

Total No. of Questions : 10]

SEAT No. :

P2031

[Total No. of Pages : 4

[4858]-1019

T.E.(Common-Mechanical / Auto)

NUMERICAL METHODS AND OPTIMIZATION

(2012 Pattern) (End-Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :-

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume suitable data if necessary.*

- Q1)** a) What do you mean by convergence? Explain importance in brief. [2]
- b) Solve the following set of linear simultaneous equation using Gauss elimination method. [8]

$$x + 3y + z = 10$$

$$x + 2y + 5z = 12$$

$$4x + y + 2z = 16$$

OR

- Q2)** a) Find the root of $\log_{10} x - x^2 + 2 = 0$ upto accuracy 0.01. Use false position method. [6]
- b) Write short note on Genetic Algorithm. [4]

- Q3)** a) Write a flow chart for Bisection method for root finding. [4]
- b) Using Gauss Seidal iteration method solve the following equation.[6]

$$x + 20y + 9z = -23$$

$$2x - 7y - 20z = -57$$

$$20x + 2y + 6z = 28$$

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OR

Q4) a) Write short note on Simulated Annealing. [4]

b) Write a flow chart for Thomas algorithm for tri-diagonal matrix solution. [6]

Q5) a) The value of x and y obtained in an experiment are as follows, the law controlling them is $y = ax^b$, [8]

x	1	2	3	4	5
y	0.5	2.0	4.5	8	12.5

Find the best value of the constant a and b .

b) From the tabulated values of x and y given below prepare forward difference table. Find the polynomial passing through the points and estimate the value of y when $x = 1.5$. [8]

x	0	2	4	6	8
y	5	29	125	341	725

Also find the slope of curve at $x = 1.5$.

OR

Q6) a) Fit the exponential curve $y = ae^{bx}$ to the following data. [8]

x	2	4	6	8
y	25	38	56	84

b) The velocity distribution of a fluid near a flat surface is given below. [8]

x	0.1	0.3	0.6	0.8
$V = y$	0.72	1.81	2.73	3.47

Where x is the distance from the surface (mm) and V is the velocity (mm/sec). Use Lagrange's interpolation polynomial to obtain the velocity at $x = 0.4$.

Q7) a) Draw flow chart for Simpson's $3/8^{\text{th}}$ rule. [8]

b) Find double integration of $f(x) = x^2 + y^2 + 5$ for $x = 0$ to 2 and $y = 0$ to 2 taking increment in both x and y as 0.5. Use Trapezoidal rule. [8]

OR

Q8) a) Find the area under the curve on X axis. The curve passes through the following points (1.00,2.00), (1.50,2.40), (2.00,2.70), (2.50,2.80), (3.00,3.00), (3.50,2.60), (4.00,2.10). [8]

b) The velocity of car running on a straight road at the interval of 2 minutes is given below: [8]

Time (min)	0	2	4	6	8	10	12
Velocity (Km/hr)	0	22	30	27	18	7	0

Find the distance covered by the car using Simpson's $1/3^{\text{rd}}$ rule.

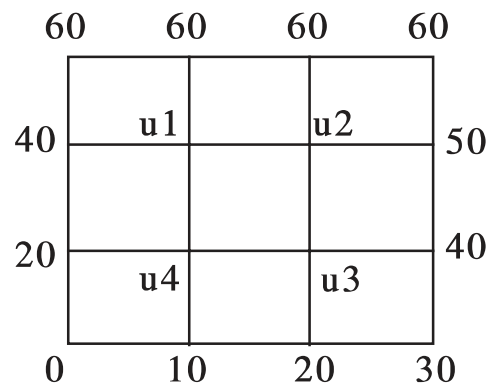
Q9) a) A second order ODE is transformed into first order ODE as,
 $\frac{dy}{dx} = z$, $y(0)=2$ and $\frac{dz}{dx} = 0.5x - y$, $z(0)=0$. Estimate the value of y and z at $x = 0.2$ take $h = 0.1$. [10]

b) Explain the step by step solution procedure for solving parabolic equations. [8]

OR

Q10)a) The relationship between x and y is given by $\frac{dy}{dx} + xy = 2$. Estimate y at $x = 5.1$ using 2^{nd} order Runge Kutta method. Assume $y = 2$ at $x = 5.0$. Take step size of 0.02. [8]

- b) Solve the Laplace's equation $\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} = 0$ for the square mesh shown below. [10]



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