

Total No. of Questions : 12]

SEAT No. :

P1698

[Total No. of Pages : 3

[5460]-516

T.E. (Mechanical/Automobile)
NUMERICAL METHODS & OPTIMIZATION
(2015 Pattern) (Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10 and Q11 or Q12.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) Explain the convergence and divergence of Successive Iterative method with graphical representation. [6]

OR

Q2) Solve by Bisection method $3x = \cos x + 1$ correct up to three decimal places.

Q3) Solve the following equation by Gauss Elimination method, with partial pivoting. [6]

$$2x + y + z = 10, 3x + 2y + 3z = 18, x + 4y + 9z = 16.$$

OR

Q4) Solve the following simultaneous equations using Tridiagonal Matrix Algorithm (TDMA).

$$5x_1 - x_2 = 5.5$$

$$-x_1 + 5x_2 - x_3 = 5$$

$$-x_2 + 5x_3 - x_4 = 11.5$$

$$-x_4 + 5x_4 = 16.5$$

P.T.O.

Q5) Solve the following problem of LPP.

[8]

Maximize $Z = 2X_1 + X_2$

Subject to, $X_1 + 2X_2 \leq 10$

$$X_1 - X_2 \leq 2$$

$$X_1 + X_2 \leq 6$$

$$X_1 - 2X_2 \leq 1$$

$$X_1, X_2 \geq 0$$

OR

Q6) Write a short note on Simulated Annealing with flowchart and applications in detail.

Q7) a) Solve the second order differential equation $y'' = xy'^2 - y^2$ for $x = 0.2$ correct to 4 decimal places. Initial conditions are $x = 0, y = 1, y' = 0$, by Runge Kutta 2nd order. [10]

b) Draw flow chart for Eulers Method for given no of iterations. [8]

OR

Q8) a) Solve the $u_t = u_{xx}$ subjected to $u(0, t) = u(1, t) = 0$ $u(x, 0) = \sin\pi x, 0 \leq x \leq 1$, using Bender Smichdt method [10]
taking $h = 1$

b) Draw flow chart for Solution of Ordinary Differential Equation by Runge Kutta 4th order. [8]

Q9) a) An experimental data on life time 't' of a cutting tool at a different cutting speeds 'v' is given below : [8]

Speed v	325	375	450	475	500
Life t	75	30	10	7	5

Fit the curve of the form $v = at^b$

- 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
y	5	29	125	341

OR

- Q10)** a) Fit a straight line passing through the points : [8]

X	1	2	5	7
Y	1	12	117	317

- b) Draw the flowchart for $y = ax^b$ [8]

- Q11)** a) Find double integration of $f(x) = x + y + 5$ for $x = 0$ to 2 and $y = 0$ to 2 taking increment in both x and y as 0.5. Use Trapezoidal rule. [8]

- 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 1/3rd rule.

OR

- Q12)** a) Draw combine flow chart for Simpson's 3/8th rule & Simpson's 1/3rd rule. [8]

- b) Evaluate $I = \int_0^{0.8} [\log_e(x+1) + \sin 2x] dx$ by using Gauss quadrature two point formula. [8]

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