : **[18]**

a) P.I.V drive.

b) Static and dynamic coefficient of compliance in a machine.

c) Feed box with Meander's mechanism.

d) Design of column of radial drilling machine.

e) Vertical roller feed screw.

SECTION - II

Q6) a) Describe with block diagram of the power pack used for hydrostatically controlled high speed spindle unit stating the specific utilisation of elements in the system. **[6]**

b) Compare hydrostatic and aerostatic supports. What are the additional components needed and precautions necessary in an aerostatically supported high speed spindle? **[4]**

c) Explain with sketch, construction of a typical spindle unit with mounting used on machine tool. **[6]**

Q7) a) With a neat sketch explain the operation of a thermal relay and push button control of a driving motor of a machine tool. **[6]**

b) What is meant by 'Stick slip' vibration in a machine tool? Enumerate commonly adopted methods in reducing the positional error due to stick-slip vibrations. **[8]**

c) Why shaft encoders mainly use Gray code for the construction and measurement? **[2]**

Q8) a) What is meant by Adaptive Control Machine? What are sensors used in adaptive control machine as essential features? **[8]**

b) Compare hydraulic system with mechanical control system with reference to performance, cost, and reliability considerations. **[8]**

Q9) a) Classify NC, CNC machines as against traditional machines, based on, functional movements etc. **[4]**

b) Describe the special design considerations of NC and CNC machine tools as compared to conventional machine tools. **[6]**

c) Discuss the method of programming a CNC machine with 'Automated Programming Tool' (APT) language with suitable illustration. **[6]**

Q10) Write short notes on (any three) : **[18]**

a) Dynamic testing of machine tools.

b) Modular design concept in machine tools.

c) Stepper motor Vs D.C.Servomotor.

d) Retrofitting of conventional milling machine into a CNC machine.

e) Vibration isolated tool holders.

Total No. of Questions : 10] **[Total No. of Pages : 3**

P1759

[3865]-81
M.E. (Mechanical) (Design Engg.)
PROCESS EQUIPMENT DESIGN
(Revised 2002 Course) (Elective - I) (Theory)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answer will be valued as a whole.***
6) ***Use of logarithmic tables, slide rules, Mollier chart, electronic steam table and electronic pocket calculator and steam table is allowed.***
7) ***Assume suitable data, if necessary giving reasons.***

SECTION - I

Q1) a) What is stress corrosion? What are the factors which affect stress corrosion cracking? Explain measures taken to eliminate or control corrosion. **[5]**

b) What are the general categories of protective coating? Explain the techniques with respect to process of coating, categories. **[5]**

c) Explain various types of roofs used for storage vessels. **[6]**

Q2) a) A cylindrical pressure vessel with 2m internal diameter is to be operated at 5 kgf/cm^2. The permissible stress of materials is 960 kg/cm^2. Welded joint efficiency is 85%. Calculate the thickness required. If the vessel is fabricated in the spherical form, what maximum pressure will it be able to withstand. **[6]**

b) Define pressure vessel and explain general design considerations for the design of unfired pressure vessel. **[8]**

c) Name the steels used for high temperature and low temperature applications. **[2]**

Q3) a) A storage tank 6m in diameter and 7.5m in height has to be provided self supported conical roof. The slope of self supported conical roof is 1 in 5. Roof is subjected to an superimposed load of 125kg/sq ms. density of plate material is 7850kg/m^3. E = 2.0 × 10^{6}kg/sq cm. Poisson's ratio = 0.33. Calculate the minimum thickness required for fabrication of self supporting conical roof. **[6]**

P.T.O.

b) Explain in detailed design procedure for design of cylindrical storage vessel with cone roof. **[10]**

Q4) a) Explain method for calculating thickness of torispherical head subjected to

i) Internal pressure.
ii) External pressure. **[8]**

b) Explain autofrettage and shrink fit construction for high pressure vessel. **[6]**

c) Name various standards used in process equipment design. **[2]**

Q5) Explain with neat sketches (any three) : **[18]**

a) Various forms of corrosion.

b) Protective coatings and their applications.

c) Design of saddle support.

d) Reinforcement of nozzles.

e) Types of constructions for high pressure vessels.

