Name of Course	: **B.A. (Prog.)**
Unique Paper Code	: **62357602**
Name of Paper	: **DSE: Numerical Analysis**
Semester	: **VI**
Duration	: **3 hours**
Maximum Marks	: **75 Marks**

Attempt any four questions. All questions carry equal marks.

1. Find the iteration method based on Newton Raphson Method to find $N^{(1/3)}$ where $N = 18$. Perform four iterations by taking initial approximation as 2.

2. Obtain a second degree polynomial approximation to

$$f(x) = (1+x)^{(1/2)}, x \in [0,0.2]$$

using the Taylor series expansion about x=0. Use the approximation to approximate f(0.1) and found a bound of the truncation error.

3. Find the unique polynomial of degree 3 or less such that $f(0) = -1, f(1) = 0, f(2) = 15, f(3) = 80$ using

(i) The Lagrange interpolation.

(ii) The Newton forward difference interpolation.

Interpolate at $x = 1.5$

4. For the following system of equations:

$$6x_1 + 3x_2 + x_3 = 12$$
$$x_1 + 5x_2 + 2x_3 = 3$$
$$2x_1 + 4x_2 + 7x_3 = 21$$

Starting with $X^{(0)} = (1, 0, 1)$, iterate two times using the Gauss- Jacobi method and two times using the Gauss-Seidel method.

5. Apply the Runge- Kutta 2nd order midpoint method to solve the I.V.P.:

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

on the interval [0, 0.3] by taking $h = 0.1$.

6. Apply the Euler's method to approximate the solution of the I.V.P. and calculate y(0.3) by using h= 0.1:

$$\frac{dy}{dx} = \frac{x}{y}, \qquad y(0) = 1$$

On the interval [0, 5] by taking $h = 1$. Also find the absolute error at each step given that the exact solution is $y(x) = \sqrt{x^2 + 1}$.