INSTITUTE OF AERONAUTICAL ENGINEERING

(AUTONOMOUS)

Code No: **BST003**

MODEL QUESTION PAPER - II

M.Tech- I Semester Regular Examinations, February 2017

COMPUTER ORIENTED NUMERICAL METHODS

(Structural Engineering)

Time: 3 hours　　　　　　　　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 system by the Gauss elimination method $2x+y+z=10, 3x+2y+3z=18, x+4y+9z=16$ **[7M]**

   (b) Reduce the following matrix to the tridiagonal form by Householder's method **[7M]**

$$\begin{bmatrix} 1 & 3 & 4 \\ 3 & 1 & 2 \\ 4 & 2 & 1 \end{bmatrix}$$

2. (a) Find the solutions to three decimals of the system by Jacobi method **[7M]**

$$83x+11y-4z=95, 7x+52y+13z=104, 3x+8y+29z=71$$

   (b) Determine the largest Eigen value and the corresponding Eigen vector of the matrix $\begin{bmatrix} 10 & -2 & 1 \\ -2 & 10 & -2 \\ 1 & -2 & 10 \end{bmatrix}$ **[7M]**

UNIT-II

3. (a) Use Lagrange's interpolation formula estimate the value of f(155) from the following table **[7M]**

x	150	152	154	156
f(x)	12.247	12.329	12.410	12.490

   (b) Fit a cubic spline to the following data and find $\int_0^3 f(x)dx$ **[7M]**

x	0	1	3
f(x)	1	0	2

4. (a) Find the natural cubic spline interpolate to f at the points $x_0 = 0, x_1 = 1, x_2 = 2$ and $x_3 = 3$,where $f_0 = 0, f_1 = 1, f_2 = 1$ and $f_3 = 0$ **[7 M]**

(b) Use Hermite's interpolation formula estimate the value of f(3.2) from th following table **[7 M]**

x	3	3.5	4.0
f(x)	1.09861	1.25276	1.38629
$f'(x)$	0.3333	0.28571	0.25000

UNIT-III

5. (a) The following data gives the melting points of an alloy to lead and zinc, Find the melting point of the alloy containing 54% of lead. **[7M]**

x	0.20	0.22	0.24	0.26	0.28	0.30
f(x)	1.6596	1.6698	1.6804	1.6912	1.7024	1.7139

(b) From the following table determine f (0.23) and f (0.29) **[7M]**

x	0.20	0.22	0.24	0.26	0.28	0.30
f(x)	1.6596	1.6698	1.6804	1.6912	1.7024	1.7139

6. (a) A horizontal tie-rod is freely pinned at each end. It carries a uniform load w lb per unit length and has horizontal pull P. Find the central deflection and the maximum bending moment taking the origin at one of its ends. **[7M]**

(b) From the following table determine y(1925) and y(1955) **[7M]**

x	1921	1931	1941	1951	1961
y(x)	46000	66000	81000	93000	101000

UNIT-IV

7. (a) From the table compute first and second order derivatives when x=6 **[7M]**

x	0	1	2	3	4	5	6
Y	6.9897	7.0436	7.7815	8.1291	8.4510	8.7506	9.0309

(b) Evaluate the following double integral $\int_0^1\int_0^1 e^{x+y}dxdy$,x,y=0…..1 using Trapezoidal method. **[7M]**

8. (a) A rod is rotating in a plane. The following table gives the angle θ through which the rod has turned for various values of the time *t*. Calculate the angular velocity and angular acceleration of the rod when *t*=0.6 **[7M]**

θ	0	0.2	0.4	0.6	0.8	1.0	1.2
t	0	0.12	0.49	1.12	2.02	3.20	4.67

(b) Evaluate the following double integral $\int_{-2}^{2}\int_{0}^{2}(x^2 - xy + y^2)dxdy$ using Simpson's rule. **[7M]**

UNIT-V

9. (a) Solve by Euler method $\frac{dy}{dx} = x + y, y(o) = 0$ given that h=0.2 **[7M]**
Compute y (0.4) and y (0.6).

(b) Solve the boundary value problem $y'' - 64y + 10 = 0, y(0) = y(1) = 0$ by the finite difference method. **[7M]**

10. (a) Given $\frac{dy}{dx} - 1 = xy, y(o) = 1$.Obtain the Taylor series for $y(x)$ and compute $y(0.1)$ up to four decimal places. **[7M]**

(b) Solve the differential equation $y' = x + y$ using the modified midpoint method for the initial condition $y(0) = 1$ where $0 \le x \le 1$ and h=0.2. **[7M]**