SECTION - II

Q6) a) How filters are classified? State their advantages and disadvantages. **[6]**

b) A pressure vessel is to be designed for an internal pressure of 0.3 N mm^2. The vessel has nominal diameter of 1.2m. The vessel is made up of stainless steel with permissible stress 130 N/mm^2. If the weight of vessel and content is 32000 kg and torques due to offset piping is 50kg.m. Find the stresses due to combined loading. Also suggest suitable head. **[10]**

Q7) a) A high pressure vessel fabricated by shrink fit construction has three concentric shells. The ratio of outer radius to inner radius for all shells is 1.4. The vessel is subjected to an internal pressure of $150 kg/cm^2$. Pressure outside vessel is atmospheric. Estimate :

i) Maximum combined stress at interface of concentric shells.
ii) Interface pressure resulting internal pressure and shrinkage stresses.

Data - Modulus of elasticity. $E = 2 \times 10^6 kg/cm^2$. Internal diameter of vessel is 400mm. **[10]**

b) Discuss in detail design of skirt support. **[6]**

Q8) a) Explain in detail the design procedure for a saddle support. **[8]**

b) Explain with neat sketch types of closures for high pressure vessels. **[8]**

Q9) a) Explain design considerations for shell and tube heat exchanger. **[8]**

b) What is a reboiler and bottom product? **[2]**

c) With neat sketch explain rotary drum filter. **[6]**

Q10) Explain with sketches (any three) : **[18]**

a) Falling film evaporators.

b) Process flow diagrams.

c) Optimization Techniques.

d) Theories of failure.

e) Protective coatings.

f) Floating roof type storage tank.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1760

[3865]-125
M.E. (Electronics/E & TC)
(Common to DSD and Microwave)
MICROELECTRONICS
(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Design a Moore machine synchronous to detect overlapped 1010 sequence. **[8]**

b) Compare Moore and Mealy machine. **[8]**

Q2) a) Explain about CMOS inverter with various working region with logic diagram. **[8]**

b) Write VHDL code for 8:1 Max using two 4:1 Max with WHEN, SELECT statements. **[8]**

Q3) a) What is Domino Logic? Explain Domino OR gate in detail, comment on inverter at the o/p of domino gate. **[8]**

b) What is selection criterion of PLD chip in an application? Explain with suitable examples. **[8]**

Q4) Write short note on : **[18]**

a) Multiple drivers and solution.

b) Synthesizable and non-synthesizable statements.

c) Types of VHDL modeling.

SECTION - II

Q5) a) Draw and explain about the FPGA. **[8]**

b) Compare FPGA and CPLD in detail with applications. **[8]**

P.T.O.

Q6) a) Draw a transistor schematic of 2 i/p NOR gate and its respective stick diagram. **[8]**

b) What are the limitations of silicon logic? List of features of material used to design ultra fast VLSI circuits. **[8]**

Q7) Draw state diagram and VHDL code for the two junction trafic light controller with four roads joining together. **[16]**

Q8) Write short notes on : **[18]**

a) Test bench, their types.

b) Clock distribution.

c) High level design flow.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1761

[3865] - 237

M.E. (Instrumentation and Control)

TRANSDUCER DESIGN

(2002 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any THREE questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of Non programmable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Write equation for deflection and strain of the diaphragm of a pressure transducer. The transducer should be clamped diaphragm type, employing stainless steel material. Following specifications are available. **[18]**

Pressure :- 15 MPa

Young's Modulus :- 210 GPa

Specific Gravity :- 7.83×10^{-3} kg/cm^3

Poisson's Ration :- 0.285.

Calculate a radius of diaphragm to obtain 1500 micro strain at above maximum pressure.

a) Determine deflection of diaphragm when pressures are varied in steps of 3MPa from '0' till 15 MPa.

b) The diaphragm type strain gauges are installed to obtain electrical output. The excitation to the bridge is 12 Volts DC. Find electrical output of the bridge for pressures in steps of 3MPa Up to 15 MPa.

c) Write an equation for natural resonant frequency of this transducer and calculate its value for 15 MPa. pressure with above specifications.

