(6 pages)

DECEMBER 2022 **P/ID 37513/PMA3N**

Time : Three hours Maximum : 80 marks

PART A — ($10 \times 2 = 20$ marks)

Answer any TEN questions.

1. Define a regret criterion.

2. What is the expected value of perfect information?

3. Define an expected utility for decision theory.

4. What is a residue network?

5. Define a spanning tree.

6. Define a buffer inventory.

7. Define an inventory set up cost.

8. What is a (T, s, S) policy in the inventory system.

9. Define an average length of service time.

10. Define queue size.

11. Define an retrogressive failure.

12. Define an Group replacement policy.

PART B — ($5 \times 6 = 30$ marks)

Answer any FIVE questions.

13. Write the steps of decision making process.

14. A retailer purchase cherries every morning at Rs 50 a case and sells them for Rs 80 a case. Any case remaining unsold at the end of the day can be disposed of next day at a salvage value of Rs 20 per case. Past sales have ranged from 15 to 18 cases per day. The following is the record of sales for the past 120 days:

Cases sold	15	16	17	18
Number of days	12	24	48	36

Find how many cases the retailer should purchase per day to maximize his profit.

15. Explain the backward pass computations.

16. Each unit of an item cost a company Rs.40. Annual holding costs are 18 per cent of unit cost for interest charges, 1 per cent for insurance, 2 per cent allowances for obsolescence, Rs.2 for building

overheads, Rs.1.50 for damage and loss and Rs. 4 miscellaneous costs. Annual demand for the item is constant at 1,000 units and each order costs Rs.100 to place.

(a) Calculate EOQ and the total costs associated with stocking the item.

(b) If the supplier of the item will only deliver batches of 250 units, how are the stock holding costs affected?

17. The probability distribution of monthly sale of a certain item is as follows.

Monthly sales	0	1	2	3	4	5	6
Probability	0.01	0.06	0.25	0.35	0.20	0.03	0.10

The cost of carrying inventory is Rs.30 per unit per month and the cost of unit shortage is Rs.70 per month. Find the optimum stock level which minimizes the total expected cost.

18. Arrivals at telephone booth are considered to be Poisson with an average time of 10 minutes between one arrivals and the next. The length of phone call is assumed to be distributed exponentially with mean 3 minutes.

(a) What is the probability that a person arriving at the booth will have to wait?

(b) What is the average length of the queue that forms from time to time.

(c) What is the probability that it will takes him more than 10 minutes altogether to wait for the phone and complete his call?

19. Machine A costs Rs.45000 and the operating costs are estimated at Rs.1000 for the first year increasing by 10000 per year in the second and subsequent years. Machine B costs Rs.50000 and operating costs are Rs.2000 for the first year increasing by Rs.4000 in the second and subsequent years. If we now have a machine of type A, should we replace it with B? so when? Assume that both machines have no resale value and future costs are not discounted.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

20. The probability of the demand for lorries for hiring on any day in a given district is as follows:

No. of lorries demanded	0	1	2	3	4
Probability	0.1	0.2	0.3	0.2	0.2

Lorries have a fixed cost of Rs.90 each day to keep the daily hire charges Rs.200. If the lorry hire company owns four lorries, what is its daily expectation? If the company is about to go into business and currently has no lorries, how many lorries should it buy?

21. Write the steps of Linear programming formulation.

22. A contractor has to supply 10,000 bearings per day to an automobile manufacture. He finds that when he starts production run, he can produce 25,000 bearings per day. The cost of holding a bearing in stock for a year is Rs.2 and set up cost of a production run is Rs.180. How frequently should production run be made?

23. Derive the system of differential difference equations for $(M/M/1):(\infty/FCFS)$.

24. The following mortality rates have been observed for a certain type of fuse:

Week	1	2	3	4	5
Per cent failing by the end of week	5	15	35	75	100

There are 1000 fuses in uses and it costs Rs.5 to replace an individual fuse. If all fuses were replaced simultaneously it would cost Rs.1.25 per fuse. It is proposed to replace all fuses at fixed intervals of time, whether or not they have burnt out and to continue replacing burnt out fuses as they fail. At what intervals the group replacement should be made? Also prove that this optimal policy is superior to the straight forward policy of replacing each fuse only when it fails.

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