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MT-605

Mathematical Programming-I

MA/MSC Mathematics (MAMT/MSCMT)

3rd Semester Examination, 2023 (June)

Time : 2 Hours] **[Max. Marks : 35**

Note : This paper is of Thirty Five (35) 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 answer to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

SECTION–A
(Long Answer Type Questions)

Note : Section 'A' contains Five (05) long answer type questions of Nine and Half (9½) marks each. Learners are required to answer any Two (02) questions only. (2×9½=19)

1. Use revised simplex method to solve the following LPP

Maximize $z = x_1 + x_2$

Subject to $x_1 + 2x_2 \geq 7,$

$4x_1 + x_2 \geq 6,$

$x_1 \geq 0, x_2 \geq 0.$

2. Discuss branch and bound algorithm for integer programming problem.

3. Solve the following problem by Gomory's algorithm

Maximize $z = 3x_1 + 4x_2$

Subject to $x_1 + x_2 \leq 4,$

$0.6x_1 + x_2 \leq 3,$

$x_1 > 0, x_2 \leq 0$ and integer

4. Use the method of Lagrangean multipliers to solve the following NLPP. Does the solution maximize or minimize the objective function?

Optimize $z = x_1^2 + x_2^2 + x_3^2 - 10x_1 - 6x_2 - 4x_3$

Subject to $x_1 + x_2 + x_3 = 7$

$x_1 \geq 0, x_2 \geq 0, x_3 \geq 0.$

5. Write short notes on the following :

(a) Concave function

(b) Quadratic forms.

(iii) Lagrangian multiplier.

SECTION–B

(Short Answer Type Questions)

Note : Section 'B' contains Eight (08) short answer type questions of Four (04) marks each. Learners are required to answer any Four (04) questions only. (4×4=16)

1. Write the algorithm for revised simplex method.

2. Write the fundamental ingredients for non linear programming.

3. Find the saddle point to the function $f(x_1, x_2, x_3) = x_1^3 + x_2^3 - 3x_1 - 12x_2 + 25$.

4. Write necessary conditions to the NLPP

Maximize $z = -2x_1^2 - 2x_2^2 + 4x_1 + 6x_2 - 2x_1x_2$

Subject to $x_1 + 2x_2 = 2$

$x_1 \geq 0, x_2 \geq 0.$

5. Obtain the sufficient conditions to the NLPP

Optimize $z = -x_1^2 - x_2^2 + 8x_1 + 10x_2$

Subject to $3x_1 + 2x_2 \leq 6,$

$x_1 \geq 0, x_2 \geq 0.$

6. Determine whether the following function is concave, convex or neither

$$f(X) = x_1 x_2$$

7. Discuss Branch and bound technique in integer programming.

8. Write short notes on :

(a) Bounded variables problem.

(b) Separating and supporting hyper-plane.
