

S.E. (Comp.) (First Sem.) EXAMINATION, 2008

DISCRETE STRUCTURE

(Common to I.T.)

(2003 COURSE)

Time : Three Hours

Maximum Marks : 100

N.B. :- (i) In Section I, attempt Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6. In Section II, attempt Q. No. 7 or Q. No. 8, Q. No. 9 or Q. No. 10, Q. No. 11 or Q. No. 12.

(ii) Answers to the two Sections should be written in separate answer books.

(iii) Neat diagrams must be drawn wherever necessary.

(iv) Assume suitable data, if necessary.

SECTION I

1. (a) A survey has been taken on methods of computer travel. Each respondent was asked to check BUS, TRAIN or AUTOMOBILE as a major method of travelling to work. More than one answer was permitted. The results reported were as follows :

BUS – 30 people, TRAIN – 35 people, Automobile – 100 people,

BUS and TRAIN–15 people, BUS and AUTOMOBILE–15 people,

TRAIN and AUTOMOBILE–20 people and all three methods–

5 people. How many people completed a survey form ? [4]

(b) State whether the argument given is valid or not : [4]

(i) If I drive to work; then I will arrive tired.

I do not drive to work

\therefore I will not arrive tired

(ii) I will become famous or I will not become a writer.

I will become a writer

\therefore I will become famous.

(c) Show the following using Venn diagram : [5]

(i) $A \cup (\bar{B} \cup C) = (A \cup \bar{B}) \cap (A \cup C)$

(ii) $(A - B) - C = A - (B \cup C)$.

(d) Define finite and infinite set with example. [3]

Or

2. (a) Prove that for any positive integer n , the number $n^5 - n$ is divisible by 5. [6]

(b) Obtain conjunctive normal form if each of the following : [6]

(i) $P \wedge (P \rightarrow Q)$

(ii) $\sim (P \vee Q) \leftrightarrow (P \wedge Q)$

(iii) $Q \vee (P \wedge \sim Q) \vee (\sim P \wedge \sim Q)$

(c) If $A = \{a, b, \{a, c\}, Q\}$, determine the following sets :

(i) $A - \{a, c\}$

(ii) $\{\{a, c\}\} - A$

(iii) $A - \{\{a, b\}\}$

(iv) $\{a, c\} - A$. [4]

3. (a) A die is tossed twice and the numbers showing on the top faces are recorded in sequence. Determine sample space for each of the given events :
- (i) At least one of the numbers is a 5
 - (ii) At least one of the numbers is an 8. [4]
- (b) In how many ways can 6 men and 6 women be seated in a row if :
- (i) any person may sit next to any other ?
 - (ii) men and women must occupy alternate seats ?
- (c) All picture cards are removed from a pack of 52 cards and then 4 cards are drawn. Find the probability that :
- (i) They belong to different suits
 - (ii) They belong to different suits and denominations. [4]
- (d) Consider all positive integer numbers with 3 different digits :
- (i) How many are greater than 700 ?
 - (ii) How many are even ?
 - (iii) How many are odd ?
 - (iv) How many numbers are divisible by 5 ? [4]

Or

4. (a) A man, a woman, a boy, a girl, a dog and a cat are walking down a long and winding road one after the other :
- (i) In how many ways can this happen ?

- (ii) In how many ways can this happen if the dog comes first ?
- (iii) In how many ways can this happen if the dog immediately follows the boy ?
- (iv) In how many ways can this happen if only dog is in between the man and the boy. [6]

(b) Suppose that 3 balls are selected at random from an urn containing 7 red balls and 5 black balls. Compute the probability that :

- (i) All three balls are red
- (ii) At least two balls are black
- (iii) At most two balls are black
- (iv) At least one ball is red. [6]

(c) Suppose a fair die is tossed and the number showing on the top face is recorded. Let E, F, G be the following events :

$$E : \{1, 2, 3, 5\}$$

$$F : \{2, 4\}$$

$$G : \{1, 4, 6\}$$

Compute the probability of the event indicated :

(i) $\bar{E} \cap F$

(ii) $E \cup G$. [4]

5. (a) Determine whether the relation R whose diagraph given is an equivalence relation : [6]

