

[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 unconstrained optimization
- b) Explain curve fitting for sinusoidal function.
- c) What do you mean error? Discuss propagation 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 3<sup>rd</sup> 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 2<sup>nd</sup> 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

$$xy=36,$$

$$x,y \geq 0$$

(10)

b) Write short note on

i) Extrapolation and interpolation

ii) Feasible solution and optimal feasible solution

(10)

Q. 6

a) Find the maximum value using Graphical method

Maximize  $Z=25x+30y$

subjected to

$$2x+3y \leq 1500$$

$$3x+2y \leq 1500$$

$$x \leq 400, y \leq 400$$

$$x, y \geq 0$$

(10)

b) Solve the following LPP using Simplex method

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

subjected to

$$2x+3y-2z \leq 40$$

$$4x-2y+z \leq 24$$

$$x-5y-6z \geq 2$$

$$x,y,z \geq 0$$

(10)

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