Indian Institute of Technology Ropar
Department of Mathematics

MA303: Computing Lab II
2nd semester of academic year 2024-25

Lab Sheet-2
Algebraic Method

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1. Given the following LPP

$$\begin{aligned} \text{Max Z} = 2x_1 + 3x_2 + 4x_3 + 7x_4 \\ \text{subject to} \quad 2x_1 + 3x_2 - x_3 + 4x_4 = 8 \\ x_1 - 2x_2 + 6x_3 - 7x_4 = -3 \\ x_1, x_2, x_3, x_4 \geq 0 \end{aligned}$$

   Write a MATLAB code for the following

   (a) Standardize the LPP and take parameters A, C, b as input.

   (b) Define the number of constraints (m) and the number of decision variables (n).

   (c) List out all possible basic variables.

   (d) Construct all basis matrices B_i from A.

   (e) Find all the basic solutions and check their feasibility.

   (f) Find the optimal solution and present it with the corresponding basic solution

2. Solve the following LPPs using the algebraic method by following the instructions in **Question 1**.

   (a)

$$\begin{aligned} \text{Max Z} = 0.5x_2 - 0.01x_1 \\ \text{subject to} \quad 2x_1 + 5x_2 \leq 80 \\ x_1 + x_2 \leq 20 \\ x_1, x_2 \geq 0 \end{aligned}$$

   (b)

$$\begin{aligned} \text{Min Z} = x_1 - 3x_2 + 2x_3 \\ \text{subject to} \quad 3x_1 - x_2 + 2x_3 \leq 7 \\ 2x_1 - 4x_2 \geq -12 \\ -4x_1 + 3x_2 + 8x_3 \leq 10 \\ x_1, x_2, x_3 \geq 0 \end{aligned}$$

3. A furniture firm manufactures chairs and tables, each requiring the use of three machines A, B, and C. Production of one chair requires 2 hours on machine A , 1 hour on machine B, and 1 hour on machine C. Each table requires 1 hour each on machine A and B and 3 hours on machine C. The profit realized by selling one chair is Rs. 300 while for a table the figure is Rs. 600. The total time available

per week on machine A is 70 hours, on machine B is 40 hours and on machine C is 90 hours. How many chairs and tables should be made per week to maximize the profit? Formulate the LPP and solve it using the algebraic method by following the instructions in **Question 1**.

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