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Total Pages : 4

Roll No.

MT-605

Mathematical Programming-I

MA/MSc Mathematics (MAMT/MScMT)

3rd Semester Examination, 2022 (Dec.)

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.

SECTION-A

(Long Answer Type Questions)

Note : Section 'A' contains Five (05) long answer type questions of Nine and Half ($9\frac{1}{2}$) marks each. Learners are required to answer any Two (02) questions only. Calculator is allowed for this paper. ($2 \times 9\frac{1}{2} = 19$)

1. Use revised simplex method to solve the following LPP

$$\begin{array}{ll} \text{Maximize} & z = 2x_1 + x_2 \\ \text{Subject to} & 3x_1 + 4x_2 \leq 6, \\ & 6x_1 + x_2 \leq 3, \\ & x_1 \geq 0, x_2 \geq 0. \end{array}$$

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

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

$$\begin{array}{ll} \text{Optimize} & z = 2x_1^2 + x_2^2 + 3x_3^2 + 10x_1 + 8x_2 + 8x_3 - 100 \\ \text{Subject to} & x_1 + x_2 + x_3 = 20 \\ & x_1 \geq 0, x_2 \geq 0, x_3 \geq 0. \end{array}$$

4. Solve the LPP

$$\begin{array}{ll} \text{Maximize} & z = 2x_1 + x_2 \\ \text{Subject to} & 3x_1 + 4x_2 \leq 6, \\ & 6x_1 + x_2 \leq 3, \\ & x_1 \geq 0, x_2 \geq 0. \end{array}$$

5. Write short notes on the following :

- (a) Convex function.
- (b) Quadratic forms.
- (c) Saddle points.

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 the bounded variables problem.
2. Write the algorithm for Gomory Fractional method for all integers.
3. Find the saddle point to the function $f(x_1, x_2) = 18x_1x_2 + 5x_2^2$.

4. Write necessary conditions to the NLPP

$$\text{Maximize } z = -x_1^2 - x_2^2 + 4x_1 + 8x_2$$

$$\text{Subject to } x_1 + x_2 = 2$$

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

5. Obtain the sufficient conditions to the NLPP

$$\text{Optimize } z = x_1^2 + x_2^2 + x_3^2 - 10x_1 - 6x_2 - 4x_3$$

$$\text{Subject to } x_1 + x_2 + x_3 = 7$$

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

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

$$f(X) = x_1x_2 - x_1^2 - x_2^2$$

7. Discuss fundamental ingredients in non linear programming problem.
8. Write short notes on :
- (a) Revised simplex method.
 - (b) Integer programming.
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