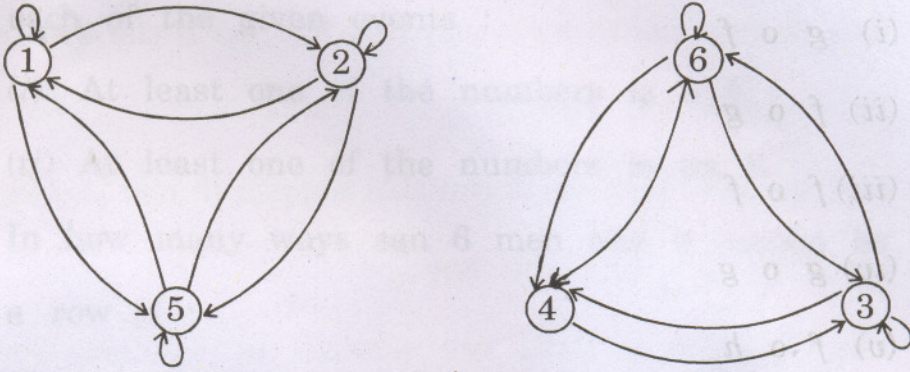


Fig. 1

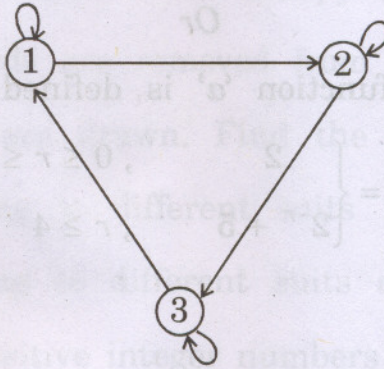


Fig. 2

- (b) Let $A = \{a_1, a_2, a_3, a_4, a_5\}$ and Let R be a relation on A whose matrix is :

$$M_R = \begin{bmatrix} 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 1 \end{bmatrix} = W_0$$

Compute W_1, W_2, W_3 as in Warshall's algorithm. [6]

(c) Let $f(x) = x + 2$, $g(x) = x - 2$ and $h(x) = 3x$ for $x \in \mathbb{R}$, where \mathbb{R} = set of real numbers. Find :

(i) $g \circ f$

(ii) $f \circ g$

(iii) $f \circ f$

(iv) $g \circ g$

(v) $f \circ h$

(vi) $h \circ g$

Or

6. (a) The numeric function 'a' is defined as :

$$a_r = \begin{cases} 2 & , 0 \leq r \leq 3 \\ 2^{-r} + 5 & , r \geq 4 \end{cases}$$

Determine :

(i) $S^2 a$

(ii) $S^{-2} a$

(iii) Δa

(iv) ∇a

[8]

(b) For $A = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ consider the poset

(A, R) whose Hasse diagram is shown below. Find :

(i) GLB $\{2, 3\}$

(ii) GLB $\{2, 7\}$

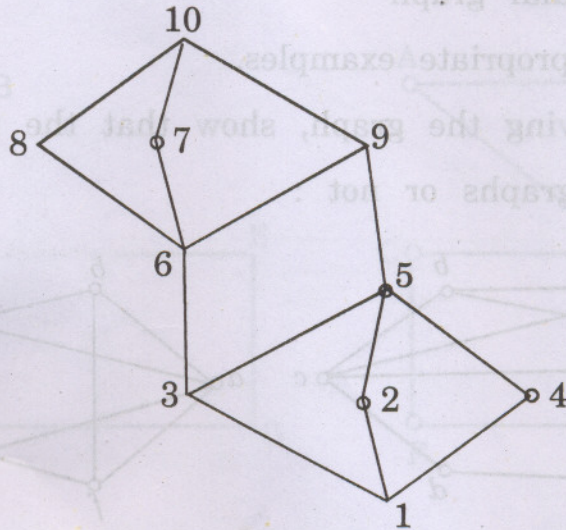
(iii) GLB $\{5, 8\}$

(iv) LUB {3, 2}

(v) LUB {4, 8}

(vi) LUB {3, 5}

[6]



(c) Define functions :

[4]

(i) One-to-one

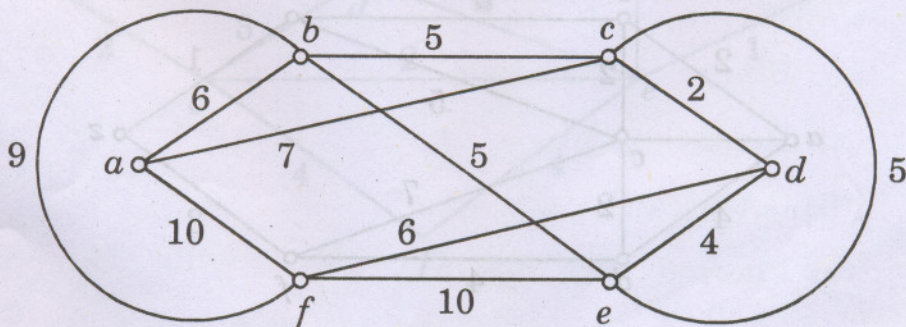
(ii) On-to

(iii) Invertible

(iv) One-to-one onto.

