Total No of Questions: [12] *SEAT NO. :*

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T.E. 2008 (Computer Oriented Numerical Methods) (Sub.Code:302045)

T.E.(Mechanical / Automobile Engineering)Examination, May 2014

(Semester - II)

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 any three questions from each section.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of Calculator is allowed.***
6) ***Assume Suitable data if necessary***

SECTION I

Q1) a) Vanderwal equation for real gases is given by $(p + a/v^2)\,(v - b) = RT$ where $p = Pressure = 1\ N/mm^2$ $R = Gas\ Constant = 0.082\ KJ/Kg\ K, a = Constant = 3.82, b = Constant = 0.06, v = Volume\ at\ pressure, T = Temperature\ in\ Kelvin$ find volume at 300 K Assume initial guess volume 20 m^3/kg. [8]

b) Draw flow chart for Simpson's 3/8 Rule [8]

OR

Q2) a) Use Trapezoidal Rule to evaluate $\int_0^1 \int_1^2 \frac{2xy\,dx\,dy}{(1+x^2)(1+y^2)}$ [8]

b) Draw flow chart for solution of roots of equation using successive approximation method [8]

Q3) a) Find the distance moved by a particle and its acceleration at the end of 4 seconds, if the time verses velocity data is as follows. [10]

t:	0	1	3	4
v:	21	15	12	10

b) Draw flow chart for calculation Modified Newton-Raphson Method [8]

OR

Q4) a) Find f(-0.5) Using Hermite's Interpolation [10]

x	-1	0	1
f(x)	1	1	3
f'(x)	-5	1	7

b) What are cubic splines? Explain the terms Interpolation', 'Extrapolation'&'Inverse interpolation' [8]

Q.5) a) Using Gauss Seidel iterative method to solve the following system of simultaneous equations $9x + 4y + z = -17,\ x - 2y - 6z = 14,\ x + 6y = 4$ perform four iteration [8]

b) Draw flowchart of Thomas algorithm [8]

OR

Q.6) a) Find the numerical solution of the system of equations $x - y + 4z = 16, 3x +$ [8]

		$2y + z = 18$ *and* $x + 4y - 2z = 12$ correct up to 3 decimal places, using Gauss elimination method with partial pivoting	
	b)	Draw a flowchart for Gauss- Seidal method with partial pivoting	[8]
		SECTION II	
Q7)	a)	a) Explain the terms with example :- i) Error Propagations ii) Round off errors iii) Trucation errors iv)Absolute error	[8]
	b)	The value of Nusselt numbers(Nu) and Reynolds numbers (Re) found experimentally are given below. If the relation between Nu and Re is of type $Nu=a*Re^b$ find the value of a and b for the given values of Nu and Re Nu: 3000, 4000, 5000, 6000, 7000 Re: 14.3575, 16.6517, 16.7353, 17.6762, 18.5128	[8]
		OR	
Q8)	a)	Following data refers to the load lifted and corresponding force applied in a pulley system. If the load lifted and effort required are related by the equation effort=a(load lifted)+b. where a and b are constants evaluate a and b by linear curve fitting) **Load Lifted in KN**: 10, 15, 20, 25, 30 **Effort applied in KN**: 0.75, 0.935, 1.1, 1.2, 1.3	[8]
	b)	Draw flow chart to fit equation $y=ax^b$	[8]
Q9)	a)	Using Runge-Kutta method of fourth order, solve for y at x= 1.2,1.4 form $\frac{dy}{dx} = \frac{2xy+e^x}{x^2+xe^x}$ givens $x_0= 1$ $y_0=0$	[8]
	b)	Draw a flow-chart for modified Euler's method	[8]
		OR	
Q10)	a)	Solve the differential equations $\frac{dy}{dx} = 1 + xy, \frac{dz}{dx} = -xy \; for \; x = 0.3$ Using Runge-Kutta method of fourth order with initial value x=y=0, z=1	[8]
	b)	Draw flow chart for Milne's Method	[8]
Q11	a)	Solve the equation $\nabla^2 = -10(x^2 + y^2 + 10)$ over the square with sides $x = 0 = y, x = 3 = y \; with \; u = 0$ on the boundary and mesh length = 1	[10]
	b)	Draw a flow-chart for solution of 1D unsteady heat conduction equation	[8]
		OR	
Q12	a)	Solve using Crank-Nicolson's method, solve $\frac{\partial u}{\partial t} = \frac{1}{16}\frac{\partial^2 u}{\partial x^2}, 0 < x < 1, t > 0 \; given \; that \; u(x,0) = 0, u(0,t) = 0, u = (1,t) = 50t$ Compute u for two steps in t direction taking h=1/4 & λ=1	[10]
	b)	Draw a flow-chart for solution of wave equation	[8]