Exercise-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 to maximize the profit.

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 to minimize the cost.

Q3. A fast food restaurant 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. 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 each product A and B. Formulate (DO NOT SOLVE) the problem as a LPP.

Q4. Material Science department of IITR 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 square cm. Formulate the problem as a LPP so that minimum number of parent metallic sheets is used.

Q5. A company manufacturing TV and Radio sets has four major departments, chasis, cabinet, assembly and final testing. Monthly capacities are:

Capacity ➤ Departments ▼	TV		Radio
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.

Q6. 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)	Minimum 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.

Q7. 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.

Q8. 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.

Q9. 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. 8000/- 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.

Q10. A complete unit of a certain product consists of four units of components A and three units of component B. The two components (A and B) are manufactured from two different raw materials of which 100 and 200 units respectively are available. Three departments are engaged in the production process with each. Using a different method for manufacturing the components per production run and the resulting units of each component are given below:

Department	Input per run		Output per run	
	Raw Material I	Raw Material II	Component A	Component B
1	7	5	6	4
2	4	8	5	8
3	2	7	7	3

Formulate the problem as LP model to determine the number of production runs for each department which will maximize the total number of complete units of the final product.