[3 Hours] **[Total Marks : 100]**

Please check whether you have got the right question paper.

N.B:
1. **Question No. 1** is **compulsory**.
2. Solve **any three** questions from **Questions No. 2** to **6**.
3. Assume necessary **data** where necessary.

Q1 Answer the following questions **20**

A) What do you mean by forward difference interpolation and backward difference interpolation? Enlist the various methods of interpolation.

B) What do you mean by equality and inequality constraints?

C) What do you mean by bracketing method? Discuss the methods with suitable example.

D) What do you mean by an error? Discuss types of errors and methods to minimize them.

Q2 a) Solve the equation $\frac{dy}{dx} = x^2 + y^2$, using 4^{Th} order RK method at x=0.2 and x =0.4, y(0) = 0. **10**

Q2 b) $Minimize\ Z = 2x_1^2 + x_2^2$

$subjected\ to\ x_1 + x_2 = 1$

$x_1, x_2 \geq 0$

Using Lagrange's multiplier method. **5**

Q2 c) What are the basic requirements of Linear programming? Discuss the various terms used in LPP. **5**

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) 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.

Q4 a) 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**

Q4 b) Minimize cost $Z = 400x_1 + 800x_2$ **10**

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.

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) 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**

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