MEPL CLASSES

CMA INTER – OM

LINEAR PROGRAMMING & STUDY NOTE 1

TOTAL MARKS – 50 **TIME ALLOWED – 90 MINUTES**

Questions 1 to 7 are allotted 7 marks each

Question 1.

A city hospital has the following minimal daily requirement for nurses:

Period	Clock time (24 hours day)	Minimal Number of Nurses Required
1	6 a.m. - 10 a.m.	2
2	10 a.m. - 2 p.m.	7
3	2 p.m. - 6 p.m.	75
4	6 p.m. - 10 p.m.	8
5	10 p.m. - 2 a.m.	20
6	2 a.m. - 6 a.m.	6

Nurses report to the hospital at the beginning of each period and work for 8 consecutive hours. The hospital wants to determine the minimal number of nurses to be employed so that there will be sufficient number of nurses available for each period.

Formulate this as a Linear Programming question by setting up appropriate constraints and objective function.

Question 2.

One unit of product A contributes ₹7 and requires 3 units of raw material and 2 hours of labour. One unit of product B contributes ₹ 5 and requires one unit of raw material and one hour of labour. Availability of raw material at present is 48 units and hence there are 40 hours of labour.

i. Formulate it as a linear programming problem.
ii. Write its dual.

Question 3.

A Company produces the products P, Q and R from three raw materials A, B and C. One unit of product P requires 2 units of A and 3 units of B. A unit of product Q requires 2 units of B and 5

units of C and one unit of product R requires 3 units of A, 2 unit of B and 4 units of C. The Company has 8 units of material A, 10 units of B and 15 units of C available to it. Profits/unit of products P, Q and R are Rs.3, Rs.5 and Rs.4 respectively

(a) Formulate the problem mathematically,
(b) Write the Dual problem.

Question 5.

Four Products A,B,C and D have ₹ 5, ₹ 7, ₹ 3 and ₹ 9 profitability respectively. First type of material (limited supply of 800 kgs.) is required by A,B,C and D at 4 kgs., 3 kgs, 8 kgs, and 2 kgs. respectively per unit.

Second type of material has a limited supply of 300 kgs. and is for A,B,C and D at 1 kg, 2 kgs, 0 kgs, and 1 kg per unit.

Supply of the other type of materials consumed is not limited. Machine hrs. available are 500 hours and the requirements are 8,5,0 and 4 hours for A,B,C and D each per unit.

Labour hours are limited to 900 hours and requirements are 3,2,1 and 5 hours for A,B,C and D respectively. How should the firm approach so as to maximize its profitability?

Formulate this as a linear programming problem. You are not required to solve the LPP.

Question 6.

A Bank is in the process of formulating its loan policy. Involving a maximum of ` 600 Million. Table below gives the relevant types of loans. Bad debts are not recoverable and produce no interest receive. To meet competition from other Banks the following policy guidelines have been set. At least 40% of the funds must be allocated to the agricultural and commercial loans. Funds allocated to housing must be at least 50% of all loans given to personal, car, Housing. The overall bad debts on all loans may not exceed 0.06.

Formulate a linear program Model to determine optimal loan allocations.

Type of loan	Interest rate %	Bad debts (Probability)
Personal	17	0.10
Car	14	0.07
Housing	11	0.05
Agricultural	10	0.08
Commercial	13	0.06

Question 7.

What are the characteristics of Modern Operations Function?

Question 8. **1marks**

In a linear programming model feasible solution is:

a) The basic solution to the general L.P problem
b) Any solution that also satisfies the non-negative restrictions of the general L.P problem
c) A solution which optimize (maximize or minimize) the objective function of a general L.P problem
d) A basic solution to the system of equations if one or more of the basic variables become equal to zero