Hall Ticket No | | | | | | | | | | | Question Paper Code: BST003

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech I Semester End Examinations (Supplementary) - July, 2018

Regulation: IARE–R16

COMPUTER ORIENTED NUMERICAL METHODS

Time: 3 Hours **(STE)** **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Solve the following equations using Gauss seidel iteration method. 2x+y=3; 2x+3y=5. **[7M]**

   (b) Solve the following equations using Gauss Jordan method. x + y = 2, 2 x +3 y = 5 **[7M]**

2. (a) Solve the following equations using relaxation method.
   9x-y-2z=9;
   x+10y-2z=15;
   2x-2y-13z=17 **[7M]**

   (b) Show that LU decomposition method fails to solve the system of equations. **[7M]**

$$\begin{bmatrix} 1 & 1 & -1 \\ 2 & 2 & 5 \\ 3 & 2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 2 \\ -3 \\ 6 \end{bmatrix}$$

UNIT – II

3. (a) Find the Lagrange's interpolating polynomial of degree 2 approximating the function y=ln x defined by the following table of values. Hence determine the value of ln 2.7 **[7M]**

x	y=ln x
2.0	0.69315
2.5	0.91629
3.0	1.09861

   (b) Construct the free cubic spline to approximate $f(x) = cos\pi$x by using the values given by f (x) at x = 0; 0:25; 0:5; 0:75 and 1:0. **[7M]**

4. (a) For linear interpretation, in the case of equispaced tabular data, show that the error does not exceed 1/8 of the second difference. **[7M]**

   (b) Determine the natural cubic spline s (x, y) which approximates the below Table 1, the function z=f (x, y) satisfies the following data for 0 X, Y Z. Find the approximate value of z (0.5,0.5). **[7M]**

Table 1

	X		
Y	0	1	2
0	1	2	9
1	2	3	10
2	9	10	17

UNIT – III

5. (a) If y(75)= 246, y(80)= 202, y(85)= 118, y(90)= 40). Find y(79). **[7M]**

   (b) Find the cubic polynomial which takes the following values shown in Table 2. **[7M]**

Table 2

x	0	1	2	3
f(x)	1	2	1	10

6. (a) Find f(32) by applying central difference formula given that
   f (25) =0.2707, f (30) =0.3027, f (35) =0.3386, f (40) =0.3794. **[7M]**

   (b) Find the value of x correct to one decimal place for which y=7 for the given data shown in
   Table 3. **[7M]**

Table 3

x	1	3	4
y	4	12	19

UNIT – IV

7. (a) Evaluate $\int_0^1 e^{-x^2}$ dx by dividing the range into 4 equal parts using Trapezoidal rule. **[7M]**

   (b) A rod is rotating in a plane as shown in Table 4 which gives the angle θ through which the rod has turned for various values of time t sec. **[7M]**

Table 4

t	0	0.2	0.4	0.6	0.8	1.0
θ	0	0.12	0.49	0.49	2.02	3.20

Calculate the angular velocity and the angular acceleration of the rod when t=0.6 sec.

8. (a) Find the value of $\log 2^{1/3}$ from $\int_0^1 \frac{x^2}{1+x^2} dx$ using simpson's 1/3 rule with h=0.25. **[7M]**

   (b) Find y'(x) at x=0.5 for the given data shown in Table 5 **[7M]**

Table 5

x	0	1	2	3	4
y(x)	1	1	15	40	85

UNIT – V

9. (a) From the Taylor series for y (x), find y (0,1) correct to 4 decimal places if y(x) satisfies. y^1 = x - y^2, and y (0) =1. **[7M]**

   (b) Solve the equation y^1=x+y^2, subject to the condition y=1 when x=0. **[7M]**

10. (a) Solve the boundary-value problem $\frac{\partial^2 y}{\partial x^2 - y} = 0$ with y (0) = y (2) = 3.62686 **[7M]**

    (b) Given the boundary value problem $x^2y^{11} + xy^1 - y = 0, y(1) = 1, y(2) = 0.5$ apply the cubic spline method to determine the value of y (1.5). **[7M]**