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MT–610

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

(Mathematical Programming-II)

4th Semester Examination, Session December 2024

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 :

$$Z = 4x_1^2 + 2x_2^2 + x_3^2 - 4x_1x_2$$

   subject to the constraints :

$$x_1 + x_2 + x_3 = 15$$

$$2x_1 - x_2 + 2x_3 = 20$$

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

   Maximize :

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

   subject to the constraints :

$$x_1 + 4x_2 \leq 4$$

$$x_1 + x_2 \leq 2$$

$$x_1, x_2 \geq 0$$

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

   Maximize :

$$Z = 4x_1 + 6x_2 - x_1^2 - 3x_2^2$$

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 :

$$f(x) = 3x_1 + 2x_2$$

subject to the constraints :

$$g(x) = 4x_1^2 + x_2^2 \leq 16$$

and $$x_1, x_2 \geq 0$$

5. What is meant by quadratic programming ? How does quadratic programming problem differ from the linear programming problem ? Discuss one method and solving it.

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 :

   (a) Quadratic programming

   (b) Dynamic programming

2. Derive the Kuhn-Tucker conditions for an optimal solution to a quadratic programming problem.

3. Discuss about duality in quadratic programming.

4. Discuss briefly four applications of non-linear programming problem.

5. Give the computational procedure for Beale's method for solving Quadratic programming problem.

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

   Minimize :

$$\Sigma f_{oj}(x_j)$$

   subject to constraints :

$$\Sigma f_{oj}(x_j) \geq b_j \quad (j = 1, 2, \ldots\ldots n)$$

7. Explain Bellman's optimality principle.

8. Mention briefly the Wolfe's algorithm for solving a quadratic programming problem given in the usual notations :

Maximize :

$$Z = cx + \frac{1}{2} x^{T}Qx$$

such that $Ax \leq b$ and $x \geq 0$,T is tranpose.

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