Total No. of Questions : 12]

SEAT No. :

P3572

[Total No. of Pages : 3

[5560]-516

T.E.(Automobile & Mechanical)

NUMERICAL METHODS AND OPTIMIZATION

(2015 Course) (Semester - II) (302047)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, 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 $x^3 - 4x + 1 = 0$ correct up to two decimal places. **[6]**

Q3) Solve the following equation by Gauss Elimination method, **[6]**

$2x + 3y - z = 5,\ 4x + 4y - 3z = 3,\ 2x - 3y + 2z = 2$

OR

Q4) Solve the following simultaneous equations using Tridiagonal Matrix Algorithm (TDMA), **[6]**

$5x_1 - x_2 = 5.5$

$-x_1 + 5x_2 - x_3 = 5$

$-x_2 + 5x_3 - x_4 = 11.5$

$-x_3 + 5x_4 = 16.5$

Q5) Solve the following problem of LPP graphically, **[8]**

Maximize $Z = 2x_1 + 5x_2$

Subject to, $x_1 + 4x_2 \leq 24$

$3x_1 + x_2 \leq 21$

$x_1 + x_2 \leq 9$

$x_1, x_2 \geq 0$

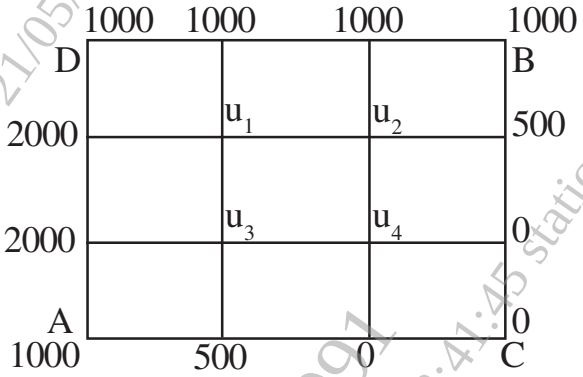
OR

P.T.O.

Q6) Write a short note on Simulated Annealing with flowchart and applications in detail. **[8]**

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. Increment in x = 0.1. **[10]**

b) Solve the equation $u_{xx} + u_{yy} = 0$ for the square mesh with the boundary values as shown below : **[8]**



OR

Q8) a) Solve the boundary value problem $u_t = u_{xx}$ subjected u(0,t) = u(1,t) = 0 $u(x,0) = \sin\pi x$, $0 \le x \le 1$, using Bender Schmidt method taking h = 0.2 and k = 0.02. **[10]**

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

Q9) a) It is known that the curve $y = ax^b$ fits the data given below. Find the best values of a and b. **[8]**

x	1	2	3	4	5	6
y	1200	900	600	200	110	50

b) From the following data, find y at x = 43. **[8]**

x	40	50	60	70	80	90
y	184	204	226	250	276	304

OR

Q10)a) Draw the flowchart for fitting second degree curve using Least Square Technique. **[8]**

b) Following data gives values of y corresponding to the values of x. Find value of x when y = 3.5 by applying Langrange's interpolation. **[8]**

X	1	2	5	7
Y	1	12	117	317

Q11)a) Find double integration of f(x,y) = 1/(x + y) for x = 2 to 3.2 and y = 1 to 2.8 taking no of steps in both x and y as nx = ny = 3. Use Trapezoidal rule. **[8]**

b) The table below gives the velocity v of a moving particle at time t seconds. **[8]**

T	0	2	4	6	8	10	12
V	4	6	16	34	60	94	136

Find the distance covered by the particle in 12 seconds using Simpson's 1/3rd rule.

OR

Q12)a) Draw flow chart for Simpson's 3/8th rule. **[8]**

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

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