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MMS/MX 6189

Management Science

Paper: CP-201

Time: Three Hours] [Maximum Marks : 70

Note:- Attempt FIVE questions in all. All questions carry equal marks.

1. Based on Integer Programming

Maximize $z = 5x_1 + 4x_2$ subject to

$$x_I + x_2 \leq 5$$

$$l0x_I + 6x_2 \leq 45$$

x_I, x_2 non-negative integers.

2. A paint company produces both interior and exterior points from two raw materials, M 1 and M2. The following table provides the basic data of the problem: The daily demand for interior paint cannot exceed that of extension point by more than 1 ton. Also the maximum daily demand interior paint is 2 tons. Determine the optimum product mix of interior and exterior paint to maximize the total daily profit and

(a) Determine the optimal range of the coefficients, if the objective Function is changed to $Z = c_1x_1 + c_2x_2$:-

	Tonns of raw material per ton on		Maximum daily availability (Tons)
	Exterior Point	Interior Point	
Raw Material, M_I	6	4	24
Raw Material, M_2	1	2	6
Profit per ton (Rs.I000)	5	4	

3. A Transport Company ships truckloads of grain from three sites to four mills. The supply (in truck loads) and the demand (also in truckloads) together with the unit transportation costs per truckloads on the different routes are summarized in the transportation model in figure given below. The unit transportation cost C_{ij} and is hundreds of Rupees:

		Mills				
		1	2	3	4	Supply
Silos	1	10	2	20	11	15
	2	12	7	9	20	25
	3	4	14	16	18	10
Demand		5	15	15	13	

Schedule the shipment from each silo to each mill in such a manner so as to minimize the total transportation cost within the constraints imposed by silo supply capacities and mills' demand. Also find the minimum cost.

4. A car hire company has one car at each of five depots a, b, c, d and e. A customer requires a car in each town, namely A, B, C, D and E. Distances (in Km.) between depots (origins) and towns (destinations) are given in the following distance matrix:

	a	B	c	D	E
A	160	130	175	190	200
B	135	120	130,	160	175
C	140	110	155	170	185
D	50	50	80	80	110
E	55	35	70	80	105

Find the assignment of depots to destinations that will result in minimum distance covered.

5. (a) "Simulation is an especially valuable t09l in a situation where the mathematics needed to describe a system which is realistically too complex to yield analytical solutions" Elucidate.

(b) Discuss the Monto-Carlo method of solving a problem illustrating it by outlining a procedure to solve a specified problem of your choice by the same.

6. A glass factory specializing in crystal is developing a substantial backlog and the firm's management is considering three courses of action: (Sl) arrange for sub-contracting, (S2) begin overtime, (S3) construct new facilities. The correct choice depends largely upon future demand which may be low, medium, or high. By consensus, management ranks the respective probabilities as 0.1 0, 0.50, 0.40. A cost analysis reveals the effect upon the profits that is shown in the table below:

Profit (Rs. 000) if demand is	Courses of action		
	Sl	S2	S3
Low (p = 0.10)	10	-20	-150
Medium (p = 0.50)	50	60	20
High (p = 0.40)	50	100	200

Show this decision situation in the form of a decision tree and indicate the most preferred decision and corresponding expected value.

7. Solve the game whose payoff matrix is

$$\begin{pmatrix} -1 & -2 & 8 \\ 7 & 5 & -1 \\ 6 & 1 & 12 \end{pmatrix}$$

(i) Find the optimal strategies for A and B.

(ii) Value of game to A.

8. The cost of a machine is Rs. 6,100 and its scrap value is only Rs. 100.

The maintenance costs are found from experience to be :

Year	1	2	3	4	5	6	7	8
Maintenance cost in Rs.	100	250	400	600	900	1250	1600	2000

When should machine be replaced?

9. (a) State the business applications of Queuing theory.

(b) There are five jobs, each of which must go through machines A, B and C in the order ABC. Processing times are given in table below:

	Processing Times		
Job i	A_i	B_i	C_i
I	8	5	4
2	10	6	9
3	6	2	8
4	7	3	6
5	11	4	5

Determine a sequence for five jobs that will minimize the elapsed time T?

10. A project consists of a series or tasks labeled A, B, ..., H, I with the following relationships:

A < D, E; B, D < F; C < G; B < H; F, G < I

With this notation, construct the network diagram having the shown constraints. Find also the minimum time of completion of the project, when the time (in days) of completion of each task is as follows:

Task	A	B	C	D	E	F	G	H	I
Time	23	8	20	16	24	18	19	4	10