

Seat No. : _____

AN-107

April-2022

M.Sc. (CA & IT), Sem.-VIII

Quantitative Technique

Time : 2 Hours]

[Max. Marks : 50

Section-I

Answer any three :

14 × 3 = 42

1. Suppose that a decision maker faced with four decision alternatives four states of nature develops the following profit payoff table :

	State of Nature			
Decision Alternatives	S1	S2	S3	S4
D1	14	9	10	5
D2	11	10	8	7
D3	9	10	10	11
D4	8	10	11	13

- (A) If the decision maker knows nothing about the probabilities of the four states of nature what is the recommended decision using optimistic and conservative approach ? [Show all calculations in support of your answer] 7
- (B) What is the recommended decision using regret approach. 7
2. (A) A commodity is to be supplied at a constant rate of 200 units per day. Supplies of any amount can be had at any required time, but each order costs ₹ 50. The cost of holding the inventory is ₹ 2 per unit per day while a delay in supply of items induces a penalty of ₹ 10 per unit per delay of 1 day. 7
- (i) Find the optimal policy of (Q, T). [Q : Ordering quantity, T : Reorder cycle]
- (ii) What would be the best policy if penalty cost is nil.
- (B) A company has a demand of 12000 units per year for an item and it can produce 2000 units of such item per month. The cost of one set up is ₹ 400 and the holding cost per unit per month is ₹ 0.15. Find the optimum lot size and maximum inventory. 7

3. (A) In a super market, the average arrival rate of customers is 10 in every 30 minutes following Poisson process. The average time taken by the cashier to serve a customer is two and a half minutes following exponential distribution. 7
- (i) What is the probability that an arrival find three customers in the system ?
- (ii) What is the expected time spent by a customer in the system ?
- (B) A mechanic is to be hired to repair machines that breakdown at an average rate of 6 per hour. The breakdown follow Poisson distribution. Non-productive time of the machine costs ₹ 40 per hour. Mechanic A and Mechanic B are interviewed. Mechanic A charges ₹ 20 per hour and services machines at the rate of 8 machines per hour on an average. Mechanic B charges ₹ 28 per hour and services machines at the rate of 12 machines per hour on an average. Which one of the two should be hired and why ? Assume 8 hours of work each day. 7

4. Dentist schedules all his patients for 30 minute appointments. Some patients take more or less than 30 minutes depending upon the type of dental work to be done. Table below shows the various categories of work, their probabilities and actual time needed to complete the work : 14

Category of service	Time Required (in minutes)	Probability of category
Filling	45	0.40
Crown	60	0.15
Cleaning	15	0.15
Extraction	45	0.10
Check up	15	0.20

Simulate the dentist's clinic for 4 hours and determine the average waiting time for the patients as well as the doctor's idle time. Assume that all patients arrive at the clinic exactly at their scheduled appointment time. Clinic opens at 8 am. Use following Random number for handling the problem :

40, 82, 11, 34, 25, 66, 17, 79

5. (A) A company that manufactures steel observed that the production of steel (in metric tonnes) represented by time series is given below :

Year	Production of Steel
2014	60
2015	72
2016	75
2017	65
2018	80
2019	85
2021	95

- I. Find the linear equation that describes the trend in the production of steel by the company
- II. Estimate the production of steel in 2023. 7

- (B) Given the following data : 7

X1:	20	25	15	20	26	24
X2:	3.2	6.5	2.0	0.5	4.5	1.5
X3:	4.0	5.2	7.5	2.5	3.4	1.5

- (i) Obtain the least square equation to predict X1 values from those of X2 and X3.
- (ii) Predict X1 when X2 = 3.2 and X3 = 3.0

Section – II

6. Answer Any **Eight** 8
- (1) In a queuing system multiple servers may be in series or in parallel.
- (a) True (b) False
- (2) An arrival rate of 12 customers per hour according to Poisson Distribution means an average inter-arrival time is 6 minutes.
- (a) True (b) False
- (3) EPPI is expected payoff under certainty.
- (a) True (b) False

- (4) In classical EOQ model, Lead time is known and fixed.
(a) True (b) False
- (5) Criteria for making decision under uncertainty would always lead to the same optimal solution.
(a) True (b) False
- (6) The annual demand of a product is 4000 units, carrying cost per unit per year is 15% of the cost of a unit. Ordering cost is ₹ 150 per order, unit product cost is ₹ 25. The EOQ is
(a) None (b) 75625
(c) 300 (d) 565.69
- (7) Simulation always gives optimal solution.
(a) True (b) False
- (8) Data collected based on time is Time series data.
(a) True (b) False
- (9) Regression Line can be used for Prediction
(a) True (b) False
- (10) Hurwicz principle of decision making reflects a midway approach between optimistic and pessimistic decision maker's strategy.
(a) True (b) False
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