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MT-605

MA/MSC Mathematics (MAMT/MSCMT)

(Mathematical Programming-I)

Examination, June 2025

Time : 2:00 Hrs.   Max. Marks : 70

Note **:–** This paper is of Seventy (70) marks divided into Two (02) Sections 'A' and 'B'. Attempt the questions contained in these Sections according to the detailed instructions given therein. ***Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.***

Section–A

(Long Answer Type Questions)   2×19=38

Note **:–** Section 'A' contains Five (05) Long-answer type questions of Nineteen (19) marks each. Learners are required to answer any *two* (02) questions only.

A–0719/MT-605   (1)   P.T.O.

1. Solve the following linear programming problem by revised simplex method :

   Max :

   $$z = 2x_1 + x_2$$

   subject to :

   $$3x_1 + 4x_2 \leq 6$$
   $$6x_1 + x_2 \leq 3$$
   $$x_1, x_2 \geq 0$$

2. Prove that a hyperplane is a closed set.

3. Solve the following linear programming problem by branch and bound techniques :

   Max :

   $$z = x_1 + x_2$$

   subject to :

   $$3x_1 + 2x_2 \leq 12$$
   $$x_2 \leq 2$$
   $$x_1, x_2 \geq 0 \text{ and integers.}$$

4. Write the necessary and sufficient conditions of general non- linear programming problem.

5. Solve the following non-linear programming problem by graphically :

Max :

$$f(x_1, x_2) = 8x_1 + 8x_2 - x_1^2 - x_2^2$$

subject to :

$$x_1 + x_2 \leq 12$$

$$x_1 - x_2 \geq 4$$

$$x_1, x_2 \geq 0$$

Section–B

(Short Answer Type Questions)   4×8=32

Note :– Section 'B' contains Eight (08) Short-answer type questions of Eight (08) marks each. Learners are required to answer any *four* (04) questions only.

1. What do you mean by bounded variables. How can you find the departing vector in the bounded variable algorithm ?

2. Show that the function $f(x) = x^2$ is a convex function.

3. Explain Lagrange's multiplier's method.

4. Give geometrical interpretation of Gomory's cutting plane method.

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5. Determine the sign of definiteness of the matrix :

$$A = \begin{bmatrix} 3 & 1 & 2 \\ 1 & 5 & 0 \\ 2 & 0 & 2 \end{bmatrix}$$

6. Write a short note on general non- linear programming problem.

7. Write the quadratic form :

$$Q(x) = x_1^2 + 2x_2^2 - 7x_3^2 - 4x_1x_2 + 6x_1x_3 - 5x_2x_3$$

in matrix form.

8. Define the following :

   (i) Saddle point

   (ii) Convexity of quadratic forms

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