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Total No. of Questions : 08

M.Tech. (CAD/CAM)   (Sem.–1)
OPTIMIZATION TECHNIQUES
Subject Code : ME-507
Paper ID : [E0866]

Time : 3 Hrs. Max. Marks : 100

INSTRUCTIONS TO CANDIDATES :
1. **Attempt any FIVE questions out of EIGHT questions.**
2. **Each question carries TWENTY marks.**

Q1. a) When a Linear Programming problem said to have multiple, unbounded and infeasible solution? (10)

   b) Seed Ltd. has two products Rice & Wheat. To produce one unit of Rice, 2 units of material X and 4 units of material Y are required. To produce one unit of Wheat, 3 units of material X and 2 units of material Y are required. At least 16 units of each material must be used in order to meet the committed sales of Rice & Wheat. Due to moderate marketing facilities not more than 8 units of product Wheat can be sold. Rice & Wheat Cost per unit of material X and Y are Rs.2.50 per unit and Rs.0.25 per unit respectively. The selling price per unit of Rice and Wheat are Rs. 12 and Rs. 16 respectively. Formulate LPP model. (10)

Q2. The management of ABC Company is considering the question of marketing a new product. The fixed cost required in the project is Rs. 4,000. Three factors are uncertain viz. the selling price, variable cost and the annual sales volume. The product has a life of only one year. The management has the data on these three factors as under :

Selling Price (Rs.)	Probability	Variable cost (Rs.)	Probability	Sales volume Units	Probability
3	0.2	1	0.3	2,000	0.3
4	0.5	2	0.6	3,000	0.3
5	0.3	3	0:1	5,000	0.4

Consider the following sequence of thirty random numbers :

81, 32, 60, 04, 46, 31, 67, 25, 24, 10, 40, 02, 39, 68, 08, 59, 66, 90, 12, 64, 79, 31, 86, 68, 82, 89, 25, 11, 98 and 16.

Using the sequence (First 3 random numbers for the first trial, etc.) simulate the average profit for the above project on the basis of 10 trials. (20)

Q3. Write short note on the following :

a) Use of computers for system design and assembly line balancing. (10)

b) Role of sensitivity analysis in Linear Programming. (10)

Q4. a) Explain the fundamental components of queuing process. (5)

b) Self-service at a university cafeteria, at an average rate of 7 minutes per customer, is slower than attendant service, which has a rate of 6 minutes per student. The manager of the cafeteria wishes to calculate the average number of customers in the cafeteria, the average time each customer spends and the average time each student spends waiting for service. Assume that customers arrive randomly at each time, at the rate of 5 per hour. Calculate the appropriate operating statistics for this cafeteria. (15)

Q5. a) What is the basic difference between linear programming and dynamic programming? (5)

b) Use Two phase methods to solve the following L.P.P.

Maximize $Z = 5X_1 + 3 X_2$

Subject to $2 X_1 + X_2 \leq 1$

$X_1 + 4 X_2 \geq 6$

$X_1, X_2, X_3 \geq 0$ (15)

Q6. An air-line operates 7 days a week has time table shown below. Crews must have a minimum layover 5 hours between flights. Obtain the pairing of flights that minimizes the layover time away from home assuming that crew flying from Delhi to Jaipur can be based either at Delhi or Jaipur for any given pairing; the crew will be based at the city that results in smaller layover. (20)

Flight No.	Delhi Depart	Jaipur Arrive	Flight No.	Jaipur Depart	Delhi Arrive
101	7 am	8 am	201	8.00 am	9.15 am
102	8 am	9 am	202	8.30 am	9.45 am
103	1.30 pm	2.30 pm	203	12noon	1.15pm
104	6.30 pm	7.30 pm	204	5.30 pm	6.45 pm

Q7. Write short notes on the following :

a) Travelling salesmen model and their industrial applications. (10)

b) Role of dual problem for post optimality analysis. (10)

Q8. Solve the following L.P.P. by dynamic programming approach :

Maximize $Z = 3X_1 + 4X_2$

Subject to $2X_1 + X_2 \leq 40$

$2X_1 + 5X_2 \leq 180$

$X_1, X_2, \geq 0$ (20)