Quote your assumptions with justification.

Q2) Design an experimental setup to measure displacement of a mini lathe used in fabrication of small components for the clock mechanisms. The contact type transducers, based on inductive and capacitive principle, be discussed in this setup. **[16]**

P.T.O.

Q3) Design an accelerometer setup to measure vibrations in the civil structure, having frequencies ranging from 0.01 Hz to 20 Hz. Which type of accelerometer would be best suited? Justify. **[16]**

Q4) pH measurement is required to be carried out for measurement of Blood pH and Urine pH in a pathological laboratory. Suggest a suitable setup. Consider all variations in the pH and temperature. **[16]**

SECTION - II

Q5) Draw an appropriate sketch for explaining flow measurement in an open channel system, carrying water from Dam to Village farms. Describe at least two measurement principles for such a system. Describe related signal conditioning and flow monitoring system. **[16]**

Q6) Discuss force transducers for measuring forces on the mooring ropes of the Ship berthed in a Harbor. Which transducers would be best suited, when maximum breaking force of the rope is 50 Ton? Suggest a setup when such a measurement is to be carried out for 24 Hours, uninterrupted, and recorded data is to be stored for detailed analysis. **[16]**

Q7) Discuss a LASER based Velocity measuring system for measuring velocity of air flow around nose and tail of an aero plane in the Wind Tunnel setup. The measurements are to be recorded for axial and transverse directions. (two axes of flow) The temperatures are varying from – 25ºC to + 70ºC at these points on nose and tail, during the test. Suggest suitable temperature monitoring system also. **[18]**

Q8) a) Discuss optical fiber transducers to measure: **[12]**

i) displacement
ii) Vibrations
iii) Temperature

b) Find the electrical output for a cantilever beam type Force Transducer when rectangular cross section beam, having 2mm thickness, 6mm width and 60mm length is subjected to a force variation from 10N to 1000N in steps of 10N. Find out strain at the root, deflection at the free end and electrical output from deflection measuring transducer. Suggest the transducer employed. **[6]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1762

[3865] - 291

M.E. (Chemical Engineering)

ADVANCED CHEMICAL REACTION ENGINEERING

(2002 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

SECTION - I

Q1) a) For the catalytic reaction $A \rightleftharpoons R$ derive rate expression using Langmuir-Hinshelwood Hougen-Watson model. **[8]**

b) With neat figure explain various types of isotherms. **[8]**

Q2) a) For non-catalytic solid-fluid reaction derive expression for ash resistance controlling reaction using strinking core model. **[8]**

b) Explain from laboratory experimental data how conclusion can be made regarding controlling mechanism in case of solid fluid non-catalytic reaction. **[5]**

c) Explain experimental procedure to determine rate controlling step in case of solid-catalyzed reaction. **[5]**

Q3) A diffusion cell is used to measure molecular diffusivities of gases. Same set up is used under following different situations.

Situation 1: Gas A diffuses through the cell and gas B back diffuses into the cell. The conditions in the cell are O°C, 1 atm. The cell is caliberated to get D_{AB} = 37.5 cm^2/s by noting the time it took for internal concentration to fall 20% of its original value. It was 1 hour and 15 min.

Situation 2: Same apparatus is used to decide diffusivity of gas (under same operating conditions). It is found that the concentration reaches half of its original concentration in 9 hours. What is the molecular diffusivity of C? How it can be used in design of two reactors based on these gases as one of the reactants. **[16]**

Q4) a) Derive expression for Thiele's modulus for 1^{st} order irreversible reaction taking place in cylindrical pore. **[10]**

b) Explain the range of values of Thiele's modulus which will deside whether the reaction is mass. **[6]**

P.T.O.

