

Total No. of Questions : 12]

SEAT No. :

P1366

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[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]

$$f(x) = x^4 - 5x^3 + 9x^2 - 7x + 2 \text{ to an accuracy of } 0.001, \text{ take } x_1 = 0.5.$$

P.T.O.

- 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 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) 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 $\frac{dy}{dx} = -2xy^2$, find $y(0.4)$ taking step size of 0.1 using Runge Kutta 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 $\frac{dy}{dx} = \log_{10}(x^2 + y)$, 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 $\nabla^2 = 2x^2y^2$ Over the square with $0 \leq x \leq 3$ and $0 \leq y \leq 3$, 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 $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ subject to condition $u(x, 0) = \sin \pi x$, $0 \leq x \leq 1$, $u(0, t) = u(1, t) = 0$ using Crank-Nicolson method, do two iterations taking $h = 1/3$, $k = 1/36$. [10]

