LINEAR PROGRAMMING PROBLEM (LPP)

⇒ Mathematical formulation of the problem.

1. Study the given situation to find the key decesions.

2. Identify the variables and designate them by symbols, x_j, $j = 1, 2, \ldots$

3. State the feasible alternatives which generally are $x_j \geq 0$, for all j.

4. Identify the constraints in the problem and express them as linear inequalities or equations.

5. Identify the objective function and express it as a linear function of the decision variable

Ques A company has three operational departments (weaving, processing and packing) with capacity to produce three different types of clothes suiting, shirtings and woollens yielding a profit of Rs 2, Rs 4 and Rs 3 per metre respectively. One metre of suiting require three minutes in weaving, two minutes in processing and one minute in packing. Similarly, one metre of shirting required 4 minutes in weaving, one minute in processing and three minutes in packing.

One metre of woollen required 3 min in each department. In a week total run time of each department is 60, 40 and 80 hours weaving, processing and packing respectively. Formulate the linear programming problem to find the maximise profit.

$$\text{Max } z = 2x_1 + 4x_2 + 3x_3$$

Subject to constant

$$3x_1 + 2x_2 + x_3 \leq 3600$$
$$4x_1 + x_2 + 3x_3 \leq 2400$$
$$3x_1 + 3x_2 + 3x_3 \leq 4000$$
$$x_1, x_2, x_3 \geq 0$$

Ques A farm can produce three types of clothes say A, B, C. Three kinds of wool are required for it, say red wool, green wool and blue wool. One unit length of type A clothes needs two yards of red wool and 3 yards of blue wool; 1 unit length of type B clothes needs 3 yards of red wool, 2 yards of green wool and 2 yards of blue wool; 1 unit length of type C clothes needs 5 yards of green wool and 4 yards of blue wool. The farm has only a stock of 8 yards of red wool, 10 yards of green wool and 15 yards of blue wool. It is as assume that the income obtained from 1 unit length of type A clothes is are as 3,

Type B clothes is are as 5 and of Type C clothes is are as 4. Determinant how the farm should use the available material show as to maximize the income from the finished clothes.

	Types of Clothes			
Wool	A(x_1)	B(x_2)	C(x_3)	Availability
Red	2	3	0	8
Green	0	2	5	10
Blue	3	2	4	15
Income	3	5	4	

Let the firm produce x_1, x_2, x_3 yards of the three Types of clothes A, B and C respectively. Total profit in Rs of the firm is given by

$$Z = 3x_1 + 5x_2 + 4x_3$$

The total quantity of red wool required to prepare x_1, x_2, x_3 yards of three clothes of type A, B and C is

$$2x_1 + 3x_2 + 0x_3 \text{ yards}$$

Since the stock of red wool available is only 8 yards

Therefore, $2x_1 + 3x_2 \leq 8$

Similarly, for green & blue wools

$$2x_2 + 5x_3 \leq 10$$

and $3x_1 + 2x_2 + 4x_3 \leq 15$ respectively

Hence the problem of the firm formulated as LPP is as follows :

Find x_1, x_2, x_3 which

$$\text{Max } z = 3x_1 + 5x_2 + 4x_3$$

Subject to Constant

$$2x_1 + 3x_2 \leq 8$$
$$2x_2 + 5x_3 \leq 10$$
$$3x_1 + 2x_2 + 4x_3 \leq 15$$
$$x_1, x_2, x_3 \geq 0$$

Date 7/02/23.

Ques The objective of a diet problem is to ascertain the quantities of certain foods that should be eating to meet certain nutritional requirement at a minimum cost. The concentration is limited to milk ; beef and eggs and to vitamins A, B, C. The number of miligrams of each of these vitamins contained within a unit of each food is given below

Vitamin	Gallon of Milk	Pound of Beef	Dozen of Eggs	Min. daily requirement
A	1	1	10	1 mg
B	100	10	10	50 mg
C	10	100	10	10 mg
Cost	Rs 1	Rs 1.10	Rs 0.50	

What is the linear programming formulation of this problem ?