Assignment

LPP formulation

1. A manufacturer of purses makes four different types of purses, a three-compartment bag which takes 45 minutes to assemble, a shoulder strap bag taking one hour for assembly, a tote bag needed 45 mins for assembly and a pocket purse requiring 80 minutes to assemble. There are 32 hours of assembly time available per day. The profit contribution on the sale of a three-compartment bag is Rs. 16, Rs 25 on a shoulder strap bag and Rs. 12 each on tote bag and pocket purse. Special kind of fancy pins are required for decorating pocket purses and they are available for only 30 pieces. Different types of pins are used in other three bags, of which only 70 pieces are in stock. Enough raw material is available for a total 60 pocket purses and tote bags which need same amount of raw material. The manufacturer estimates a minimum demand of a 6 pocket purses and 10 shoulder strap bags every day. Formulate LPP to optimize daily production.
2. A 24-hour supermarket has the following minimal requirements for cashiers.

Periods	1	2	3	4	5	6
Time	3-7	7-11	11-15	15-19	19-23	23-03
Max. No.	7	20	14	20	10	5

Period 1 follows immediately after period 6. Cashier works for eight consecutive hours, starting at the beginning of one of the six time periods. A daily employee worksheet which satisfies the requirement with least number of personnel needs to be determined. Formulate the problem as LPP.

Graphical method

3. Minimize $Z = 3A + 5B$
   Subject to constraints: $-3A + 4B \leq 12$
   $2A + 3B \geq 12$
   $A, B \geq 0$
4. Maximize $Z = 10A + 15B$
   Subject to constraints: $2A + B \leq 26$
   $2A + 4B \leq 56$
   $A - B \geq -5$
   $A, B \geq 0$
5. Minimize $Z = -x_1 + 2x_2$
   Subject to constraints: $-x_1 + 3x_2 \leq 10$
   $x_1 + x_2 \leq 6$
   $x_1 + x_2 \leq 2$
   $x_1, x_2 \geq 0$
6. Maximize $Z = A + B$
   Subject to constraints: $A + B \leq 1$
   $-A + B \geq 3$
   $A, B \geq 0$

Simplex method

7. Ashok chemicals co. Manufacturers two chemicals A and B which are sold to the manufacturers of soaps and detergents. Based on the next month's demand, the management has decided that the total production for chemicals A and B together should be at least 350 kilograms. Moreover, a major customer's order for at least 125 kilograms of product A. Product A requires 2 hours of processing times per kilogram and product B requires one hour of processing time for kilogram. For the coming month 600 hours of processing times are available. The co wants to meet the above requirements at minimum total production cost, the production cost are Rs 2 per kg for Product A and Rs 3 per kg for product B. Ashok Chemical co. wants to determine its optimal product mix and total minimum cost relevant there to.

(i) Formulate the above as LPP
(ii) Solve the problem with simplex method. (**Ans:** A=250, B=100, Z=800)
(iii) Does the problem have multiple optimal solution? Why?

Assignment

8. Solve the following LPP using simplex method.

   Maximize $Z = 3x + 2y+5z$

   Subject to the constraints: $x + 2y + z \leq 430$

   $3x + 2z \leq 460$

   $x + 4y \leq 420$

   $x \geq 0, y \geq 0, z \geq 0$

   (**Ans:** x=0, y=100, z=230, Z=1350)

9. A firm uses three machines in manufacturing three products. Each unit of product A requires 3 hrs on machine I and 2 hrs on machine II and 1 hour on machine III. Each unit of product B requires 4 hrs on machine I and 1 hr on machine II and 3 hrs on machine III, while each unit of product C requires 2hrs on each of the three machines. The contribution margin of the three products are Rs. 30, Rs. 40 and Rs. 35 per unit respectively. The available machine hours on the three machines are 90, 54 and 93 respectively.

   Formulate the problem as LPP.

   Solve the problem with simplex method. (**Ans:** x=0, y=12, z=21, Z=1215)

   Which of the three products must not be produced?

10. Make a table to show different conditions required for having **unique solution, multiple optimal solution, infeasibility, unboundedness** and **degeneracy** while solving LPP using Graphical method and Simplex method.