SECTION II

7. (a) Use nearest neighbour method to find Hamiltonian circuit starting from a . Find its weight. [6]



(b) Define :

- (i) Isomorphic graphs
- (ii) Complete graph
- (iii) Regular graph

with appropriate examples.

[6]

(c) By drawing the graph, show that the following graphs are planar graphs or not :

[6]

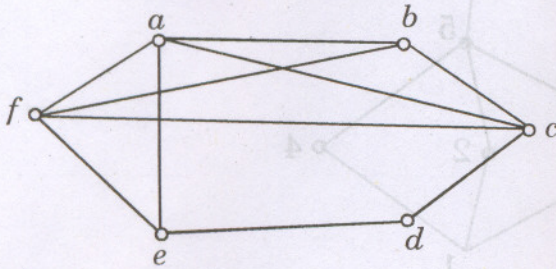


Fig. (i)

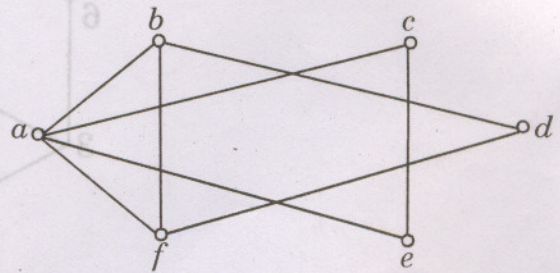


Fig. (ii)

Or

8. (a) Define :

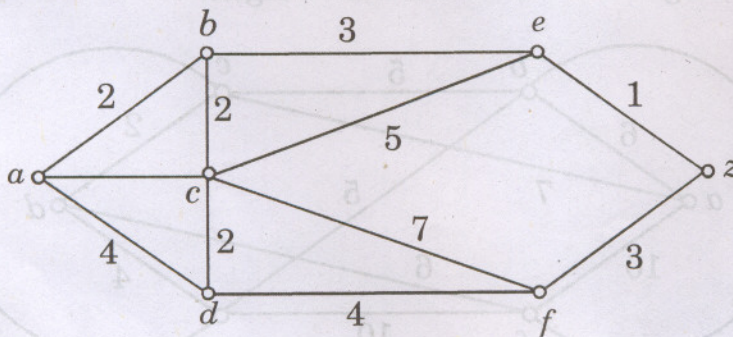
- (i) Eulerian graph
- (ii) Hamiltonian graph
- (iii) Planar graph

with examples.

[6]

(b) Apply shortest path algorithm and find shortest path between a to z in the graph given below :

[6]



- (c) Determine which of the given graphs represent Eulerian circuit, Eulerian path, Hamiltonian circuit, Hamiltonian path. Justify your answer. [6]