SECTION - II

Q5) a) A tube with 2.5 m length and 0.025m diameter is packed with alumina cylinders with a diameter and height 0.003m, the void fraction of the bed is $\theta = 0.38$. Air flows through the tubes at 372ºC with a superficial mass flow rate of 1.3 $kg/m^2.s$. Calculate the pressure drop in the bed. Viscosity of air at 372ºC = 0.031 cps. Mass flow rate of air = 1.3 kg/m^2s, specific mass of air at 372ºC = 0.9487 kg/m^3, $u_s = 1.37 m^3/m^2.s$. **[10]**

b) How internal age distribution can be used for RTD. **[8]**

Q6) a) Explain tanks in series model. How you will classify it? What are the parameters of the model? **[8]**

b) Explain two parameter models used for reactors? Define their parameters and applications. **[8]**

Q7) a) Explain run away criteria with respect to packed bed reactor. **[8]**

b) Explain how you will model coking of catalyst. (poisoning of catalyst due to coke). **[8]**

Q8) a) Explain models used for fluidized bed reactors. **[8]**

b) How you can interprete flow patterns using exit age distribution data. **[8]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1763

[3865] - 292

M.E. (Chemical Engineering)

PROCESS MODELLING & SIMULATION

(2002 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

SECTION - I

Q1) Compare deterministic and probabilistic models. Discuss steps involved in modelling of chemical process. State the equations used. **[16]**

Q2) a) For the closed tank being supplied by liquid at flow rate of Q_I and outlet flow rate of Q_o; develop model to determine height in the closed tank of liquid if Q_I changes to Q_{II}. At time t = 0 $Q_I = Q_o$ and hight is L_o. **[10]**

b) Develope model and component continuity equations for tubular reactor with series reaction $A \rightarrow B \rightarrow C$ is occuring in the reactor at isothermal condition. **[7]**

Q3) Develop the model and obtain expression for the extraction of solute in a steady-state operation with two stage counter flow state the input required and the solution statergy. **[17]**

Q4) Two concentric cylindrical metallic shells are separated by a solid material. Heat is generated in the inside cylinder at rate of q in W/m^3. Boundary surfaces $r = r_1$ and $r = r_o$ are maintained at different temperatures. Determine the steady state temperature distribution and the radial heat flow rate with in the separating material. **[17]**

P.T.O.

SECTION - II

Q5) For an ideal four component vapour liquid equilibrium system following is the data available.

Component	Vap Press (psi)150ºF	Vap.press.(psi)200ºF
1	25	200
2	14.7	60
3	4	14.7
4	0.5	5

Calculate the correct temperature and vapour composition for liquid at 75 psia for the composition of $x_1 = 0.2$, $x_2 = 0.2$, $x_3 = 0.3$, $x_4 = 0.3$. **[16]**

Q6) a) Derive and show the relationship of equations for double pipe heat exchanger and delinearate the procedure to solve it. **[10]**

b) Explain iterative convergance method and its applications in modelling and simulation. **[8]**

Q7) a) Newtons equation $4y^3 - 12y - 25 = 0$ has a root near $y = 2$. Starting with $y_o = 2$ compute y_1, y_2, y_3 using Newton Rapson method. **[8]**

b) Following system of equations is designed to determine concentration (C) in a series of coupled reactors as a function of amount of mass input to each reactor.

$17C_1 - 2C_2 - 3C_3 = 500$ ———— (1)

$-5C_1 + 21C_2 - 2C_3 = 200$ ———— (2)

$-5C_1 - 5C_2 + 22C_3 = 30$ ———— (3)

Solve using Gauss Siedel method. **[10]**

Q8) A non-isothermal batch reactor can be described by the following equation.

$$\frac{dc}{dt} = -\exp[-10/(T + 273)]\, C \quad \text{————} \quad (1)$$

$$\frac{dT}{dt} = 1000 \exp[-10/(T+273)]\, C - 10(T-20) \text{————} (2)$$

Where C is the concentration of the reactant and T is the temperature of the reactor. Initially reactor is at 25ºC and has concentration of reactant at lgmmole/lit. Find the concentration and temperature of the reactor at time t = 2 min. **[16]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1770

[3865]-634
M.E. (Electronics) (Digital System Design)
DIGITAL SYSTEM DESIGN USING PLD'S
(2008 Course) (Elective - III)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare the CPLD & FPGA on the basis of features and applications. **[8]**

b) Discuss about the spartan - 3FPGA. **[8]**

Q2) a) List the features of 5200 FPGA family. **[8]**

b) What are the types of PLD's and their selection criteria. **[8]**

Q3) a) Write VHDL code for the Hardware to drive 8 bit LED using CPLD. **[8]**

b) Draw & discuss about the SPLD. **[8]**

Q4) Write short notes on : **[18]**

a) Limitations of silicon logic.

b) Advance tools in VLSI.

c) Analogue VLSI.

