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B.E/B.Tech. (FT) DEGREE END SEMESTER EXAMINATION APRIL/MAY 2012

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MECHANICAL ENGINEERING DEPARTMENT

VII SEMESTER

ME512 –OPERATIONS RESEARCH

Answer All Questions

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

1. Write the conditions for standard form of LPP.
2. What is mixed integer problem?
3. When we will use PERT technique
4. What is Dummy activity?
5. What is ROL?
6. Write any two difference between EOQ and EBQ
7. Write the Kendal's notation for single server model
8. Write any two assumptions considered in waiting line models
9. When the player will go to multiple strategies
10. What saddle point?

PART –B(5 x 16 = 80 Marks)

11. A media specialist plans to allocate advertising expenditure in three media whose unit costs of a message are Rs.15,000; Rs. 12,500; and Rs10,000 respectively. The total advertising budget available for the year is Rs. 5,00,000. The first medium is a monthly magazine and it is desired to advertise not more than once in one issue. At least four advertisements should appear in the second medium and the number of advertisements in the third medium should strictly lie between 6 and 10. The effective audience for unit advertisement in the three media is given below. Formulate the above problem as a LPP.

Medium	:	1	2	3
Expected effective audience	:	50000	40000	25000

12 a). The following tables give data on estimates optimistic, most likely and pessimistic duration in weeks for a project

Activity	Estimated durations in week		
	Optimistic time	Most likely time	Pessimistic time
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-5	2	5	8
5-6	3	6	15

1. Draw the project network and identify all the paths though it
2. Find the expected duration and variance for each activity
3. Calculate the variance and standard deviation of the project

OR

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

Arc	Distance
1-2	8
1-3	5
1-4	7
1-5	16
2-3	15
2-6	3
2-7	4
3-4	5

Arc	Distance
3-6	6
4-5	8
4-6	12
5-8	7
6-8	9
6-9	15
7-9	12
8-9	6

a) Construct the distance network.

b) Find the shortest path from node 1 to node 9

13a) The demand for an item in a company is 18000 units/year. The company can produce the item at the rate of 3000/month. The set up cost is Rs500/set up and holding cost is 15 paise/unit/month . The shortage cost is Rs20/unit/year. Determine

i) The optimum manufacturing quantity
ii) Number of shortages
iii) Manufacturing time
iv) The time between set ups

OR

13 b Determine the EOQ and number of orders per year for the following information in an inventory problem. Annual consumption = 12,000 units; unit cost = Rs.10, Ordering cost Rs. 60/order; Carrying cost = 10% of item cost and lead time =10 days , working days per year is 300 days.

In the past two years the use rate has gone as high as 70 units per day. Determine the safety stock. What should be the reorder point at this safety stock? Also calculate the carrying cost for a year.

14 a) The arrival rate of breakdown machines at a maintenance shop follows poisson distribution with a mean of 4 per hour. The service rate of machines by a maintenance mechanic also follows poisson distribution with a mean of 3 per hour. The down time cost per hour of a breakdown machine is Rs.200. The labour rate per hour is Rs50. Determine the optimal number of maintenance mechanics to be employed to repair the machines such that the total cost is minimized.

OR

14 b)A ticket window is manned by a single server. The arrivals to the ticket window are poisson pattern with average inter arrival time as 3 minutes. The time to serve a customer is exponentially distributed with mean 130 seconds. Find

i) The expected idle time for the server in each day (8 hours day)

ii) The expected number of customers waiting in the queue

iii) The average waiting time in the queue , in the steady state

15 a) A person has two independent investment, A and B, available to him, but he can undertake only one at time due to certain constraints. He can choose A, first and then stop, or if A is successful, then take B, or vice versa. The probability of success of A is 0.6, while for B it is 0.4 . Both the investments require an initial capital outlay of Rs 10,000 and both return nothing if the venture is not successful. Successful completion of A will return Rs 20000 (over cost) and successful completion of B will return Rs 24000. Draw the decision tree and determine the best strategy.

OR

15 b) A businessman has three alternatives open to him, each of which can be followed by any of the four possible events. The conditional pay-offs for each action are given below

Action	Pay –offs conditional on Events			
	A	B	C	D
S_1	8	0	-10	6
S_2	-4	12	18	-2
S_3	14	6	0	8

a) If he adopts maximin criterion, which acts should he choose?

b) If the criterion of choice is minimax regret, what action should be chosen.

c) If he uses EMV as his decision criterion, what action should be chosen (assuming that all events have equal probability of occurrences).