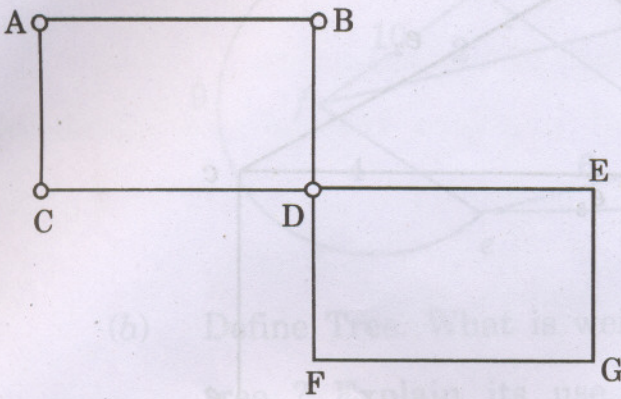


Fig. 1

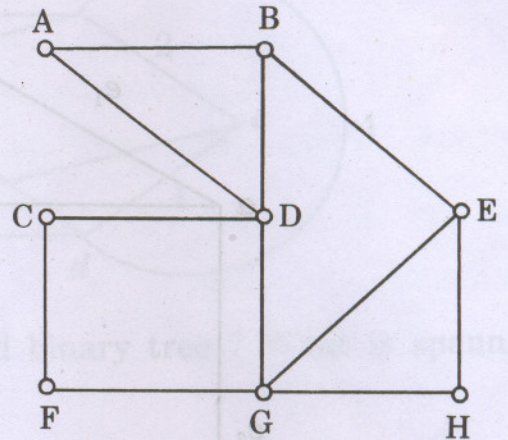
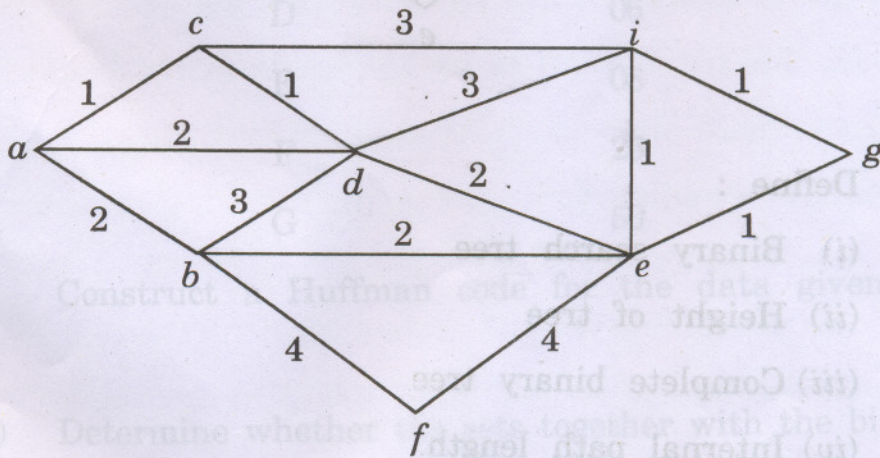
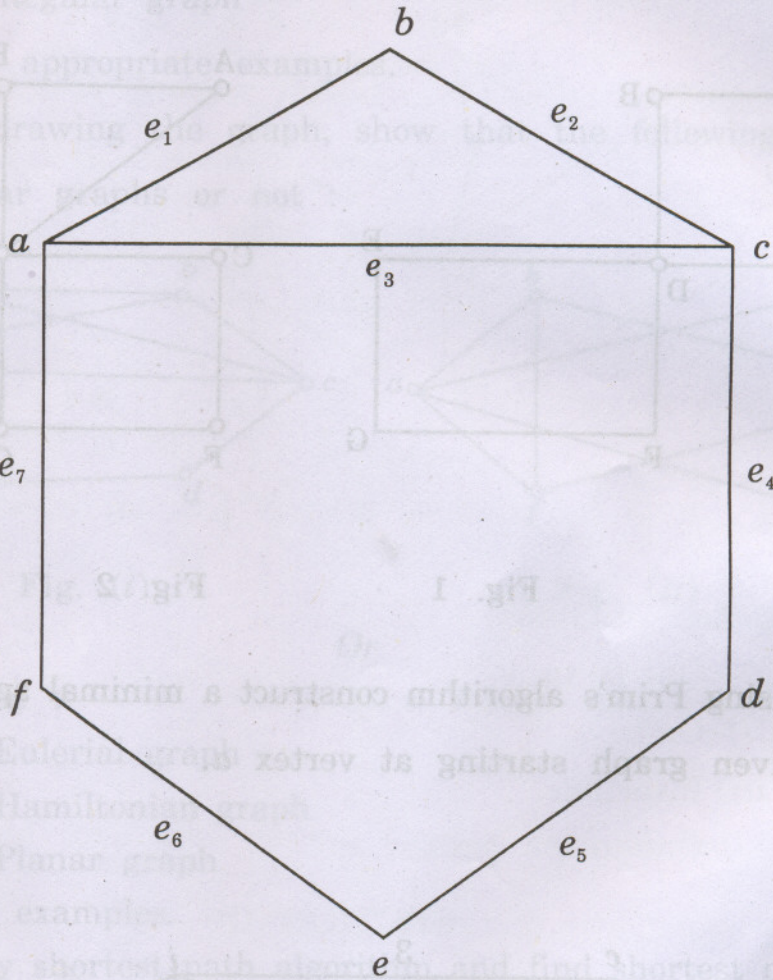


Fig. 2

9. (a) Using Prim's algorithm construct a minimal spanning tree for given graph starting at vertex a . [6]



- (b) Find all possible cut sets of graph G . Also find its fundamental system of cut sets for a spanning tree T . [6]



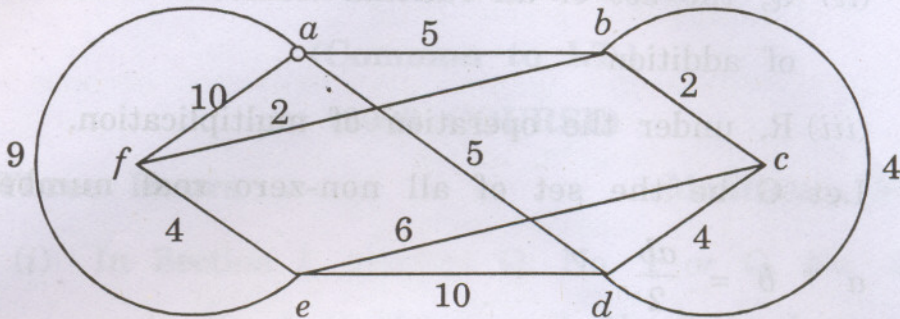
(c) Define :

- (i) Binary search tree
- (ii) Height of tree
- (iii) Complete binary tree
- (iv) Internal path length.