SECTION - II

Q5) a) Write VHDL code for 3 floor lift controller with interfacing diagram. **[8]**

b) Comment on area and power optimization of CPLD & FPGA. **[8]**

P.T.O.

Q6) a) What are the different FPGA programming techniques? Discuss any one in detail. **[8]**

b) Give the features of XC 9500 CPLD. **[8]**

Q7) a) Draw and explain about the building blocks of FPGA. **[8]**

b) Discuss the features about the Cool Runner - II CPLD. **[8]**

Q8) Write short notes on : **[18]**

a) DSP processor.

b) Area & power distribution.

c) Need of Design for Testability.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1771

[3865]-645

M.E. (Production) Manufacturing Engg. & Automation

SUPPLY CHAIN MANAGEMENT

(2008 Course) (Elective - I) (511104)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Define supply chain management and explain why supply chain flows are important. **[8]**

b) Describe the major obstacles that must be overcome to manage successfully a supply chain. **[8]**

Q2) a) Discuss the key issues that should be considered for distribution network decision in practice. **[8]**

b) Derive the expression for the capacitated plant location model for network design in supply chain. **[8]**

Q3) Mention and explain the ways in which one can tackle supply chain design decisions under uncertainty in practice. **[16]**

Q4) a) What is ERP? Mention the advantages & disadvantages of using best-of-breed solution and single integrator solution. **[6]**

b) Explain the value of E-business for a traditional PC Manufacturer. **[6]**

c) Explain the bullwhip effect. And how does it relate to lack of coordination in the supply chain? **[6]**

SECTION - II

Q5) a) Why is the location of warehouse important for the SCM? Discuss some methods for determining the location of the warehouse. **[8]**

b) Discuss how the three supply chain macro processes interface in order to be successful. **[8]**

P.T.O.

Q6) a) "Many innovations on technology-based approaches are well-suited to the enhancement of the effectiveness of Supply Chain Management?" - Justify the statement by giving few applications of information technology in SCM. **[8]**

b) What are the essential differences in the Supply Chain Management of Products vs. Services? Discuss the application of Supply Chain Management principles in Financial Services. **[8]**

Q7) a) "In the era of outsourcing, third party logistics can add value to existing supply chains". Explain this statement with examples. **[8]**

b) Explain in detail Savings Matrix Method for routing and scheduling in transportation. **[8]**

Q8) Write short notes on (Any three) : **[18]**

a) Bullwhip effect.

b) Binomial representation of uncertainty.

c) Role of Transportation in SCM.

d) Significance of JIT in SCM.

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Total No. of Questions : 8] **[Total No. of Pages :2**

P1773

[3865]-688

M.E. (Computer Networking) (Common to Computer)

NETWORK PROGRAMMING

(2008 Course) (A 510311)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the TCP state machine with suitable diagram and explain the handshaking process for three way and four way handshaking. **[8]**

b) Describe the buffersize limitation for TCP connection. What is the concurrent servers? Describe with suitable example. **[8]**

Q2) a) Write a program that uses raw sockets for handling ICMP messages. **[10]**

b) Explain the method of working for communication with echo server using **[8]**

i) Echo client server.

ii) Telnet client.

Q3) a) Explain various issues in interoperability for following cases **[8]**

i) IPV4 client and IPV6 server.

ii) IPV6 client and IPV4 server.

b) Explain the function and parameter descriptor for IPV4 socket address structure and Listen function. **[8]**

Q4) Write short notes on any three **[16]**

a) IPV6 Address Testing Macros.

b) Advanced Name and Advance Conversions.

c) Routing sockets.

d) Byte ordering and Byte Manipulation function.

P.T.O.

