A–0724

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MT-610

MA/MSC Mathematics (MAMT/MSCMT)

(Mathematical Programming-II)

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.

1. Solve the non-linear programming problem by Kuhn-Tucker conditions :

   Optimize :

$$Z = 2x_1^2 - 7x_2^2 + 12x_1x_2$$

   subject to the constraints :

$$2x_1 + 5x_2 \leq 98$$

$$x_1, x_2 \geq 0$$

2. Use Wolfe's method to solve the Quadratic Programming Problem :

   Maximize :

$$Z = 4x_1 + 6x_2 - 2x_1^2 - 2x_1x_2 - 2x_2^2$$

   subject to the constraints :

$$x_1 + 2x_2 \leq 2$$

$$x_1, x_2 \geq 0$$

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

   Maximize :

$$Z = 2x_1 + 3x_2 - x_1^2$$

   subject to the constraints :

$$x_1 + 2x_2 \leq 4$$

   and $x_1, x_2 \geq 0$

4. Use separable convex programming to solve the non-linear programming problem :

Maximize :

$$f(x) = x_1 + x_2^2$$

subject to the constraints :

$$3x_1 + 2x_2^2 \leq 9$$

and $$x_1, x_2 \geq 0$$

5. Is it correct to say that in the quadratic programming, the objective function and constraints both should be quadratic ? If not, give your own comments.

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. Write short notes on the following :

   (a) Separable programming problem

   (b) Convex programming

2. What is non-linear programming problem ? Give two examples of NLPP stating clearly why do you classify them ?

3. Solve the following non-linear programming problem graphically :

   Maximize :

$$Z = 8x_1 + 8x_2 - x_1^2 - x_2^2$$

   subject to the constraints :

$$x_1 + x_2 \leq 12$$

$$x_1 - x_2 \geq 4$$

   and $x_1, x_2 \geq 0$

4. Discuss about dynamic programming along with its real-life application.

5. Write the steps of Beale's algorithm for Quadratic programming problem.

6. What do you mean by convex separable programming ? How will you solve the separable non-linear programming problem :

   Minimize :

$$\sum f_{0j}(x_j)$$

subject to constraints :

$$\sum f_{0j}(x_j) \geq b_j \qquad (j = 1, 2, ...n)$$

7. Explain Separable programming algorithm.

8. Write algorithm for constrained non-linear programming problem.

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