A–1050

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MT-610

M.A./M.Sc. Mathematics (MAMT/MSCMT)

Mathematical Programming-II

Examination, 2026 (Feb.)

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.

1. Use Kuhn-Tucker condition to solve the following non-linear programming problem :

   Max. :

   $$f(x) = 8x - x^2$$

   Subject to :

   $$x \leq 3,\ x \geq 0$$

2. Solve the following quadratic programming problem by Wolfe's Method:

   Min. :

   $$f(x_1, x_2) = -10x_1 - 25x_2 + 10x_1^2 + x_2^2 + 4x_1x_2$$

   Subject to :

   $$x_1 + 2x_2 \leq 10,$$

   $$x_1 + x_2 \leq 9$$

   $$x_1, x_2 \geq 0$$

3. Solve the following quadratic programming problem by Beale's Method:

   Min. :

   $$f(x_1, x_2) = 10x_1^2 + x_2^2 + 4x_1x_2 - 10x_1 - 25x_2$$

   Subject to :

   $$x_1 + 2x_2 \leq 10,$$

   $$x_1 + x_2 \leq 9$$

   $$x_1, x_2 \geq 0$$

4. Proof that every local maximum of the general convex programming problem is it's global maximum.

5. Find an optimal solution of the following convex separable programming problem :

Max. :

$$Z = 3x_1 + 2x_2$$

Subject to :

$$4x_1^2 + x_2^2 \leq 16$$

and $$x_1, x_2 \geq 0$$

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. Define a general non-linear programming problem and what are the Kuhn-Tucker conditions and how are they of fundamental importance in the theory of nonlinear programming.

2. Define the terms :

   (i) Quadratic Programming

   (ii) Wolfe's Method and Beale's Method

3. Describe duality in Non-Linear Programming and duality in Quadratic Programming with example.

4. Describe separable function and Convex Programming Problem with example.

5. Proof that the set of all optimal solutions(global maximum) of the general convex programming problem is a convex set.

6. Define dynamic programming problem and Bellman's Principle of Optimality.

7. Solve the following dynamic programming problem :

   Max :

$$Z = 8x_1 + 7x_2$$

   Subject to :

$$2x_1 + x_2 \leq 8$$

$$2x_1 + 2x_2 \leq 15$$

$$x_1, x_2 \geq 0$$

8. Use Bellman's optimality principle to divide a positive quantity '*b*' into *n* parts in such a way that their product is maximum.

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