

Instructions: All questions are compulsory. Use of non-programmable scientific calculator is allowed.

- Q.1** (a) Derive Basic Economic Order Quantity (EOQ) Model with constant rate of demand. (07)
 (b) Find the most economic batch Quantity of a Product on a machine if the production rate of that item on the machine is 200 pieces per day and the demand is uniform at the rate of 100 pieces per day. The ordering cost is Rs. 200 per batch and the cost of holding one item in inventory is Rs. 0.81 per day. Also find Cycle time. (07)

OR

- (a) Derive EOQ Model with Finite Replenishment rate. (07)
 (b) An oil engine manufacturer purchases 42 lubricants pieces from a vendor. The requirement of these lubricants is 1800 per year. What should be the order quantity per year, if the cost per placement of an order is Rs. 16 and inventory carrying charge per rupee per year is 20 paise. (07)

- Q.2** (a) Explain Pure birth process of Arrival units. (07)
 (b) The arrival rate of a customer at a service window of Cinema Hall follows a probability distribution with a mean rate of 45 per hour. The service rate of the clerk follows Poisson distribution with mean of 60 per hour. (07)
 i. What is the probability of having no customer in the system?
 ii. What is the probability of having 5 customers in the system?
 iii. Find L_s and L_q .

OR

- (a) Derive M/M/1 Queueing Model with infinite capacity of system. (07)
 (b) Explain The Arrival rate, Service rate and Queue discipline. (07)

- Q.3** (a) Find the Value of game. (07)

		Player B	
		B_1	B_2
Player A	A_1	6	9
	A_2	8	4

- (b) Solve the following game graphically. (07)

		Player B		
		B_1	B_2	B_3
Player A	A_1	-4	3	-1
	A_2	6	-4	-2

OR

- (a) Reduce the following game as far as possible by using dominance principle and solve. (07)

		Player B			
		B_1	B_2	B_3	B_4
Player A	A_1	-1	2	3	0
	A_2	-4	-1	-1	0
	A_3	-1	1	1	-4
	A_4	4	-1	2	-7

- (b) (07)

		Player B		
		B_1	B_2	B_3
Player A	A_1	1	-1	-1
	A_2	-1	-1	3
	A_3	-1	2	-1

- Find the Maximin Value.
- Find the Minimax Value.
- Explain saddle point and find if possible.

- Q.4 (a) Farmer Mahesh can plant either corn or soybeans. The probabilities that the next harvest prices will go up, stay the same, or go down are 0.25, 0.30, and 0.45, respectively. The payoff table is given below. (Price in rupees) (07)

Decision alternative	State of nature		
	Prices go up	Prices unchanged	Prices go down
Corn	30,000	0	-35,000
Soyabean	10,000	0	-5000

- Draw the decision tree of given problem.
 - Which crop should Mahesh plant?
- (b) A manufacturer of goods has only three options available for the existing plant: expand the present plant, build a new plant and subcontract out extra production to other manufacturers. The future events concern demand for the product. They are: High demand, Moderate demand, Low demand and failure. The payoff table is given below: (Price in rupees) (07)

Decision alternatives	State of nature			
	High	Moderate	Low	Failure
Expand	5,00,000	2,50,000	-2,50,000	-4,50,000
Build	7,00,000	3,00,000	-4,00,000	-8,00,000
Subcontract	3,00,000	1,50,000	-10,000	-1,00,000

Which strategy should the concerned executive choose on the basis of -
 (a) Maximax Criterion

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- (b) Maximin Criterion
- (c) Hurwicz criterion (degree of optimism = 0.6)
- (d) Laplace criterion

OR

- (a) A conditional profit table shows the profit resulting from any possible combination of supply and demand. The profits can be either positive or negative and are conditional in that a certain profit result from taking a specific stocking actions (Ordering 10, 11, 12 or 13 boxes) and having sales of a specific number of boxes (10, 11, 12 or 13 boxes) (07)

Decision alternative (Stock)	State of nature (Demand)				Probability of Demand
	10 Boxes	11 Boxes	12 Boxes	13 Boxes	
10 Boxes	50	47	44	41	0.20
11 Boxes	50	55	52	49	0.40
12 Boxes	50	55	60	57	0.30
13 Boxes	50	55	60	65	0.10

Find the Expected Profit with Perfect Information (EPPI).

- (b) A Manufacturing Company must decide whether to manufacture a component part at its own plant or purchase the component part from a supplier. The resulting profit is dependent upon the demand for the product. The following payoff table shows the projected profit (in thousands of dollars): (07)

Decision Alternative	State of Nature		
	Low Demand, S_1	Medium Demand, S_2	High Demand, S_3
Manufacture, d_1	-20	40	100
Purchase, d_2	10	45	70

The state-of-nature probabilities are $P(S_1) = 0.35$, $P(S_2) = 0.35$, and $P(S_3) = 0.30$.

- a. Use a decision tree to recommend a decision.
- b. Use EVPI to determine whether Gorman should attempt to obtain a better estimate of demand.

Q.5 Attempt any SEVEN out of TWELVE:

(14)

- (1) Explain holding cost and shortage cost.
- (2) What is Lead time and Cycle time of inventory?
- (3) Describe total inventory cost.
- (4) Explain Kendall's notation of Queuing model.
- (5) What is Balking of customers in Queue?
- (6) What is pure death process?
- (7) Explain pure and mix strategy.
- (8) What is 2-person 0- sum game?
- (9) Write down any two rules of dominance method.
- (10) Explain Expected Value of Sample Information (EVSI).
- (11) Find the value of game of following payoff table.

4	3
-1	4

- (12) Explain Hurwicz criterion.

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