

**III B.Tech II Semester Supplementary Examinations, Apr/May 2006**  
**OPERATIONS RESEARCH**  
**(Computer Science & Systems Engineering)**

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions  
 All Questions carry equal marks

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1. A Caterer is to organize garden parties for a week. He needs a total of 160, 120, 60, 90, 110, 100 and 120 fresh napkins during the seven days of the week. Each new napkin costs Rs. 3. He can use soiled napkins after getting them washed from a laundry. Ordinarily, washing charges are Rs.0.6 per napkin and they are returned after four days. However, the laundry also provides express service, at a cost of Rs.1 per napkin, in which case they are returned after two days. Determine the planning schedule the caterer should adopt to buy or send napkins to the laundry so as to minimize the cost. [16]

2. Solve the following transportation problem [16]

	D1	D2	D3	D4	D5	Availability
O <sub>1</sub>	4	7	3	8	2	4
O <sub>2</sub>	1	4	7	3	8	7
O <sub>3</sub>	7	2	4	7	7	9
O <sub>4</sub>	4	8	2	4	7	2
Demand	8	3	7	2	2	22

3. A Company has four territories open and four salesman available for assignment. The territories are not equally rich in their sales potential, it is essential that a typical salesman operating in each territory would bring in the following annual sales :

Territory I : Rs. 60,000

Territory II : Rs. 50,000

Territory III : Rs. 40,000

Territory IV : Rs. 30,000

The four salesmen are also considered to differ in ability; it is estimated that, working under the same conditions, their yearly sales would be proportionately as follows :

Salesman A : 7 ; Salesman B : 5 ; Salesman C : 5 ; Salesman D : 4

If the criterion is maximum expected total sales, the intuitive answer is to assign the best salesman to the richest territory, the next best salesman to the second richest territory and so on. Verify this answer by the assignment method. [16]

4. A series lamp circuit contains 10,000 bulbs. When any bulb fails, it is replaced. The cost of replacing a bulb individually is Re.1 only. If all the bulbs are replaced simultaneously, the cost per bulb would be Re.0.35. The percent of surviving, say  $s(t)$  at the end of the month 't' and  $p(t)$  probabilities of failure during the month are given below:

t	0	1	2	3	4	5	6
s(t)	100	97	90	70	30	15	0
p(t)	-	0.03	0.07	0.20	0.40	0.15	0.15

what is the optimal replacement?

[16]

5. (a) Briefly explain

- i. pure strategy
- ii. mixed strategy
- iii. optimal strategy

(b) Find the saddle point, optimum strategies and value of the game in the following pay off matrix [6+10]

		Y			
		A	B	C	D
X	I	-3	4	2	9
	II	7	8	6	10
	III	6	2	4	-1

6. A firm is engaged in both shipping and receiving activities. The management is always interested in improving the efficiency by new innovations in loading and unloading procedures. The arrival distribution of trucks is found to be poisson with arrival rate of two trucks per hour. The service time distribution is exponential with unloading rate of three trucks per hour. Find the following:

- (a) average number of trucks in the waiting line
- (b) the average waiting time of trucks in line
- (c) the probability that the loading and unloading dock and workers will be idle.
- (d) What reductions in waiting time are possible if loading and unloading is standardized.
- (e) What reductions are possible if lift trucks are used. [16]

7. (a) List and explain different types of costs incurred in inventory system.

(b) The annual demand for an items is 3200 units, the unit cost is Rs. 6/- and inventory charges 25% per annum. If the cost of one procurement is Rs. 150/-, Determine

- i. Economic Order Quantity
- ii. Number of orders per year
- iii. Time between two consecutive orders
- iv. the optimal cost. [6+10]

8. (a) Write a note on the application of dynamic programming.

(b) Define the following terms in dynamic programming :

- i. State

- ii. State variable
- iii. Immediate return
- iv. Optimal return .

[8+8]

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