[4]

Or

10. (a) Using Kruskal's algorithm find minimal spanning tree for the given graph. [6]



- (b) Define Tree. What is weighted binary tree? What is spanning tree? Explain its use. [6]
- (c) Suppose data items A, B, C, D, E, F, G occur with the following probability distribution.

Data item	Probability
A	20
B	15
C	12
D	06
E	08
F	25
G	50

Construct a Huffman code for the data given. [4]

11. (a) Determine whether the sets together with the binary operation is a group in the following sets. If it is a group, determine

if it is Abelian; specify the identity and the inverse of a generic element. [6]

(i) Z , where $*$ is ordinary multiplication

(ii) Q , the set of all rational numbers under the operation of addition

(iii) R , under the operation of multiplication.

(b) Let G be the set of all non-zero real numbers and let

$$a * b = \frac{ab}{2}$$

Show that $(G, *)$ is an Abelian group. [6]

(c) Define :

(i) Group

(ii) Semigroup with example. [4]

Or

12. (a) Define :

(i) Ring homomorphism

(ii) Ring Isomorphism. [6]

(b) What is monoid ? Let $(A, +)$ be an algebraic system, where $+$ is binary operation on $A = \{0, 2, 4, 6, \dots\}$ show that $(A, +)$ is a monoid. [6]

(c) Explain group codes. [4]

S.E. (I.T.) (First Sem.) EXAMINATION, 2008**MANAGEMENT AND FINANCE****(2003 COURSE)****Time : Three Hours****Maximum Marks : 100**

N.B. :— (i) Answer *three* questions from Section I and *three* questions from Section II.

(ii) Answers to the two Sections should be written in separate answer-books.

(iii) Neat diagrams must be drawn wherever necessary.

(iv) Figures to the right indicate full marks.

(v) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

SECTION I

1. (a) Define Management. Explain various functions of Management. [8]

(b) State and explain Henry Fayol's theory of Management. [8]

Or

2. (a) "Management is an art, science as well as a profession." Explain. [8]

(b) Critically examine F.W. Taylor's theory of scientific management. [8]

3. (a) What is human wants ? Explain various characteristics of human wants. [8]

(b) Define law of demand. How is the demand curve derived ?

Under what conditions demand curve slopes backward ? [10]

4. Explain the following concepts : [18]
- (i) Salient features of Contract Act
 - (ii) Patent and copyright
 - (iii) Role of SEBI.

5. (a) Explain how functional organisation is an improvement over line and staff organisation. [8]
- (b) Explain the concepts of ERP and E-Commerce. [8]

Or

6. What are the different forms of business organisation ? Explain in detail the formation and functions of Joint Stock Company. Also describe its merits and demerits. [16]

SECTION II

7. (a) Define Communication. Explain communication process with its importance to industry. [8]
- (b) What is Man Power Planning ? Explain the objectives and functions of man power planning. [8]

Or

8. (a) State and explain different methods of training. Also highlight the significance of training in the industry. [8]
- (b) What do you mean by capital structure ? Explain various types of capital and its importance. [8]

9. Explain in brief : [16] (Total No. of Printed Pages [16])

- (a) Capital Budgeting
(b) Money Market and Capital Market.

(2003 Or RSE)

10. Define Break-even Analysis. What are its assumption ? Construct the CVP graph and explain its importance to industry. [16]

11. (a) What is credit rating ? Explain the process of credit rating for software companies. [10]

(b) What is overheads ? Explain various types of overheads with suitable examples. [8]

(iv) Right indicates full marks.
(v) Use of logarithmic tab, slide rule, Stodier charts, electronic

12. (a) Explain the following Ratios with their significance : [8]

(i) Debt-equity ratio

(ii) Current ratio.

