P1366

[4858] - 112

T.E. (Mechanical and Automobile Engineering)
COMPUTER ORIENTED NUMERICAL METHODS
(2008 Pattern)

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 'Successive approximation Method'.   **[8]**

      b) Use Simpson's 1/3 rule to evaluate using 6 strips.   **[8]**

$$I = \int_{2.2}^{3.4} x^3 - 2x^2 + 7x - 5 \, dx$$

OR

Q2) a) Draw Flow chart for Double Integration using Trapezoidal Rule. **[8]**

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

        $f(x) = x^4 - 5x^3 + 9x^2 - 7x + 2$ to an accuracy of 0.001, take $x1 = 0.5$.

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

b) Determine y' and y'' at $x = 3$ for following data **[8]**

x	1	2	3
y	3.2	8.05	13

OR

Q4) a) Draw flowchart for 'Newton's Backward differentiation'. **[8]**

b) Find f(3.5) using Newton's Forward Interpolation method. **[8]**

X	3	4	5	6	7
F(x)	1.59	2.76	3.195	2.73	1.988

Q5) a) Draw Flow Chart for Gauss Siedel method. **[8]**

b) Solve following set of equations using Gauss Elimination Method. **[10]**

$$15X + 3Y - 2Z = 85$$
$$2X + 10Y + Z = 51$$
$$X - 2Y + 8Z = 5$$

OR

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

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

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

SECTION - II

Q7) a) Explain error propagation with suitable example. **[4]**

b) Explain *relative error and round-off error* with suitable example. **[4]**

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

x	1	3	5	7	9
y	1.5	2.8	4	4.7	6

OR

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

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

x	2000	3000	4000	5000	6000
y	15	15.5	16	17	18

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

b) Solve the equation $\dfrac{dy}{dx} = -2xy^2$, find y(0.4) taking step size of 0.1 using Runge Kutte 2nd order method. Given the initial condition as y(0) = 1. **[8]**

OR

Q10) a) Draw flow chart to solve simultaneous first order differential equations using RK2 method. **[8]**

b) Given $\dfrac{dy}{dx} = \log_{10}(x^2 + y)$, find $y(0.4)$ with step size of 0.2, using Modified Euler's order method for accuracy of 0.001. with initial condition as $y(0) = 1$. **[8]**

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

b) Solve the Poisson's equation $\nabla^2 = 2x^2 y^2$ Over the square with $0 \le x \le 3$ and $0 \le y \le 3$, with $u = 0$ on the boundary and h = 1. **[10]**

OR

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

b) Solve the Parabolic Equation $\dfrac{\partial u}{\partial t} = \dfrac{\partial^2 u}{\partial x^2}$ subject to condition $u(x, 0) = \sin \pi x$, $0 \le x \le 1$, $u(0, t) = u(1, t) = 0$ using Crank-Nicolson method, do two iterations taking $h = 1/3$, $k = 1/36$. **[10]**

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