SECTION - II

Q5) a) Compare and contrast unicasting, broadcasting and multicasting on WAN & LAN. **[10]**

b) Explain datagram client function for broadcasting using suitable code. **[8]**

Q6) a) What is SNTP? Explain atleast five premetives with suitable examples. **[8]**

b) Explain the process of TCP preforked server with suitable psudocode. **[8]**

Q7) a) Explain with suitable code that use a single mutex to lock the counter between the two thread. **[8]**

b) Explain the Interface name & index function with iB structure. **[8]**

Q8) Write short notes on any three: **[16]**

a) TCP client Alternatives.

b) Web client and simultaneous connections.

c) Multicasting on WAN.

d) Raw sockets.

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Total No. of Questions : 10] **[Total No. of Pages : 2**

P1774

[3865]-858

M.E. (Environmental Engineering)

ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT (Elective - I) (501504)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer three questions from Section I and three questions from Section II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Write short notes on (any three) : **[18]**

a) Matrices.

b) Mitigation.

c) Screening.

d) Life cycle assessment.

Q2) Briefly discuss Environmental Impact Assessment methodologies. **[16]**

Q3) State and define noise and it's adverse impact on human body and materials. **[16]**

Q4) State types of air pollutants and air quality standards. **[16]**

Q5) Write in brief about environmental indices and indicators for describing affected environment. **[16]**

P.T.O.

SECTION - II

Q6) How the prediction and assessment of impact for water environment is carried out. **[16]**

Q7) Briefly discuss the rules and regulations for cultural resources. **[16]**

Q8) a) What do you mean by post environmental monitoring. **[8]**

b) State the procedure for conducting Environmental Impact Assessment report. **[8]**

Q9) How the predication and assessment of impact on socioeconomic environment is done. **[16]**

Q10) Write short note on : **[18]**

a) Rapid and comprehensive.

b) Resettlement and Rehabilitation.

c) Water Quality Standards.

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1781

[3865]-5

M.E. (Construction and Management)

CONSTRUCTION MATERIALS AND MATERIALS MANAGEMENT

(2002 Course)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) With a detail case study, explain the salient features of FRP application in retrofitting and rehabilitation works. **[18]**

Q2) With a detail case study, explain the use of serpentine in nuclear radiation shield. What are special properties of concrete shields? **[16]**

Q3) Explain the 3 basic requirements of a smart material. Explain the basic properties of any 4 smart materials. Explain any 2 applications in Civil Engineering involving use of smart materials. **[16]**

Q4) Explain in brief the following (any 4) : **[16]**

a) Roller compacted concrete.
b) Precautions in mass concreting works.
c) Leed Rating.
d) Nano technology and TQC.
e) G.R.C.

SECTION - II

Q5) a) Explain with statistical figures how the effective materials management directly contributes to the profit of any construction firm. **[10]**

b) Explain 7 types of inventories giving suitable examples. Explain the purposes of maintaining inventory. Explain why Inventory Management is essential. **[8]**

P.T.O.

Q6) Hindustan Construction Company requires 1000 tonnes of reinforcement steel every year. Cost of steel is Rs. 24,000/- per tonne. Inventory carrying cost is 30% of average inventory per year. Procurement cost is Rs. 300/- per order. **[16]**

The supplier offers discounts as per following.

a) For 750 tonnes and above 8%
b) For 500 to 749.9 tonnes 6%
c) For 250 to 499.9 tonnes 4%
d) For 100 to 249.9 tonnes 2%
e) < 100 tonnes 0%

Consumption of steel per month is as follows.

1. Jan - 150 tonnes.
2. Feb - 200 tonnes.
3. Mar - 100 tonnes.
4. April - 50 tonnes
5. May - 80 tonnes.
6. June - 70 tonnes.
7. July - 100 tonnes.
8. Aug - 75 tonnes.
9. Sept - 50 tonnes.
10. Oct - 80 tonnes.
11. Nov - 20 tonnes.
12. Dec - 25 tonnes.

Cost of Overstocking of steel is Rs. 1000/- per tonne,whereas cost of understocking is Rs. 5000/- per tonne. Decide the optimum order quantity. Justify your answer.

