# Assignment-5

# Linear Programming

**1.** A factory makes tennis rackets and cricket bats. A tennis racket takes $1.5$ hours of machine time and $3$ hours of craftsman's time in its making while a cricket bat takes $3$ hour of machine time and $1$ hour of craftsman's time. In a day, the factory has the availability of not more than $42$ hours of machine time and $24$ hours of craftsman's time.

(i) What number of rackets and bats must be made if the factory is to work at full capacity?

**[2 Marks]**

**(ii)** If the profit on a racket and on a bat is ₹ $20$ and ₹ $10$ respectively, find the maximum profit of the factory when it works at full capacity. **[4 Marks]**

**2.** A diet is to contain at least $80$ units of vitamin $A$ and $100$ units of minerals. Two foods $F_1$ and $F_2$ are available. Food $F_1$ costs ₹ $4$ per unit food and $F_2$ costs ₹ $6$ per unit. One unit of food $F_1$ contains $3$ units of vitamin $A$ and $4$ units of minerals. One unit of food $F_2$ contains $6$ units of vitamin $A$ and $3$ units of minerals. Formulate this as a linear programming problem. Find the minimum cost for diet that consists of mixture of these two foods and also meets the minimal nutritional requirements?

**[6 Marks]**

**3.** There are two types of fertilizers $F_1$ and $F_2$. $F_1$ consists of $10\%$ nitrogen and $6\%$ phosphoric acid and $F_2$ consists of $5\%$ nitrogen and $10\%$ phosphoric acid. After testing the soil conditions, a farmerfinds that she needs at least $14$ kg of nitrogen and $14$ kg of phosphoric acid for her crop. If $F_1$ cost ₹ $6$/kg and $F_2$ costs ₹ $5$/kg, determine how much of each type of fertilizer should be used so that nutrient requirements are met at a minimum cost. What is the minimum cost? **[6 Marks]**

**4.** An oil company has two depots $A$ and $B$ with capacities of $7000$ L and $4000$ L respectively. The company is to supply oil to three petrol pumps, $D$, $E$ and $F$ whose requirements are $4500$L, $3000$L and $3500$L respectively. The distance (in km) between the depots and the petrol pumps is given in the following table:

| Distance in (km) | | |
|---|---|---|
| From/To | $A$ | $B$ |
| $D$ | 7 | 3 |
| $E$ | 6 | 4 |
| $F$ | 3 | 2 |

Assuming that the transportation cost of $10$ litres of oil is ₹ $1$ per km, how should the delivery be scheduled in order that the transportation cost is minimum? What is the minimum cost? **[6 Marks]**