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(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 4093 Roll No. | | | | | | | | | | |

B. Tech.

(SEM. VI) THEORY EXAMINATION 2010-11

OPERATIONS RESEARCH

Time : 3 Hours *Total Marks : 100*

Note :—(1) Attempt **ALL** questions.

(2) Assume suitable missing data if any.

1. Attempt any **two** of the following : **(10×2=20)**

(a) A toy manufacturer produces two types of dolls; a basic version—doll A and a deluxe version doll B. Each doll of type B takes twice as long to produce as one doll of type A. The company has time to make a maximum of 2,000 dolls of type A per day. The supply of plastic is sufficient to produce 1,500 dolls per day and each type requires an equal amount of it. The deluxe version is type B requires a fancy dress of which there are 600 per day available. If the company makes a profit of Rs. 30 and Rs. 50 per doll respectively, on doll A and B,

how many of each should be produced per day in order to maximize profit ? Solve it Graphically.

(b) Solve the following LPP :

Maximise :

$$Z = 40x_1 + 30x_2 + 20x_3$$

subject to :

$$2x_1 + 5x_2 + 10x_3 \leq 900$$

$$2x_1 + 5x_2 + 3x_3 \leq 400$$

$$4x_1 + 2x_2 + 2x_3 \leq 600$$

$$x_1, x_2, x_3 \geq 0.$$

(c) Briefly explain the mechanism and managerial significance of post-optimality analysis of a simplex linear programming solution.

Attempt any **one** of the following : **20**

(a) A 6-ton vessel is loaded with one or more of the three items. The following table gives the unit weight w_i in tons and the unit revenue in thousand of dollars r_i, for item i. How should the vessel be loaded to maximize the total return ? Solve using Dynamic Programming method :

Item i	w_i	r_i
1	4	70
2	1	20
3	2	40

(b) (i) South India Soaps Limited (SISOL) operated three factories and four warehouses. Capacity and forecaster demand were as follows :

Factory at	Capacity	Region	Demand
Madras	12	Cochin	5
Coimbatore	7	Nellore	4
Bangalore	7	Salem	4
		Madurai	11

Note : Capacity and demand are in tonnes.

The transportation costs per tonne (Rs.)

From / To	Cochin	Nellore	Salem	Madurai
Madras	95	105	80	15
Coimbatore	115	180	40	30
Bangalore	155	180	95	70

SISOL wished to minimize its transportation costs incurred.

(ii) Five lathers are to be allotted to five operators (one for each). The following table gives weekly output figures (in pieces) :

Weekly Output

	L_1	L_2	L_3	L_4	L_5
P	20	22	27	32	36
Q	19	23	29	34	40
Operators R	23	28	35	39	34
S	21	24	31	37	42
T	24	28	31	36	41

Profit per piece is Rs. 25. Find the maximum profit per week.

Attempt any **one** of the following :

(a) Expected return (in million rupees) from the sale of three machines A, B and C under expected market condition as Poor (S_1), Fair (S_2) and Good (S_3) are given in the following table :

Sales	S_1	S_2	S_3
A	0·5	1·0	1·5
B	0	1·5	2·5
C	−1·5	0·5	3·5

Chances of market at States S_1, S_2 and S_3 are 30%, 50% and 20% respectively. But the market research finds the actual chances of States of the market as follows :

ActualState	$X_1^{(Poor)}$	$X_2^{(Fair)}$	$X_3^{(Good)}$
S_1	0·7	0·2	0·1
S_2	0·2	0·7	0·1
S_3	0	0·2	0·8

Find :

(i) Conditional expected loss table. 4

(ii) Expected Value of Perfect Information (EVPI). 6

(iii) Expected loss table on the basis of the results of market research. 7

(iv) Economic cost of market research. 3

(b) (i) Solve the following game. The payoff is for player A :

	B_1	B_2	B_3	B_4
A_1	1	9	6	0
A_2	2	3	8	4
A_3	−5	−2	10	−3
A_4	7	7	−2	−5

10

(ii) With the help of an appropriate example establish the relationship between game theory and linear programming. 10

4. Attempt any one of the following : 20

(a) A refrigerator dealer finds that the cost of holding a unit in stock for a week is Rs. 20. Customers who cannot get the new refrigerator immediately tend to go to other dealers and he calculates his loss to Rs. 200 for every customer he losses. Probability distribution of demand is as follows :

Demand	0	1	2	3	4	5
Probability	0·05	0·10	0·20	0·30	0·20	0·15

Assuming that there is no time lag between ordering and delivery, how many refrigerators should he order per week ?

(b) Analyse a Stochastic Single Period Model with Initial inventory and the set up cost, for perishable products; listing the assumptions.

5. Attempt any one of the following : 20

(a) (i) Define simulation. What are the advantages and disadvantages of simulation models ?

(ii) What is a queuing problem ? What are some of the important assumptions of Queuing Models ?

(b) (i) A company has two manufacturing shops and two tool cribs, one for each shop. Both tool cribs handle almost identical tools, gauges and measuring instruments. Analysis of service time shows a negations exponential distribution with mean of 2·5 minutes per workman. Arrivals of workman follows Poisson distribution with a mean of 18 per hour. The production manager feels that if tool cribs are combined for both shops efficiency will improve and waiting time in the queue will reduce. Do you agree with his opinion ?

(ii) Explain the basic steps of Monte Carlo simulation.