(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) What do you mean by an error? Discuss propagation of error with suitable example.

b) Write the algorithm for golden section search method.

c) What is the need for optimization? Explain constrained optimization.

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

Q2 a) Solve the equation y'' = 8 +6xy' using 4^{Th} order RK method at x=0.2 correct up to 4decimal places. Initial conditions are x =0, y = 0, y' = 0.1. The step size h = 0.2 **10**

Q2 b) Solve the equation $\frac{dy}{dx} = 2x + y$ using Milne's Predictor-Corrector method. Find y at x = 0.4 and x = 0.5 with step size of 0.1. Given that y(0) = 0.2, y(0.1) = 0.2313, y(0.2) = 0.2870, y(0.3) = 0.3696. **10**

Q3 a) Write the algorithm for Newton's divided difference interpolation. For the following data, find y at x = 4.8. **10**

x	4	5	7	10	11	13
y	48	100	294	900	1210	2028

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) Solve the following system of equations using LU method. What are the advantages of this method? **10**

$$x + y + z = 1$$
$$4x + 3y - z = 6$$
$$3x + 5y + 3z = 4$$

10

Q4 b) Solve using Secant method to obtain root of equation $xe^{x} - \cos 3x - 0.51 = 0$. Do four iterations. Write the algorithm for the same.

10

Q5 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.

Q5 b) Determine root of equation $f(x) = 0.51x - sinx$ using Newton Raphson method for three iterations. **10**

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

$$Max\ Z = 3x_1 + 2x_2$$
$$subjected\ to\ \ x_1 + x_2 \leq 4$$
$$x_1 - x_2 \leq 2$$
$$x_1, x_2 \geq 0$$

Q6 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**

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