Name of the Course	: Generic Elective
Semester	: <b>IV</b>
Unique Paper Code	: 32355402
Name of the Paper	: GE-4 Numerical Methods

Duration: 2 Hours

Maximum Marks: 75

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

- 1. Perform four iterations of the Regula-Falsi method to obtain a root of the equation  $f(x) = x \log_{10} x + 3$  correct to four decimal places in the interval (0,1).
- 2. Perform two iterations of Newton's method to solve the non-linear system of equations with initial approximation (1, 1)

$$f(x, y) = x^{2} - y^{2} - 4 = 0$$
  
$$g(x, y) = x^{2} - y^{2} - 16 = 0.$$

3. Solve the following system of linear equations

$$2x + 2y + z = 1$$
$$4x + 2y + 3z = 2$$
$$x + y + z = 3$$

using the Gauss elimination method with partial pivoting.

4. For the following data, construct Newton divided difference table:

x	-2	-1	0	1	3	4
$f(\mathbf{x})$	9	16	17	18	44	81

Find the interpolating polynomial f(x) and by using it approximate value of f(x) at x = 0.5 and x = 3.1.

5. Find the approximate value of the integral

$$I = \int_{0}^{\pi} t \sin t \, dt$$

using Trapezoidal rule and Simpson's rule. Also calculate the error in each case.

6. Apply Mid-Point method to solve the initial value problem and calculate y(0.3) by using h = 0.1

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