Total No. of Questions : 12]

SEAT No. :

P2392

[Total No. of Pages : 4

[5153]-15
T.E. (Mechanical /Automobile)
Computer Oriented Numerical Methods
(2008 Pattern) (Semester-I) (302045)

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) ***Figures to the right side indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION-I

Q1) a) Draw Flow chart for 'Modified Newton Raphson' Method. **[8]**

b) Use Simpson's 3/8 rule to evaluate **[8]**

$$I = \int_1^2 \frac{1}{x} dx$$

OR

Q2) a) Draw Flow chart for 'Gauss Quadrature 3 Point Formula'. **[8]**

b) Apply Newton Raphson Method to determine the root of equation **[8]**

$f(x)=x^3-4x+1=0$ to an accuracy of 0.001, take x1=0

Q3) a) Draw flowchart for 'Newton's Backward Difference' Interpolation. **[8]**

b) Determine y' and y'' at $x=0$ for following data **[8]**

x	0	1	2	3	4
y	2	5	10	22	34

OR

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

Interpolation

Inverse Interpolation

Extrapolation

b) Find f(4.2) using Newton's Forward Difference **[10]**

X	4	6	8	10	12
F(x)	93	259	569	1071	1813

Q5) a) Draw Flow Chart for finding values of unknown variables by Back Substitution in Gauss-Elimination method. **[6]**

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

$$x+y+z=9$$

$$2x-3y+4z=13$$

$$3x+4y+5z=40$$

OR

Q6) a) Explain partial pivoting with example. **[6]**

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

$$27x+6y-z=85$$

$$6x+15y+2z=72$$

$$x+y+54z=110$$

SECTION-II

Q7) a) Explain the following with suitable example **[8]**

i) significant Digit

ii) Inherent Error

iii) Rounding error

iv) Truncation error

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

x	1	2	3	4
y	0.17	0.18	0.23	0.32

OR

Q8) a) Draw flow chart to fit an equation $y=ax^b$ using Least Square Method. **[8]**

b) Fit an equation $y=ab^x$ through following set of points **[8]**

x	1	2	3	4
y	4	11	35	100

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

b) Given $\frac{dy}{dx}=\frac{1}{x+y}$. with initial conditions as y(0)=1, find y(0.1) with step size of 0.05. Use Runge Kutta 4th order method. **[8]**

OR

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

b) Solve the equation $\frac{dy}{dx}=1+xy$. Given the initial condition y(0)=2, find y(0.3) taking step size of 0.1 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 **[10]**

$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -10\,(x^2+y^2+10)$ Over the square with x = y = 0 and x = y = 3, with u = 0 on the boundary and mesh length 1.

OR

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

b) Evaluate the pivotal values of the following equation taking h=1 and upto one half of the period of vibration, **[10]**

$$16\frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial t^2}$$

Given that $u(0,t) = u(5,t) = 0; u(x,0) = x^2(5-x)$ and $\frac{\partial u}{\partial t}(x,0) = 0$

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