Q7) Explain the challenges faced by a materials manager in balancing between quality, cost, timely supply and consistency with examples from field.**[16]**

Q8) Explain how various materials indices are very useful in Inventory management. **[16]**

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Total No. of Questions : 8] **[Total No. of Pages : 2**

P1782

[3865] - 65

M.E. (Mech.) (D.E.)

ANALYSIS AND SYNTHESIS OF MECHANISMS

(2002 Course)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule and electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State and prove the condition to be satisfied by a 4-bar mechanism so that a symmetrical coupler curve is generated. **[8]**

b) Explain the Hartmann construction with a neat sketch and show that it satisfies the Euler-Savary equation. **[8]**

Q2) a) The link lengths of a 4-bar mechanism AoABBo are : AoBo = 60 mm, AoA = AB = BoB = 30 mm. The input link AoA is in line with the frame AoBo. Draw the inflection circle. You may consider this configuration of the mechanism as a limiting case of its nearby configurations. **[12]**

b) Explain how will you construct the inflection circle for the motion of the output link of a 4-bar, relative to its input link. **[6]**

Q3) a) Explain the terms 'Structural Error' and 'Mechanical Error' and distinguish between them. **[8]**

b) Use Frudensteins equation to synthesize a slider crank mechanism for the following specified positions of the input crank (ϕ) and output slider (s).

$\phi_1 = 60^\circ$, $\phi_2 = 100^\circ$, $\phi_3 = 150^\circ$

$s_1 = 10$cm, $s_2 = 4$cm, $s_3 = 7$cm

Draw the synthesized mechanism in the 1st position. **[8]**

P.T.O.

Q4) a) Explain with neat sketches the various D-H parameters. **[8]**

b) Explain the terms 'Branch Defect' and 'Order Defect' and discuss their practical significance. **[8]**

SECTION - II

Q5) a) Explain the method of Auxiliary Points used for the velocity and acceleration analysis of a complex mechanism. Write the important equations of velocity and acceleration analysis and explain clearly how these equations are used. **[14]**

b) Give one example each of a 'mechanism with low degree of complexity' and a 'mechanism with high degree of complexity'. **[4]**

Q6) A rigid body motion task is specified below:
Point A on the body occupies 4 positions successively with coordinates (0, 0), (4, 0), (10, 0) and (20, 0) as it rotates successively by 30º, 30º and 45º, in the clockwise sense.
Synthesize a 4-bar mechanism for this task and draw it in all 4 positions. **[16]**

Q7) a) Starting from the 'standard form equation' of Dyad, explain the synthesis of a 4-bar for motion of coupler point with prescribed timing with 3 accuracy positions.
Also correlate the number of solutions to the Dyad equation with the number of prescribed positions of the coupler point with timing. **[9]**

b) A slider-crank is to be synthesized for the following starting and final values of the crank rotation and slider displacement .
$\phi s = 30º$, $\phi f = 90º$, Ss= 10cm, Sf = 20cm. The slider displacement should be proportional to the square of the crank rotation within the above range. 4 accuracy points with Chebyshev spacing are to be used. Find out the values of crank rotations and slider displacements at the 4 accuracy points. **[7]**

Q8) a) Using the complex vector approach, obtain the expressions for the link length ratios of a 4-bar, in terms of the angular velocities and accelerations of its moving links. **[8]**

b) Write notes on any Two. **[8]**

i) Inflection Circle
ii) Cognates of a 4-bar
iii) Number Synthesis.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1783

[3865]-603
M.E. (E & TC - VLSI)
EMBEDDED AUTOMOTIVE SYSTEMS
(2008 Course)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, wherever necessary.***

SECTION - I

Q1) a) Explain the current trends in Automotive systems. What is Hybrid Vehicle? State its advantages. **[10]**

b) Explain the role of Embedded systems in Automotive systems. **[8]**

Q2) a) How safety is achieved using onboard diagnostic system? **[8]**

b) Explain security and warming system in automotive systems. **[8]**

Q3) a) Write short note on following : **[8]**

i) GPS system in automobile system.

ii) Vehicle motion control.

b) Which different types of fuel injection systems? Explain. **[8]**

Q4) a) Write short note on any two devices. **[8]**

i) Exhaust temperature sensors.

ii) Relays.

iii) Vehicle speed sensors.

b) Which are the rating and efficiency of battery? What are the various tests on batteries and how charging is done? **[8]**

P.T.O.

