[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 918 **G**

Unique Paper Code : 2362571101

Name of the Paper : Introduction to Operational Research and Linear Programming Problem

Name of the Course : **B.A. (Program)**

Semester : I

Duration : 3 Hours Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **five** questions.
3. **All** questions carry equal marks.

P.T.O.

1. (a) What is linear programming problem? Discuss the application of linear programming problem. (8)

(b) A home decorator manufactures two types of lamps say P and Q. Both lamps go through two technicians first a cutter, second a finisher. Lamp P requires 2 hours of the cutter's time and 1 hours of the finisher's time. Lamp Q requires 1 hours of cutter's and 2 hours of finisher's time. The cutter has 104 hours and finisher 76 hours of available time each month. Profit on one lamp P is Rs. 6 and on one lamp Q is Rs. 11. Formulate the linear programming problem and determine using graphical method how many of each type of lamps should be manufacturer to obtain the best return. (10)

2. (a) Define the convex set. Show that the intersection of any finite numbers of convex sets is a convex set. (8)

(b) Do all possible basic solutions of the following system of equation exist? Find all existing basic solutions.

$$x_1 + 2x_2 + 3x_3 + 4x_4 = 7$$

$$2x_1 + x_2 + x_3 + 2x_4 = 3 \qquad (10)$$

3. (a) Define the following terms :

(i) Open half space and closed half space with examples

(ii) Basic feasible solution

(iii) Slack and surplus variables

(iv) Unrestricted variable (8)

(b) Solve the following LPP using simplex method :

Maximize $Z = 2x_1 + 5x_2 + 7x_3$

Subject to $3x_1 + 2x_2 + 4x_3 \leq 100$

$x_1 + 4x_2 + 2x_3 \leq 100$

$x_1 + x_2 + 3x_3 \leq 100$

$x_1, x_2, x_3 \geq 0.$ (10)

4. (a) Define artificial variable technique. Write a short note on two phase method. (8)

(b) Solve the following LPP using Charne's-M method

Maximize $Z = x_1 + 2x_2 + 3x_3 - x_4$

Subject to $x_1 + 2x_2 + 3x_3 = 15$

$2x_1 + x_2 + 5x_3 = 20$

$x_1 + 2x_2 + x_3 + x_4 = 10$

$x_1, x_2, x_3 \geq 0.$ (10)

5. (a) Solve the following LPP

Maximize $Z = 4x_1 + 6x_2$

Subject to the constraints

$$x_1 - 2x_2 \geq -4$$

$$2x_1 + 4x_2 \leq 12$$

$$x_1 + 3x_2 \leq 9$$

x_1 and x_2 are unrestricted (8)

(b) Use two phase simplex method to solve the following problem :

Maximize $Z = 4x_1 + 8x_2 + 3x_3$

Subject to the constraints

$$x_1 + x_2 \geq 2$$

$$2x_1 + x_3 \geq 5$$

$$x_1, x_2, x_3 \geq 0$$ (10)

6. (a) Explain the term degeneracy in the context of LPP. Explain the perturbation technique to resolve the degeneracy in LPP. (8)

(b) Solve the given LPP :

Maximize $Z = 2x_1 + 3x_2 + 10x_3$

Subject to $x_1 - 2x_3 = 0$

$x_2 + x_3 = 1$

$x_1, x_2, x_3 \geq 0$ (10)

7. (a) What is difference between simplex method and revised simplex method? (8)

(b) Use revised simplex method to solve the LPP:

Maximize $Z = x_1 + 2x_2$

Subject to $x_1 + x_2 \leq 3$

$x_1 + 2x_2 \leq 5$

$3x_1 + x_2 \leq 6$

$x_1, x_2 \geq 0$ (10)