(b) What is depreciation ? Explain various methods of depreciation. [10]

(a) "Management is an art, science as well as a profession." Explain. [8]

(b) Critically examine F.W Taylor's theory of scientific management. [8]

3. (a) What are human wants ? Explain various characteristics of human wants. [8]

(b) Define law of demand. How is the demand curve derived ? Under what conditions demand curve slopes backward ? [10]

S.E. (I.T.) (Sem. I) EXAMINATION, 2008
DIGITAL ELECTRONICS AND MICROPROCESSOR
(2003 COURSE)

Time : Three Hours**Maximum Marks : 100**

- N.B. :—** (i) Answer questions 1 or 2, 3 or 4 and 5 or 6 from section I and questions 7 or 8, 9 or 10 and 11 or 12 from section II.
- (ii) Answers to the two Sections should be written in separate answer-books.
- (iii) Neat diagrams must be drawn wherever necessary.
- (iv) Figures to the right indicate full marks.
- (v) Assume suitable data, if necessary.

SECTION I

1. (a) Convert the following : (Write the steps involved in the conversion) : [8]
- (i) $(110000110.11011)_2 = (\quad)_8$
- (ii) $(62.245)_8 = (\quad)_{10}$
- (iii) $(4563.876)_{10} = (\quad)_{16}$
- (iv) $(1001011110.1111)_2 = (\quad)_{10}$
- (b) Represent-9 in signed 2's complement, signed 1's complement and signed magnitude form. Compare signed 2's complement, signed 1's complement and signed magnitude form representation. [6]
- (c) (i) What do you mean by a self-complementing code ? Write two self-complementing codes.
- (ii) What is a BCD code ? What are its advantages and disadvantages ? [4]

Or

2. (a) Perform the following arithmetic using 2's complement form (show step by step process) : [8]
- (i) $+5 + 8$
 - (ii) $-5 + 8$
 - (iii) $+5 - 8$
 - (iv) $-5 - 8$.

(b) What is Hamming code ? Construct Hamming code for 4-bit message 1101. [6]

(c) What do you mean by Gray code ? What are its applications ? [4]

3. (a) Describe what happens to each of the following CMOS characteristics as VDD is increased ? [8]

- (i) Noise Margin
- (ii) Power Dissipation
- (iii) Switching Speed

And in which application is CMOS ideally suited ?

(b) A TTL gate is supposed to drive CMOS gates, what arrangement has to be made to work this interface satisfactorily ? Justify your answer with suitable circuit diagram. [8]

Or

4. (a) With the help of neat circuit diagram explain the working of : [8]

- (i) A Two-input TTL NAND gate
- (ii) A Two-input CMOS NOR gate.

(b) Explain the following terms with reference to a gate : [8]

- (i) Propagation Delay
- (ii) Fan-out
- (iii) Fan-in
- (iv) Noise Margin.

5. (a) Draw the circuit diagram and describe the operation performed by the following circuits : [8]
- (i) Half-adder
 - (ii) Half-subtractor
 - (iii) Full-adder
 - (iv) Full-subtractor.

- (b) Implement the following function using 3 : 8 decoder and some logic gates :

$$F(A, B, C, D) = \sum m(0, 1, 3, 4, 6, 10, 12, 13, 15)$$

Assume A = MSB. [8]

Or

6. (a) Explain in short carry look ahead generation technique. Draw circuit diagram of 4-bit adder with carry look ahead generation technique. [8]

- (b) Simplify the following Boolean function. Also implement using basic logic gates :

$$f(A, B, C, D) = A + ABCD + ABC + ABC + D. [8]$$

SECTION II

7. (a) Design a sequence detector to detect the sequence : 1010 based on Mealy machine. [8]
- (b) What is race around condition ? How to avoid it in level triggered JK flip-flop ? Draw master slave JK flip-flop. [6]
- (c) Explain 4-bit bidirectional shift register with diagram. [4]

Or

8. (a) Design 3-bit controlled synchronous up/down counter. Draw timing diagram. [10]
- (b) Draw and explain internal architecture of IC 7490. Construct divide by 96 counter with the help of IC 7490. [8]

9. (a) State and define any *four* specifications of ADC. Compare in brief different ADC techniques based on these specifications. [8]

- (b) Explain 4-bit R – 2R ladder DAC with the help of suitable diagram. [8]

Or

10. (a) Explain the conversion logic of 4-bit successive approximation ADC. Draw suitable block diagram and explain the logical flow of a conversion. [10]
- (b) What are the various specifications one need to consider while deciding DAC for a specific application ? Explain. [6]
11. (a) Draw control word format of 8255 in BSR mode. Explain hand shaking signals used in mode 2 of 8255. [6]
- (b) State the function of the following signals of microprocessor 8085 : [6]
- (i) HOLD
 - (ii) TRAP
 - (iii) ALE.
- (c) Draw the timing diagram of the basic memory, write operation of microprocessor 8085. Show the necessary signals in your timing diagram. [4]

