[3 Hrs] **Total Marks : 80**

Note : Q. 1 is compulsory
Solve any 3 questions out of remaining questions.
Assume suitable data if necessary

Q. 1 (20)

a) Why do we need optimization? Explain unconstrined optimization
b) Explain curve fitting for sinusoidal function.
c) What do you mean error? Discuss propogation of error with suitable?
d) Write short note on Golden Section search.

Q. 2

a) Solve the equation $dy / dx = 2e^x - y$ using Milne Predictor Corrector Method. Given that y(0)=2. Find y at x=0.4 with a step size of 0.1. The values of x and y are given in table below:

x	0	0.1	0.2	0.3
Y	2	2.01	2.04	2.09

(10)

b) Write the algorithm of bisection method and find the root of equation $\cos x - 1.3x = 0$ with accuracy of 0.01. (10)

Q. 3

a) Solve differential equation $dy / dx = x^2 + 2xy$, $y(0) = 0$ by Picard's method upto 3rd approximation. (10)

b) For the following data find the polynomial f(x) which passes through all points using Newton's Divided difference Interpolation and also find f(1.3). (10)

x	0	2	3	4	6
f(x)	1	13	34	73	229

Q. 4

a) Solve following system of equations by LU decomposition method (10)

$2x + y + z = 10$
$3x + 2y + 3z = 18$
$x + 4y + 9z = 16$

b) Solve the equation $dy/dx = x + y$ given that $y(0) = 1$, $h = 0.1$ using Runge Kutta 2nd Order method for y(0.2) (10)

Q. 5

a) State the necessary and sufficient conditions for solving multivariable optimization problem with equality constraint using Lagrange's multiplier method. Use Lagrange's Multiplier method to minimize

$$f(x,y) = 4x^2 + 9y^2$$

subjected to

$$xy=36,$$
$$x,y>=0$$ (10)

b) Write short note on (10)

i) Extrapolation and interpolation

ii) Feasible solution and optimal feasible solution

Q. 6

a) Find the maximum value using Graphical method

Maximize $Z=25x+30y$

subjected to

$$2x+3y<=1500$$
$$3x+2y<=1500$$
$$x <=400,\ y <=400$$
$$x,y >=0$$ (10)

b) Solve the following LPP using Simplex method (10)

Max $Z= 3x+2y+5z$

subjected to

$$2x+3y-2z<=40$$
$$4x-2y+z<=24$$
$$x-5y-6z>=2$$
$$x,y,z >=0$$

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