(Time: 3 Hours) **Total Marks: 80**

Note:

- Question **1** is **compulsory**.
- Solve ant **three** questions from questions no. 2 to 6.
- Assume necessary data wherever necessary.

Q1 Answer the following questions **20**

A) Define error, accuracy and precision of numbers with suitable examples.
B) Derive the condition for convergence in case of Newton Raphson method.
C) What do you understand by unconstrained optimization? Write the algorithm for Golden section search method?
D) What are the basic requirements of Linear programming problem?

Q2 a) Solve the equation $\frac{dy}{dx} = x^2 + y^2$, using 2nd order RK method at x=0.2 and x =0.4, y(0) = 0. **10**

Q2 b) Solve the equation $dy/dx = 1 + xy^2$ with y (0) = 0.2 using Adam's Bashforth method. Determine y at x=0.5 with a step size of 0.1. **10**

Q3 a) Write the algorithm for Newton's forward difference interpolation and calculate f(3.5) for the following data **10**

x	2	3	4	5	6	7	8	9
f(x)	19	48	99	178	291	444	643	894

Q3 b) $Minimize\ Z = 2x_1^2 + x_2^2$ **5**
$subjected\ to\ x_1 + x_2 = 1$
$x_1, x_2 \geq 0$
Using Lagrange's multiplier method.

Q3 c) What are the basic requirements of Linear programming? Discuss the various terms used in LPP. **5**

Q4 a) Minimize cost $Z = 400x_1 + 800x_2$
subject to $6x_1 + 2x_2 \geq 12$
$2x_1 + 2x_2 \geq 8$
$4x_1 + 12x_2 \geq 24$
$x_1, x_2 \geq 0$ using graphical method. **10**

Q4 b) Determine root of equation $f(x) = 0.51x - sinx$ using Newton Raphson method for three iterations. **10**

Q5 a) Use LU Decomposition method to find solution of the following system of equations. **10**

$$2x + 2y + 3z = 4$$
$$4x - 2y + z = 9$$
$$x + 5y + 4z = 3$$

Q5 b) Use method of Regula Falsi to obtain root of equation $sins = x - 2$, near x = 2.5 for 5 iterations. x is in radians. Write the algorithm for this method. **10**

Q6 a) Using Simplex method solve **10**

$$Max\ Z = 500x_1 + 600x_2$$
$$subjected\ to\ \ x_1 + 2x_2 \leq 15$$
$$3x_1 + 2x_2 \leq 18$$
$$x_1, x_2 \geq 0$$

Q6 b) Solve the equation $\frac{dy}{dx} = x - y^2$ using Milne's Predictor-Corrector method. **10**
Find y at x = 0.8 and x = 1 with step size of 0.2.
Given that y(0) = 0, y(0.2) = 0.0199, y(0.4) = 0.079, y(0.6) = 0.1762.

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