Or

12. (a) What is addressing mode ? State addressing modes of 8085 and give suitable instruction as an example for each addressing mode. [6]
- (b) State the internal operations carried out by 8085 microprocessor to execute the following instructions : [6]
- (i) DAA
 - (ii) RST0

(iii) SHLD.

memory mapped I/O and I/O mapped peripherals with microprocessor. [4]

(c) Differentiate between memory mapped I/O techniques of interfacing peripheral devices with microprocessor. [4]

S.E. (Information Technology) (First Sem.) EXAMINATION, 2008**FUNDAMENTALS OF DATA STRUCTURES****(2003 COURSE)****Time : Three Hours****Maximum Marks : 100**

- N.B. :-** (i) Attempt any *three* questions from each Section.
- (ii) Answers to the two Sections should be written in separate answer-books.
- (iii) Neat diagrams must be drawn wherever necessary.
- (iv) Figures to the right indicate full marks.
- (v) Assume suitable data, if necessary.

SECTION I

1. (a) Determine the value of each of the logical expressions (assuming $x = 5$, $y = 10$ and $z = -6$) given below :
- (i) $x > y \ \&\& \ x < z$
- (ii) $x = z \ \|\ y > x$
- (iii) $x < y \ \&\& \ x > y$
- (iv) $y > 15 \ \&\& \ z < 0 \ \|\ x > 0$. [8]
- (b) What is a macro ? Explain with suitable example. [4]
- (c) In response to the input statement
`scanf("%4d%*d", & year, & code, & count);`
the following date is keyed in :
19883745
What values does the computer assign to the variables year, code and count. [4]

Or

2. (a) Write a 'C' function `extract ()` to extract 'm' characters from string 'S', starting from nth character. [6]
- (b) What is an enumerated data type ? What are the advantages of using it in a program ? [6]
- (c) Explain the concept of inline functions with suitable example. [4]

3. (a) Write suitable 'C' program that creates different results after passing a parameter by reference and by values. [8]
- (b) Given the following declaration
- ```
int x = 10, y = 10;
int *P1 = &x, *P2 = &y.
```

What is the value of each of the following expressions

- (1) `(*P1)++`
- (2) `--(*P2)`
- (3) `*P1 + (*P2) - -`
- (4) `++ (*P2) - *P1` [8]

Or

4. (a) What are the benefits of the use of pointers in the program to the programmer ? Explain any *one* of the benefit with the example. [6]
- (b) Explain the effect of the following statements :
- (i) `int a, *b = & a;`
- (ii) `int p, *p;`

(iii) char \*s;

(iv) a = (float \*) & x

(v) int \* p, a = \*p + 5 [10]

5. (a) Compare external and internal sorting. Give the suitable example of external and internal sorting each. [8]
- (b) State various characteristics of an algorithm. [4]
- (c) Compare fibonacci and binary search. How do you select proper searching algorithm for application ? [6]

Or

6. (a) Consider the following numbers. Sort them using "selection sort". Show the output after each pass  
50, 20, 70, 40, 30. [8]
- (b) Write a 'C' function binary-search (A, M , x) to search for a given number 'x' in an array 'A' with 'M' sorted numbers. [6]
- (c) Write a short note on "applications of sorting". [4]

## SECTION II

7. (a) Why is it necessary to arrange the terms of a sparse matrix in column X row sequence while transposing a sparse matrix ? Write an algorithm to get a transpose of a sparse matrix using fast transpose. [10]

(b) Define the following terms :

(i) Data object

(ii) Data type. [4]

(c) What is an abstract data type ? [2]

Or

8. (a) Explain row major and column major representation of arrays. [4]

(b) Represent the following polynomials using an array :

(i)  $x^4 + 59x + 10$

(ii)  $3x^3y^2 + 10xy - 1$ . [4]

(c) Write a pseudo C-code for performing the following string operations without using library functions :

-reverse of a string

-concatenation of two strings. [8]

9. (a) Describe the advantages of skip list with an example. [4]

(b) Explain different types of linked lists. [4]

(c) Explain the insertion of node in doubly linked list at :

(i) the start of the list

(ii) the end of the list

(iii) after the position

using pseudo-code. [8]

Or

10. (a) Write an algorithm for polynomial addition, where the polynomials are represented using linked lists. [8]

- (b) Write a function that removes all duplicate elements from a linear singly linked list. [6]
- (c) List the advantages of representing linear data structures using linked organization over sequential organization. [2]

