8. Define the following :

(a) Lagrangian function

(b) Saddle point

(c) Convex programming problems

(d) Quadratic programming and Duality

(e) Separable function

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Total Pages : 6 Roll. No. : ....

Examination Session June-2022

(Fourth Semester)

MT-610

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

[Mathematical Prgramming]

Time : 2 Hours] **[Max. Marks : 40**

Note : This paper is of Forty (40) marks divided into two (02) Section A and B. Attempt the questions contained in these sections according to the detailed instructions given therein.

SECTION—A

(Long-Answer-Type Questions)

Note : Section 'A' contains five (05) long-answer-type questions of Ten (10) marks each. Learners are required to answer any two (02) questions only. 2×10=20

1. Solve the following non-linear programming problem :

Min. $f(x_1, x_2) = (x_1 - 2)^2 + (x_1 - 1)^2$

Subject to $x_1^2 - x_2 \leq 0$

$x_1 + x_2 \leq 2$

$x_1, x_2 \geq 0$

2. Solve the following quadratic programming problem by wolfe's method :

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

Subject to $x_1 + 2x_2 \leq 10$

$x_1 + x_2 \leq 9$

$x_1, x_2 \geq 0$

3. Derive the dual of the quadratic programming problem :

Min. $f(X) = C^T X + \frac{1}{2} X^T G X$

Subject to $AX \geq b$

Where A is an $m \times n$ real matrix and G is an $n \times n$ real positive semi-definite a symmetric matrix.

5. Solve the following convex separable programming problem :

Max. $z = x_1^2 - 2x_1 - x_2$

Such that $2x_1^2 + 3x_2^2 \leq 6$

and $x_1, x_2 \geq 0$

6. The set of all optimum solutions (global maximum) of the general convex programming problem is a convex set.

7. Use dynamic programming to solve the following problem :

Min. $(x_1^2 + x_2^2 + \dots \dots x_n^2)$

Subject to $x_1, x_2, \dots \dots \dots x_n = b$

and $x_1, x_2, \dots \dots \dots x_n \geq 0$

4. Find the optimal solution of the following separable programming problem :

Max. $z = 3x_1 + 2x_2$

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

and $x_1, x_2 \geq 0$

5. Use dynamic programming to solve the following L.P.P. :

Max. $z = 2x_1 + 5x_2$

Such that $2x_1 + x_2 \leq 43$

$2x_2 \leq 46$

and $x_1, x_2 \geq 0$

SECTION—B

(Short-Answer-Type Questions)

Note : Section 'B' contains eight (08) short-answer-type questions of Five (05) marks each. Learners are required to answer any four (04) questions only. $4 \times 5 = 20$

4. Find the optimal solution of the following separable programming problem :

Max. $z = 3x_1 + 2x_2$

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

and $x_1, x_2 \geq 0$

5. Use dynamic programming to solve the following L.P.P. :

Max. $z = 2x_1 + 5x_2$

Such that $2x_1 + x_2 \leq 43$

$2x_2 \leq 46$

and $x_1, x_2 \geq 0$

SECTION—B

(Short-Answer-Type Questions)

Note : Section 'B' contains eight (08) short-answer-type questions of Five (05) marks each. Learners are required to answer any four (04) questions only. $4 \times 5 = 20$

MT-610/6 (3) [P.T.O.]

1. Determine the optimal solution of the following nonlinear programming problem, using the Khun–Tucker conditions :

   Min. $f(x_1, x_2) = x_1^2 + 2x_2^2 - x_1x_2$

   Subject to $x_1 + x_2 \geq 2$

   $x_1, x_2 \geq 0$

2. Define general non-linear programming problem.

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

   Min. $f(x_1, x_2) = x_1 + x_2 - x_1^2 + x_1x_2 - 2x_2^2$

   Subject to $2x_1 + x_2 \leq 1$

   $x_1, x_2 \geq 0$

4. Prove that every local maximum of the general convex programming problem is its global maximum.

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4. Prove that every local maximum of the general convex programming problem is its global maximum.

MT-610/6 (4)