

PG (CBCS)
M.Sc. Semester- III Examination, 2023
MATHEMATICS
PAPER: MTM 305A
(ADVANCED OPTIMIZATION)



Full Marks: 50

Time: 2 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP-A

1. Answer any **FOUR** of the following questions: 4×2=8

- a) Write the limitations of Fibonacci searching method.
- b) State the integer and mixed integer programming problem.
- c) Explain the deletion of an existing variable from the optimal table of an LPP
- d) What do you mean by exact and inexact one dimensional search?
- e) Explain the concept of deviational variable in goal programming problem.
- f) Show that the optimum point can be obtained for a quadratic objective function in a single step by Newton's method.

GROUP-B

2. Answer any **FOUR** of the following questions: 4×4=16

a) Following is the optimal solution of an LPP

		c_j	4	6	2	0	0
c_B	B	x_B	y_1	y_2	y_3	y_4	y_5
4	x_1	1	1	0	-1	4/3	-1/3
6	x_2	2	0	1	2	-1/3	1/3
$z_j - c_j$		16	0	0	6	10/3	2/3

If the cost coefficients c_1 changes to 8, then find the optimal basic feasible solution of the modified problem.

- b) Maximize $f(x) = \begin{cases} 2x/3, & x \leq 3 \\ 5 - x, & x > 3 \end{cases}$ in the interval $[1, 4]$ by Fibonacci method for $n = 5$.
- c) Determine the value of x_1, x_2, x_3 so as to maximize $\{x_1, x_2, x_3\}$, subject to $x_1 + x_2 + x_3 = 10$ and $x_1, x_2, x_3 \geq 0$.
- d) Write the procedure of Golden section method to optimize an unimodal minimization problem.
- e) Write the steps of Steepest Descent method.
- f) Using Newton's method Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ with $\begin{pmatrix} 0 \\ 0 \end{pmatrix}$ as a starting point.

P.T.O

GROUP-C3. Answer any **TWO** of the following questions:

2×8=16

a) Solve the following IPP using Gomory's cutting plane method

$$\begin{aligned} \text{Maximize } z &= 7x_1 + 9x_2 \\ \text{subject to } -x_1 + 3x_2 &\leq 6 \\ 7x_1 + x_2 &\leq 35 \end{aligned}$$

$$x_1, x_2 \geq 0 \text{ and are integers}$$

b) Using Gradient Projection method solve

$$\text{Minimize } f = x_1^2 + x_2^2 - 2x_1 - 4x_2$$

Subject to,

$$x_1 + 4x_2 \leq 5$$

$$2x_1 + 3x_2 \leq 6$$

$$x_1, x_2 \geq 0$$

c) Use dynamic programming to solve the following LPP

$$\text{Maximize } z = 3x_1 + 5x_2$$

$$\text{subject to, } x_2 \leq 6$$

$$x_1 \leq 4$$

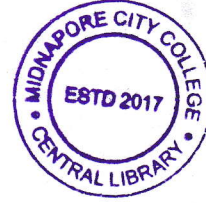
$$3x_1 + 2x_2 \leq 18$$

$$\text{and } x_1, x_2 \geq 0$$

d) Graphically solve the following goal programming problem

$$\text{Minimize } z = P_1d_1^- + P_2d_2^- + P_3d_3^-$$

$$\text{subject to, } 2x_1 + 3x_2 \leq 30, 6x_1 + 4x_2 \leq 60, x_1 + x_2 + d_1^- - d_1^+ = 10; x_1 + d_2^- - d_2^+ = 7, x_2 + d_3^- - d_3^+ = 8 \text{ and } x_1, x_2, d_i^-, d_i^+ \geq 0 (i = 1, 2, 3).$$



[Internal Assessment- 10 Marks]