11. (a) What do you understand by multistack ? Give the C structure representation of the SOME using the PUSH and POP operation. [8]
- (b) List the advantages of priority queue and multi-queue. [4]
- (c) Write an algorithm to convert infix expression to prefix expression. [6]

Or

12. (a) Convert the following expression into postfix expression  
 $7 - (((x + y)/(j - 3)) + y)/(4 - 2)$ .  
Evaluate the postfix expression using stack. Show stack representation. (Take  $x = 8$ ,  $y = 6$ , and  $j = 2$ ). [8]
- (b) What is doubly ended queue ? Give its Pictorial representation. What is its use ? [6]
- (c) Write an ADT for stack. [4]

S.E. (I.T.) (First Sem.) EXAMINATION, 2008

**PROGRAMMING PARADIGM AND METHODOLOGY**

**(2003 COURSE)**

**Time : Three Hours**

**Maximum Marks : 100**

**N.B. :-** (i) Answer *three* questions from Section I and *three* questions from Section II.

(ii) Answers to the two Sections should be written in separate answer-books.

(iii) Neat diagrams must be drawn wherever necessary.

(iv) Figures to the right indicate full marks.

(v) Assume suitable data, if necessary.

**SECTION I**

1. (a) What do you mean by syntax of programming languages ?  
Syntax affects the usability of programming language. Justify your answer. [6]
- (b) Why to study variety of different programming languages that is unlikely ever to use by programmers ? [6]
- (c) What are the characteristics of good programming languages ?  
Explain. [6]

- Or
2. (a) State and explain challenges of programming language design. [6]  
(b) What are various programming language paradigms ? Explain in brief with suitable example. [8]  
(c) Compare the compilation and interpretation of programming language. [4]
3. (a) What do you mean by dynamic type checking ? Enlist advantages and disadvantages of dynamic type checking. [6]

(b) Define the following terms :

- (i) data object [6]  
(ii) data type [6]  
(iii) type checking. [6]
- (c) Why do we need to do declaration in program ? [4]

Or

4. (a) What is structured programming ? What is need for structured programming ? [8]  
(b) Define the term binding. Explain the following classes of binding times : [8]  
(i) Language implementation time  
(ii) Translation time  
(iii) Run time.

5. (a) What are general characteristics of subprogram ? What do you mean by subprogram to be active ? Explain ? [8]

(b) Define the following terms related to variable : [8]

(i) Lifetime

(ii) Static scope

(iii) Dynamic scope.

Or

6. (a) Write single program fragment producing different results with respect to the following parameter passing method :

(i) Call by value

(ii) Call by reference

(iii) Call by name. [8]

(b) What do you mean by procedure activation ? How does the declaration travel from name to value ? [8]

## SECTION II

7. (a) What is inheritance in C++ ? What are different types of inheritance ? Give the code of each type and corresponding dynamic representation. [10]

(b) Define the following terms in OOPs :

(i) Object

(ii) Class

(iii) Method

(iv) Message. [8]

Or

8. (a) What is constructor and destructor in OOPs ? What is their use in programming ? Give suitable example. [10]

- [8] (b) Explain the following terms in C++ : [8]
- (i) Friend function
  - (ii) This pointer
  - (iii) Virtual function
  - (iv) Copy constructor. [8]

9. (a) Explain the difference between facts, rules and queries in PROLOG. [6]
- (b) What is concurrent programming ? Why do we write concurrent program ? [6]
- (c) What are application of functional language ? [4]

Or

10. (a) What are different components of PROLOG program ? [8]
- (b) What is the meaning of the following functions in LISP : [4]
- (i) car
  - (ii) cdr
  - (iii) cons.
- (c) Write short notes on application of logic programming. [4]
11. (a) Compare the different control structure available in C++ and PROLOG. Give suitable example. [8]
- (b) Explain how the variable declaration is done in C, C++, LISP and PROLOG. [8]

Or

12. (a) Compare functional and object-oriented programming languages with respect to the following issue : [10]

(i) Syntactic structure

(ii) Semantics

(iii) Data types

(iv) Subprogram.

(b) State and explain key features and design goals of LISP.

[6]

from Section II.

Answers to the two Sections should be written in separate

books.

(b) Next diagrams must be drawn wherever necessary.

Figures to the right indicate full marks.

SECTION I

(a) What do you mean by syntax of programming languages?

Syntax affects the usability of programming languages. Justify

your answer.

(b) Why to study variety of different programming languages that

is unlikely ever to see by programmers?

(c) What are the characteristics of good programming languages?

Explain.