Name of the Course	: B.A. (Prog.)
Semester	: VI
Unique Paper Code	: 62357602
Name of the Paper	: DSE: Numerical Analysis

Duration: 2 Hours

Maximum Marks: 75

Attempt any four questions. All questions carry equal marks. All symbols have usual meaning.

- 1. Determine an initial approximation to find the smallest positive root of the equation $x e^{-x} = 0$. Using Newton-Raphson method, perform four iterations to find the root correct to three decimal places.
- 2. Find the inverse of the given matrix using Gauss Jordan method with partial pivoting

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

3. For the system of equations

$$10x_1 + 4x_2 - 2x_3 = 12$$

$$x_1 - 10x_2 - x_3 = -10$$

$$5x_1 + 2x_2 - 10x_3 = -3$$

Starting with $x^{(0)} = [0, 0, 0]^T$ do three iterations using Jacobi iteration scheme.

4. Construct the interpolating polynomial that fits the data

x	0	0.1	0.2	0.3	0.4
$f(\mathbf{x})$	-1.5	-1.27	-0.98	-0.63	-0.22

Using the Gregory Newton Forward difference interpolation. Hence estimate the value of f(0.15).

5. Evaluate the integral

$$\int_{0}^{1} \frac{1}{1+x^2} dx$$

Using composite Trapezoidal rule with 2, 4 and 8 equal subintervals. Improve the result by Romberg integration.

6. Solve the initial value problem

$$\frac{dy}{dx} = -y^2, \qquad y(1) = 1$$

Using the Heun method over the interval [1, 1.4] with h = 0.2.