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

PAPER ID : 2984 Roll No. | | | | | | | | | | |

B. Tech.

(SEM. VIII) THEORY EXAMINATION 2011-12

OPERATIONS RESEARCH

Time : 3 Hours *Total Marks : 100*

Note : (1) Attempt ***all*** questions.

(2) Be precise in your answers.

(3) Assume suitable value for missing data if any.

(4) Use of standard normal distribution table is permitted.

1. Attempt any ***two*** parts :

(a) (i) "The hard problems are those for which models do not exist." Interpret this statement. Give some examples. **(5)**

(ii) Write the dual to the following primal LP problem :

Maximise : $z = 20x_1 + 17x_2 + 18x_3 + 12x_4$

subject to :

$$4x_1 - 3x_2 + 8x_3 + 3x_4 \leq 60$$

$$x_1 + x_2 + x_3 = 25$$

$$-x_2 + 4x_3 + 7x_4 \geq 35$$

and x_4 is unrestricted in sign. **(5)**

(b) (i) Discuss the role of sensitivity analysis in Linear Programming. **(4)**

(ii) Solve graphically the following LP problem :

Maximise : $z = 9x_1 + 3x_2$

subject to :

$$2x_1 + 3x_2 \leq 13$$

$$2x_1 + x_2 \leq 5$$

$$x_1, x_2 \geq 0$$ **(6)**

(c) Solve :

Max. $z = x_1 + x_2 + x_3$

subject to :

$$4x_1 + 5x_2 + 3x_3 \leq 15$$

$$10x_1 + 7x_2 + x_3 \leq 12$$

and $x_1, x_2, x_3 \geq 0$ **(10)**

2. Attempt any ***two*** parts : **(10×2=20)**

(a) A company has five salesmen, who have to be allocated to three marketing zones. The profit from each zone depends upon the member of salesman working in that zone. The expected returns for different number of

salesmen in different zones, as estimated from the past records are given below. Determine the optimal allocation policy :

Number of salesmen	Marketing zones		
	1	2	3
0	45	30	35
1	59	45	45
2	70	62	52
3	80	70	65
4	93	80	70
5	101	91	80

(b) Alpha Corporation has four plants, each of which can manufacture any one of four products A, B, C or D. Production costs differ from one plant to another and so do the sales revenue. Given the revenue and the cost data below, determine which product should each plant produce to maximize profit.

Sales Revenue (in Rs. 1,000)

		Plant			
		1	2	3	4
Product	A	50	68	49	61
	B	60	70	50	75
	C	55	67	52	70
	D	58	65	55	69

Production cost in (Rs. 1,000)

		Plant			
		1	2	3	4
Product	A	49	60	45	60
	B	54	63	46	49
	C	51	62	48	68
	D	55	63	49	66

(c) Solve the following transportation problem and find the minimum transportation cost :

	Destination					
	D_1	D_2	D_3	D_4	D_5	
S_1	16	16	13	22	17	50
S_2	14	14	12	19	15	60
S_3	19	19	20	23	14	50
	30	20	70	30	60	

3. Attempt any *two* parts : **(10×2=20)**

(a) What do you understand by Decision Tree Analysis ? Explain taking an example.

(b) (i) Define : pure and mixed strategies, principle of dominance and fair game.

(ii) Solve the following game whose payoff matrix is given by :

	B_1	B_2	B_3	B_4	B_5
A_1	3	−1	4	6	7
A_2	−1	8	2	4	12
A_3	16	8	6	14	12
A_4	1	11	−4	2	1

(c) Determine the optional sequence of jobs that minimize the total elapsed time based on the following information :

Job	:	A	B	C	D	E	F	G
Machine M_1	:	3	8	7	4	9	8	7
M_2	:	4	3	2	5	1	4	3
M_3	:	6	7	5	11	5	6	12

4. Attempt any ***two*** parts : **(10×2=20)**

(a) XYZ Company wants to provide a 95 percent service level to its customers. Using the past history of demand, the following data is available. Daily demand follows normal

distribution with an average daily demand of 20 units and the standard deviation of 5 units. The lead time for procurement is 4 days. The cost of placing an order is Rs. 12 and inventory carrying cost is Rs. 1.20 per unit per year. There are no stockout costs and unfilled orders are supplied after the items are received. What should be the inventory policy for the company ?

(b) (i) Describe the importance of ABC analysis as a selective approach for inventory control.

(ii) Define simulation. Give one application area when this technique is used in practice.

(c) (i) Derive a single period probabilistic inventory model with instantaneous and continuous demand and no setup cost.

(ii) What is Monte Carlo simulation ? Discuss in brief.

5. Attempt any ***two*** parts : **(10×2=20)**

(a) Explain in brief the main characteristics of the "Queuing System". Also discuss the standard format used to describe the main characteristics.

(b) What is a Project ? Explain in brief important characteristics of Project.

(c) Write notes on :

(i) Lowest cost schedule

(ii) Recource levelling.