SECTION - II

Q5) a) What are ECUs? Discuss their significance in modern vehicles. **[8]**

b) How fuel measurement is done? What are the different techniques? **[8]**

Q6) a) Briefly explain the technique of Integrated engine control and exhaust emission control technique. **[8]**

b) How artificial intelligence plays role in modern automobiles? **[8]**

Q7) a) Explain the different Dashboard instruments and their use. **[8]**

b) Draw a schematic arrangement for atypical CAN network containing a master and number of slaves. How multiprocessor communication is possible? **[8]**

Q8) a) Explain the following system used in modern automobiles. **[8]**

i) Lane departure and cutting system.

ii) Curve over speed counter measures.

iii) Night vision.

iv) Rear camera assistance.

b) Discuss with block diagram, the recent trends in cruise control of car. **[10]**

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1784

[3865]-462
M.E. (Civil - Structure)
PLASTIC ANALYSIS AND DESIGN OF STEEL STRUCTURES
(2008 Course)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Attempt any two questions from Section I & II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***If necessary, assume suitable data.***
6) ***Use of nonprogrammable electronic pocket calculator, IS: 800 and steel table are allowed.***

SECTION - I

Q1) a) Explain elasto-plastic behavior of a beam in flexure and find expression for moment of resistance. **[10]**

b) Determine the shape factor for an I-section consists of 8 mm thick web and 12 mm thick flange. The depth of web excluding flanges is 300 mm. The width of flange is 120 mm. **[10]**

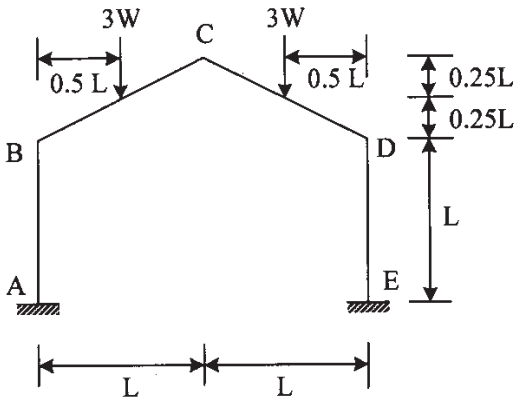
c) State and explain the concept of plastic hinge. **[5]**

Q2) a) A beam fixed at both ends is subjected to uniformly distributed load w on the right half portion; determine the value of collapse load W_c by static and kinematical method. The beam is of uniform plastic moment, M_p. **[13]**

b) A rectangular portal frame ABCD has fixed base A and D, 4 m apart. Height of column AB and CD is 4 m. A vertical downward load W is act at the centre of beam BC and horizontal point load W is act at B in the direction of BC. Plastic moment of resistance for beam is 1.5 times that of column. Determine collapse load. **[12]**

P.T.O.

Q3) Analyze the gable portal frame loaded and supported as shown in **Fig** using mechanism method and obtain collapse mechanism. Draw the free body and bending moment diagram of all members. **[25]**



SECTION - II

Q4) a) Explain in brief, philosophy of limit state design. **[5]**

b) What are the requirements of steel for the design of steel structure by limit state method? **[5]**

c) A simply supported beam of 10 m effective span carrying a total factor load of 60 kN/m. The depth of beam should not exceed 500 mm. The compression flange of the beam is laterally supported. Design the section as per IS: 800-2007 and check for shear and deflection. **[15]**

Q5) In **Q.2 b**, if W = 25 kN, design the section for column as per IS: 800-2007. Check the section for, **[25]**

a) combined bending and shear,

b) combined bending and axial force.

Q6) Design symmetrical gable portal frame for workshop shed of span 24 m. height of both column is 8 m and apex is at 12 m from base. Column bases are fixed. A C sheet is used over purlins. Using DL + LL combination, design uniform section for bending as per IS: 800-2007. **[25]**

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