

Mathematical Formulation of a L.P.P. :-

It is important to recognize a problem which can be handled by linear programming and then to formulate its mathematical model.

Example :-

① A manufacturer of a line of patent medicines is preparing a plan on medicines A and B. There are sufficient ingredients available to make 40,000 bottles of A and 45,000 bottles of B but there are only 20,000 bottles of A and 45,000 bottles of B into which either more material it take 3 hours to prepare enough material to fill 1,000 bottles of A, it takes one hour to prepare enough material to fill 1,000 bottles of B and there are 66 hours available for this operation. The profit is Rs 7/- per bottle of A and Rs 8/- per bottle of B.

- ① Formulate this problem as a linear programming problem?
 - ② How should the manufacturer schedule production in order to maximize his profit?
- ① Let the manufacturer produce x_1 and x_2 bottles of medicines A and B respectively.
- \therefore Total profit (in Rs) $Z = 8x_1 + 7x_2$
- The time of medicine required to prepare x_1 bottles of A = $3x_1 / 1000$ hours.

(2)

and the time required to prepare x_2 bottles of medicine B

$$= x_2 / 1000 \text{ hours}$$

\therefore Total time required to prepare x_1 bottles of medicine A and x_2 bottles of medicine B is $\frac{3x_1}{1000} + \frac{x_2}{1000}$ hours

Since total time available for this operation is 66 hours

$$\therefore \frac{3x_1}{1000} + \frac{x_2}{1000} \leq 66$$

$$\text{or, } 3x_1 + x_2 \leq 66000$$

since there are only 45000 bottles into which the medicines can be put

$$\therefore x_1 + x_2 \leq 45000$$

Hence the linear programming problem of the given problem is as follows.

$$\text{Max. } Z = 8x_1 + 7x_2$$

Subject to the Constraints

$$3x_1 + x_2 \leq 66,000, x_1 + x_2 \leq 45000$$

$$x_1 \leq 20,000$$

$$x_2 \leq 40000$$

and

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