

School of Mathematics, TIET
Optimization Techniques (UMA-035)
Practice Sheet # 1

- Q1.** A Company manufactures two types of chips, A and B. The unit selling price for A and B is Rs. 15 and Rs. 25. Profits are proportional to the selling prices. To manufacture A, the Company has to invest 3 Hrs of skilled labour, 2 Hrs. of unskilled labour and 1 unit of raw material. This data for B is 4, 3 Hours and 2 units respectively. The Company has 100 Hrs of skilled labour, 70 Hrs. of unskilled labour and 30 units of raw material. The Company has to produce at least 3 units of chip B. Formulate the problem as a LPP.
- Q2.** The NDMC has two plants, each of which produces and supplies two products: milk and butter. Each plant can work up to 16 Hrs a day. In plant A, it takes 3 Hrs to prepare and pack 1000 liters of milk and 1 Hr to prepare and pack 100 Kg of butter. In plant B, these figures are 2 Hrs. and 1.5 Hrs. In plant A(B) it cost Rs.15,000(18,000) to prepare and pack 1000 liter of milk and Rs. 28,000(26,000) for 100 Kg. of butter daily. The NDMC is obliged to produce daily at least 10000 liters of milk and 800 kg. of butter. Formulate the problem as a LPP.
- Q3.** A fast food restaurants sells two products A and B. One unit of product A uses a quarter of one kg of wheat and one unit of product B uses only 0.2 kg. The restaurant starts the day with 200 kg of wheat but can order more at an additional cost of Rs.0.25 per kg to cover the delivery cost. Any surplus wheat at the end is donated every day. The profits of restaurant for one unit of product A(B) is Rs.0.20(Rs.0.15). Also, the restaurant does not expect to sell more than 900 units of both products A and B. How many units of each product should the restaurant make every day?
- Q4.** Material Science department of TIET needs circular metallic plates of diameter 3 cm and 6 cm to perform experiments on heat treatment studies and requires minimum 2500 and 1500 units respectively. These are to be cut from parent metallic sheets of dimension 6 x 15 cm². Formulate the problem as a LPP so that minimum number pf parent metallic sheets are used.
- Q5.** A small bank is going to allocate Rs.20, 000 for personal and car loans for the next month. The bank charges an annual interest rate of 12% for personal and 8% for car loans. Both types of loans are repaid at the end of one year. The amount of car loans should be at least twice as much as that of personal loans. Past experience shows that bad debts amount to 1% of all personal loans. Formulate the problem for the bank to allocate funds.
- Q6.** A company manufacturing TV and Radio sets has four major departments, chasis, cabinet, assembly and final testing. Monthly capacities are:

Capacity →	TV		Radio
Departments ↓			
Chasis	2500	or	4500
Cabinet	2000	or	8000
Assembly	3000	or	4000
Final Testing	4500	or	9000

The profit per TV set is Rs. 250 and that of a radio set is Rs. 50. Assuming that the company can sell any quantity of either product, determine the optimal combination of output. Formulate it as Linear programming problem.

Q7. A metal slitting company cuts master rolls with width 200 centimeters into subrolls of small width. Customer specify that they need subrolls of different widths given in the following table:

Width of subroll (in cm)	Numbers required
35	200
80	90
90	350
120	850

The objective is to use a minimum number of master rolls to satisfy set of customers' orders. Formulate the problem as linear programming problem.

Q8. A company has two grades of inspectors, I and II, who are to be assigned for a quality control inspection. It is required that at least 2000 pieces be inspected per 8 hour day. Grade I inspectors can check pieces at the rate of 50 per hour with an accuracy of 97%. Grade II inspectors can check pieces at the rate of 40 per hour with an accuracy of 95%. The wage rate of grade I inspector is Rs. 4.50 per hour and that of grade II is Rs. 2.50 per hour. Each time an error is made by an inspector , the cost to the company is Rs. 2.00. The company has available for inspection job, 10 grade I and 5 grade II inspectors. Formulate the problem (DO NOT SOLVE) to minimize the total cost of inspection.

Q9. A company produces two types of hats. Type 1 requires twice as much labour time as type 2 alone. If all labour time is dedicated to type 2 alone, the company can produce a total of 400 hats of type 2 per day. Respective market limits for two types are 150 and 200 per day. The profit is Rs. 8 per type 1 hat and Rs. 5 per type 2 hat. Find the optimum number of hats to be prepared so that it maximizes company's profits.

Q10 A dealer in used scooters wishes to stock-up his lot to maximize his profit. He can select scooters A,B and C which are valued on wholesale at Rs. 5000/-, Rs. 6000/- and Rs. 3000/- respectively. These can be sold at Rs. 6000/-, Rs. 8500/- and Rs. 10500/- respectively. For each type of scooter probabilities of sale are :

Type of scooter :	A	B	C
Probability of sale in 90 days :	0.7	0.8	0.6

For every two scooter of B-type, he should buy one scooter of type A or C. If he has Rs. 100000/- to invest, what should he buy to maximize his expected gain? Formulate this problem as a L.P. model.