(6 pages)

MAY 2025 **P/ID 37513/PMA3N**

Time : Three hours Maximum : 80 marks

PART A — (10 × 2 = 20 marks)

Answer any TEN questions.

1. Define payoff.

2. Define expected monetary value.

3. What is a posterior probability distribution?

4. Define a connected network.

5. Define a loop in network models.

6. Define an inventory.

7. Define an order quantity in inventory control models.

8. Define a queue discipline.

9. Define a service time.

10. Define a service channels in queuing theory.

11. Define a gradual failure.

12. Define a random failure.

PART B — (5 × 6 = 30 marks)

Answer any FIVE questions.

13. Write the steps of decision making process.

14. Explain coefficient of optimism and savage criterion.

15. Write the scope of network applications.

16. A company that operate for 50 weeks in a year is concerned about its stocks of copper cable. This costs Rs. 240 a meter and there is a demand for 8000 meters a week. Each replenishment costs Rs. 1,050 for administration and Rs. 1,650 for delivering, while holding costs are estimated at 25 percent of value held a year. Assuming no shortages are allowed. What is the inventory policy for the company?

17. A television repairman finds that the time spent on his jobs has an exponential distribution with a mean of 30 minutes. If he repairs sets in the order in which they came in and if the arrival of sets follows a Poisson distribution approximately with an average rate of 10 per 8 hour day.

(a) What is repairmens expected idle time each day?

(b) How many jobs ahead of the average set just brought in?

18. The data collected in running a machine, the cost of which is Rs. 60,000 are given below :

Year	1	2	3	4	5
Resale value (Rs.)	42,000	30,000	20,400	14,400	9,650
Cost of spares (Rs.)	4,000	4,270	4,880	5,700	6,800
Cost of labour (Rs.)	14,000	16,000	18,000	21,000	25,000

Determine the optimum period for replacement of the machine.

19. A firm is considering replacement of a machine, whose cost price is Rs. 12,200 and the scrap value Rs. 200. The running cost are found from experience to be as follows :

Year	1	2	3	4	5	6	7	8
Running cost :	200	500	800	1200	1800	2500	3200	4000

When should the machine be replaced?

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

20. The probability of demand for hiring cars on any day in a given city is as follows :

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

Cars have a fixed cost of Rs. 90 each day to keep the daily hire charges Rs. 200. If the car hire company owns 4 cars, what is its daily expectation? If the company is about to go into business and currently has no car, how many cars should it buy? Find how many cases the retailer should purchase per day to maximize his profit.

21. Write the maximal flow algorithm in network models.

22. The pattern demand for seasonal product is as follows :

Demand :	1	2	3	4	5	6	7	8
Probability :	0.05	0.10	0.15	0.20	0.20	0.15	0.10	0.05

The cost of product is Rs. 80 per unit and the selling price is Rs. 120. How many units should be purchased for the season so as to maximize the expected profit. Also, if the salvage price of the product is Rs. 20, then would there be any change in the purchase decision?

23. A super market has two sales girls at the sales counters. If the service time for each customer is exponential with a mean of 4 minutes and if the people arrive in a Poisson fashion at the rate of 10 an hour. Calculate the :

(a) probability that a customer has to wait for being served?

(b) expected percentage of idle time for each sales girls?

(c) if a customer has to wait, what is the expected length of his waiting time?

24. A computer contains 10000 resisters. When any resister fails, it is replaced. The cost of replacing a resister individually is Rs. 1 only. If all the resisters are replaced at the same time, the cost per resister would be reduced to 35 paise. The percentage of surviving resisters say $S(t)$ at the end of month t and the probability of failure $P(t)$ during the month t are :

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 plan?

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