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Exam. Code : 0 0 0 6

B.A./B.Sc. (General) 6th Semester

1059

MATHEMATICS

Paper-III : Numerical Analysis

e Allowed : Three Hours] [Maximum Marks : 30

:— (i) Attempt **five** questions in all, selecting at least **two** questions from each section.

(ii) Use of scientific non-programmable calculator is allowed.

SECTION—A

(a) Solve by Regula-Falsi method to find a root of the equation $x^3 + x - 1 = 0$ in four steps, upto three decimal places.

(b) Use Newton-Raphson's method to find a root of the equation $x \sin x + \cos x = 0$ which is nearer to $x = 3$, correct to three decimal places. 3,3

2. (a) Given that f(1) = 4, f(2) = 5, f(7) = 5, f(8) = 4, find the value of f(6) by using Lagrange's formula.

(b) Find number of Prisoners under age of 35 years in a jail from the following data using Newton's Divided Difference Formula :

Age below	:	25	30	40	50	
No. of Prisoners	:	52	67	84	94	3,3

3. (a) Find f'(1.5) from the following data :

x	:	0	1	3
f(x)	:	0	0.84	0.42

(b) Show that :

$$\Delta^n y_{x-n} = y_x - n y_{x-1} + \frac{n(n-1)}{2} y_{x-2} \ldots\ldots\ldots + (-1)^n y_{x-n}.$$

3,3

4. (a) Evaluate the integral $\int_5^{12} \frac{1}{x} dx$ by applying Gauss's Quadrature formula with n = 3.

(b) Evaluate the integral $I = \int_{-1}^{1} (1-x^2)^{1/2} \cos x \, dx$ using Gauss-Chebyshev three point formula. 3,3

SECTION—B

5. Using Cholesky decomposition method, solve the equations :

$$x + y + z = 3$$
$$x + 2y + 3z = 6$$
$$x + 3y + 6z = 10$$ 6

6. (a) Reduce the given matrix A into a tri-diagonal matrix by using Householder's method :

$$A = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}.$$

(b) Using Jacobi's method, find all the eigen values and the eigen vectors of the matrix :

$$\begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}.$$ 3,3

7. (a) Apply Milne's method to find a solution of the differential equation $\frac{dy}{dx} - 4y = 0$ at x = 0.4 given that :

x	0	0.1	0.2	0.3
y(x)	1	1.492	2.226	3.320

(b) Use Runge-Kutta's fourth order method to find y when x = 0.4 with step-size of 0.2 given that :

$$\frac{dy}{dx} = 1 + y^2 \text{ and } y(0) = 0.$$ 3,3

8. (a) Apply Gauss-Seidal iterative method to solve the following system of linear equations :

$27x_1 + 6x_2 - x_3 = 85,$

$6x_1 + 15x_2 + 2x_3 = 72,$

$x_1 + x_2 + 54x_3 = 110$

(b) Find by Taylor's series method, the value of y at $x = 0.1$ to five places of decimals from :

$$\frac{dy}{dx} = x^2y - 1, \; y(0) = 1. \qquad 3,3$$