

1. A firm makes two products X and Y & has a total production capacity of 9 tonnes per day, X & Y requiring the same production capacity. The firm has a permanent contract to supply atleast 2 tonnes of X and atleast 3 tonnes of Y per day to another company. Each tonne of X required 20 machine hours production time & each tonne of Y requires 50 machine hours production time. the daily maximum possible number of machine-hours is 360. All the firm's output can be sold and the profit made is 'Rs. 80 per tonne of X & Rs. 120 per tonne of Y'. It is required to determine the production schedule for maximum profit and to calculate this profit.

1. Using graphical method, find the maximum value of

a) $Z = 7x_1 + 10x_2$ subject to the constraints.

$$x_1 + x_2 \leq 30,000$$

$$x_2 \leq 12,000$$

$$x_1 \geq 6000$$

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

b) Maximize $Z = 4x_1 + 2x_2$ subject to the Constraints

$$2x_1 + 3x_2 \leq 18$$

$$x_1 + x_2 \geq 10, \quad x_1, x_2 \geq 0.$$

c) Maximize $Z = 4x_1 + 9x_2$ subject to the Constraints

$$3x_1 + 4x_2 \leq 24$$

$$8x_1 + 6x_2 \leq 48$$

$$x_1 \leq 5$$

$$x_2 \leq 6, \quad x_1, x_2 \geq 0.$$

2) An advertising firm desires to reach two types of audiences - Customers with annual income of more than Rs. 40,000 (target audience A) & Customers with annual income of less than Rs. 40,000 (target audience B). The total advertising budget is Rs. 2,00,000. One programme of T.V. advertising costs of Rs. 50,000 & one programme of radio advertising costs of Rs. 20,000. Contract conditions normally require that there should be atleast 3 programmes on T.V and the number of programmes on Radio must not exceed 5. Solve

indicates that a single TV programme reaches 7,50,000 customers in target audience A & 1,50,000 in target audience B. One radio programme reaches 40,000 customers in target audience A & 2,60,000 in target audience B. Formulate as a linear LPP & determine the media mix to maximize the total reach using graphic method.

3. Solve graphically Minimize $Z = 3x_1 + 5x_2$

Sub to Constraints $x_1 + x_2 = 200,$

$$x_1 \leq 80$$

$$x_2 \leq 60$$

$$\& x_1 \geq 0, x_2 \geq 0$$

Unit-1 Notes 1 - Resource Management Techniques

1. Solve the following by Simplex method
- Maximize $Z = x_1 + 2x_2 + x_3$ Subject to the Constraints
- $$2x_1 + x_2 - x_3 \geq -2$$
- $$-2x_1 + x_2 - 5x_3 \leq 6$$
- $$4x_1 + x_2 + x_3 \leq 6 \text{ with } x_1, x_2, x_3 \geq 0$$
2. Solve the following by Simplex method
- Maximize $Z = 4x_1 + x_2 + 3x_3 + 5x_4$
- Sub to $4x_1 - 6x_2 - 5x_3 + 4x_4 \geq -20$
- $$3x_1 - 2x_2 + 4x_3 + x_4 \leq 10$$
- $$8x_1 - 3x_2 + 3x_3 + 2x_4 \leq 20, x_1, x_2, x_3, x_4 \geq 0$$
3. Solve the following by Big M method using artificial Variables.
- Min $Z = 10x_1 + 20x_2$ Subject to the Constraints
- $$6x_1 + 8x_2 \geq 100$$
- $$7x_1 + 12x_2 \geq 120 \text{ and } x_1, x_2 \geq 0$$
4. Solve the following by penalty method.
- Maximize $Z = 2x_1 + x_2 + 3x_3$
- Subject to the Constraints
- $$x_1 + x_2 + 2x_3 \leq 5$$
- $$2x_1 + 3x_2 + 4x_3 = 12 \text{ and } x_1, x_2, x_3 \geq 0$$