Total No. of Questions :12]

SEAT No. :

P2810

[Total No. of Pages :4

[4958]-112

T.E. (Mechanical/Automobile)

COMPUTER ORIENTED NUMERICAL METHODS (302045)

(2008 Course) (Semester - 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) ***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) Draw Flow chart for 'Newton Raphson' Method. **[8]**

b) Use Trapezoidal rule to evaluate take h=k=0.25 **[8]**

$$I = \int_2^3 \int_2^3 \frac{dx\,dy}{x^2 + y^2}$$

OR

Q2) a) Draw Flow chart for 'Gauss Quadrature 2 Point Formula'. **[8]**

b) Apply Successive Approximation Method to determine the root of equation $x^3 - 2x - 3 = 0$ to three decimal accuracy **[8]**

Q3) a) Draw flowchart for 'Lagrange' s Interpolation' Method. **[8]**

b) Determine y' and y'' at $x = 1.2$ for following data **[8]**

x	1.2	1.4	1.6	1.8	2.0
y	0.1	0.5	1.25	2.4	3.9

OR

P.T.O.

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

Interpolation

Inverse Interpolation

Extrapolation

b) Find f(1986) using Newton's Backward Interpolation Method. **[10]**

X	1951	1961	1971	1981	1991
f(x)	13	17	22	28	41

Q5) a) Explain partial pivoting with example. **[6]**

b) Solve following set of equations using Gauss Elimination Method. **[12]**

$$2X+4Y-6Z=-4$$
$$X+5Y+3Z=10$$
$$X+3Y+2Z=5$$

OR

Q6) a) Draw Flow Chart for finding values of unknown variables by Back Substitution in Gauss – Elimination method. **[6]**

b) Using Gauss Siedel method, solve the following set of simultaneous equations up to two decimal place accuracy. **[12]**

$$8X+2Y-2Z=8$$
$$X-8Y+3Z=-4$$
$$2X+Y+9Z=12$$

SECTION - II

Q7) a) Draw flow chart to fit an equation $y = ax^b$ using Least Square Method. **[8]**

b) Fit a curve of the form $xy^a = b$ through following set of points **[8]**

x	200	150	100	60	40	10
y	1	1.5	1.8	2.4	4.1	10

OR

Q8) a) Fit a straight line through following set of points **[8]**

x	47	54	26	38	62	20
y	250	300	100	150	500	75

b) The value of u is given by equation, $= 3v^7 - 6v$. Find the absolute error, relative error and percentage error in u at v = 1 if the error in v = 0.05. **[8]**

Q9) a) Draw flow chart to solve Ordinary differential equations using Modified Euler's method. **[8]**

b) Given $\frac{dy}{dx} = \sin$ (y) with initial condition as y(0)=1, find y(0.3) with step size of 0.1. Use Runge Kutta 2nd order method. **[8]**

OR

Q10)a) Draw flow chart to solve simultaneous first order differential equations using RK4 method. **[8]**

b) Solve the equation $\frac{dy}{dx} = 2xy.$ Given the initial condition y(1)=1, find y(1.4) taking step size of 0.2 and accuracy of 0.001 using Modified Euler's formula. **[8]**

Q11)a) Draw flow chart to solve Parabolic Equation by Explicit Method. **[8]**

b) Solve the partial differential equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -10\left(x^2 + y^2 + 10\right)$

Over the square with x=y=0 and x=y=3, with u=0 on the boundary and mesh length 1. **[10]**

OR

Q12) a) Draw flow chart to solve Laplace Equation for given no of iterations.**[8]**

b) A simply supported beam of length 'L' 1200mm, is loaded by a uniformly distributed load 'w' of intensity 1kN/m. The governing Exact Differential Equation is, $\frac{d^2y}{dx^2} = \frac{1}{EI}\left[\frac{wLx}{2} - \frac{wx^2}{2}\right]$, where 'x' is distance from a support and 'y' is displacement. Using finite difference method, calculate the deflection at distance 400mm and 800mm from a support. Take E = 200 X 10^3 N/mm^2 and I = 100 X 10^6 mm^4. **[10]**