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B.E/B.Tech. (FT) DEGREE END SEMESTER EXAMINATION APRIL/MAY 2011

MANUFACTURING ENGINEERING BRANCH

VI SEMESTER- (REGULATION 2004)

ME512 –OPERATIONS RESEARCH

Answer All Questions

PART 'A' (10 x 2 = 20 Mark)

1. When can we use the graphical method for solving LPP
2. What do you understand by restricted assignment?
3. What is augmenting path in the maximal flow problem.
4. What is the use of dummy activity in project network?
5. What are the costs involved in inventory.
6. Define EOQ?
7. What is meant by reneging in queuing theory?
8. What are the major applications of waiting line models?
9. What is saddle point in game theory?
10. What is group replacement policy?

PART 'B' (5 x 16 = 80)

11) Find the optimal transportation cost of the following matrix using least cost method (16)

	A	B	C	D	E	Available
Factory P	4	1	2	6	9	150
Factory Q	6	4	3	4	5	170
Factory R	5	2	6	3	8	170
Demand	90	75	95	115	115	

OR

12 a) Consider the details of a distance network as shown below

Arc	1-2	1-3	1-4	2-3	2-5	3-4	3-5	3-6	3-7
Distance	6	7	10	8	4	6	11	3	5

Arc	4-7	5-6	5-8	6-7	6-8	6-9	6-10	7-9	8-10	9-10
Distance	7	13	9	5	4	8	3	10	10	9

- a) construct the distance network
- b) find the minimum spanning tree using PRIM algorithm

OR

12b) Consider the data of a project as shown in table

Activity	Normal time (weeks)	Normal cost(Rs.)	Crash time (weeks)	Crash Cost(Rs.)
1-2	15	500	11	900
1-3	6	800	3	560
1-4	9	800	5	910
2-5	16	850	12	865
3-2	8	1120	5	1230
3-4	6	1200	3	1380
4-5	13	1600	8	1850

If the indirect cost per week is 300 find the optimal, normal and minimum project completion time.

13 a) The demand rate for an item in a company is 18000 units per year. The company can produce at the rate of 3000/month. The set up cost Rs.400 per order and the holding cost is Rs. 0.20 per unit per month. Calculate

- 1) The optimum manufacturing quantity
- 2) The maximum inventory
- 3) The time between orders
- 4) The number of order per year
- 5) The time of manufacture
- 6) The optimum annual cost is Rs 4/unit

OR

13 b) Find the optimum order quantity for a product for which the price breaks are as follows (16)

Order Quantity	Unit cost (Rs.)
$0 < Q_1 < 1000$	200.00
$1000 \leq Q_2 < 2000$	180.00
$2000 \leq Q_3$	160.00

The monthly demand for the product is 400 units. The storage cost is 25% of the unit cost of the product per month and the cost of ordering is Rs250/month.

14 a) A repairman is to be hired to repair machines which breakdown at an average rate of 3 per hour. The breakdowns follow Poisson distribution. Non-productivity time of a machine is considered to cost Rs16 per hour. Two repairman A and B have been interviewed. The repairman A charges Rs 8 per hour and the rate of his service is 4 machine per hour. The repairman B demands Rs10 per hour and he services at average rate of 5 per hour. Which repairman should be hired?

OR

14 b) A post office has 3 windows providing the same services. It receives on an average 30 customers per hour. Arrivals are Poisson distributed and service time exponentially distributed. The post office serves on average 12 customers per hour

- i) What is the probability that a customer will be served immediately
- ii) What is the probability that a customer will have to wait?
- iii) What is the average number of customers in the system?
- iv) What is the average total time that a customer must spend in the post office?

15a) A finance manager is considering drilling a well. In the past , 70% of wells drilled were successful at 20 meters depth in that area. Moreover on finding no water at 20 meters, some person in that area-drilled in further up to 25meters but only 20% struck water at that level. The prevailing cost of drilling is Rs 500 per meter. The finance manager estimated that in case he does not get water in his own well, he will have to pay Rs 15,000 to but water from outside for the same period of getting water from the well. The following decisions are considered

- i) Do not drill any well
- ii) Drill up to 20 meters and
- iii) If no water is found at 20 meters , drill up to 25 meters

Draw on appropriate decision tree and determine the finance Manager's optimal strategy.

OR

15 b) Obtain the optimal strategies for both players and value of the game for two-person zero sum game whose pay-off matrix is as follows:

	B1	B2
A1	-6	7
A2	4	-5
A3	-1	-2
A4	-2	5
A5	7	-6