DHANAMANJURI UNIVERSITY

Examination, 2023 (Dec)

Four year course B.Sc. 1st Semester

Name of Programme	**:**	**B.A/B.Sc. (Honours)**
Semester	**:**	**I**
Paper Type	**:**	**SEC (Theory)**
Paper Code	**:**	**SMA-001**
Paper Title	**:**	**Linear Programming and Application**

Full Marks : 40

Pass Marks : 16 **Duration: 2 Hours**

The figures in the margin indicate full marks for the questions

All the questions.

1. Answer the following question:

a) State three characteristics of canonical form of LPP.

b) A hospital dietician wishes to find the combination of two foods A and B that contain atleast 0.5mg of thiamine and atleast 600 calories. Each ounce of A contains 0.12 mg of thiamine and 100 calories while each ounce of B contains 0.80 mg of thiamine and 150 calories. Each food costs 10 paise per ounce .Formulate the linear programming problem, specifying how many ounces of each food A and B should be combined to get the cheapest combination of two foods. Solve it graphically. 3+3+4=10

2. Define artificial variables. Write an algorithm for solving a given LPP by using **Charne's penalty method.** 10

3. a) Define convex set. Prove that intersection of two convex sets is also a convex set.

b) Define non degenerate basic solution. Determine all the basic solutions of the following problem

$$maximise\ Z = x_1 - 2x_2 + 4x_3$$
$$subject\ to\ the\ constraints$$
$$x_1 + 2x_2 + 3x_3 = 7$$
$$3x_1 + 4x_2 + 6x_3 = 15$$

5+5=10

Or

Define slack and surplus variables. Solve the LPP by using simplex method

$$maximise\ z = x_1 - x_2 - x_3 + x_4$$
$$subject\ to\ the\ constraints$$
$$5x_1 - x_2 + 2x_3 + 6x_4 \leq 20$$
$$2x_1 + 3x_2 + 4x_3 - 5x_4 \leq 16$$
$$x_1 + 2x_2 - 3x_3 + x_4 \leq 2$$
$$x_1, x_2, x_3\ and\ x_4 \geq 0$$

2+8=10

4. Solve by using Charne's penalty Big M method.

$$Minimise,\ z = 3x_1 + 5x_2$$
$$subject\ to\ the\ constraints$$
$$x_1 + 2x_2 \geq 8$$
$$3x_1 + 2x_2 \geq 12$$
$$5x_1 + 6x_2 \leq 60,\ x_1, x_2 \geq 0$$

10

Or

Use Two phase method to solve the following LPP.

$$\text{Maximize } z = 3x_1 - x_2$$
$$subject\ to\ the\ constraints$$
$$2x_1 + x_2 \geq 2$$
$$x_1 + 3x_2 \leq 2$$
$$x_2 \leq 4$$
$$x_1, x_2 \geq 0$$

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