Total No. of Questions : 6]

SEAT No. :

PE1036

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First Year B.Com.

SDA 108 T : STATISTICAL DECISION ANALYSIS - I

(2024 Credit Pattern) (NEP 2020) (Semester - I)

Time : 3 Hours] *[Max. Marks : 60*

Instructions to the candidates:

1) ***Q. No. 1 and Q. No. 6 are compulsory.***
2) ***Attempt any three questions from the remaining (Q. Nos. 2 to 5).***
3) ***Use of non-programmable scientific calculator is allowed.***
4) ***Figures to the right indicate full marks.***

Q1) Attempt any five of the following multiple-choice questions by selecting correct option from the given options : **[5]**

a) What happens when maximin ≠ minimax values of the game are same?

i) Saddle point exists ii) Solution is mixed

iii) Saddle point exists iv) None of these

b) Consider the matrix given, which is a payoff matrix of a game. Identify the dominance in it.

		B		
		X	Y	Z
A	P	1	5	7
	Q	7	6	2
	R	3	4	0

i) P dominates Q ii) Y dominates Z

iii) Q dominates R iv) Z dominates Y

c) Decision theory is concerned with :

i) Methods of arriving at an optimal decision

ii) Selecting an optimal decision in sequential manner

iii) Analysis of information that is available

iv) All of the above

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d) The expected value of perfect information (EVPI) is

i) Equal to expected regret of the optimal decision under risk

ii) The utility of additional information

iii) Maximum expected opportunity loss

iv) None of the above

e) What type of chart will be used to plot the number of defectives in the output of any process?

i) $\bar{x}$ bar chart ii) R chart

iii) C chart iv) p chart

f) Process control is carried out

i) Before production ii) During production

iii) After production control iv) All of these

g) Sequencing is

i) Routing ii) Scheduling

iii) Expediting iv) None of these

Q2) Solve the following :

a) Solve the following game : **[5]**

		Player B	
Player A	6	3	
	3	2	

b) Solve the following game : **[5]**

		Player B		
Player A	2	0	3	
	3	–1	1	
	5	2	–1	

c) Solve the following game using the principle of dominance : **[5]**

		Player B			
Player A	3	5	4	9	6
	5	6	3	7	8
	8	7	9	8	7
	4	2	8	5	3

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Q3) Solve the following :

a) Write the payoff matrix for the given situation. The demand for Vadapav in the morning may be 21, 22, 23, 24 and 25. Cost price and selling price of one Vadapav is Rs. 8 and Rs. 10 respectively. Balance Vadapav is treated as waste. **[5]**

b) From the following payoff table determine optimal strategy using maximin, maximax and Hurwicz criterion (Take $\alpha = 0.8$) **[5]**

		States			
		N_1	N_2	N_3	N_4
Strategies	S_1	4	4	4	4
	S_2	–2	8	8	8
	S_3	–8	2	12	12
	S_4	–14	–4	6	16

c) For the following payoff table determine the best decision by using expected monetary value. **[5]**

	State of nature		
Course of action	Good	Fair	Bad
A	100	60	–50
B	80	50	–10
C	40	20	–5
Probability	0.7	0.2	0.1

Q4) Solve the following :

a) The maintenance cost and resale value per of a machine whose purchase price is Rs. 15,000/- is given below : **[8]**

Year	1	2	3	4	5	6	7	8
Maintenance cost (Rs.)	600	800	1050	1400	2100	3500	5000	6800
Resale value (Rs.)	12000	9500	7500	5700	4200	3900	2900	2000

When should the machine be replaced?

b) The Lajwaab Bakery shop keeps stock of a popular brand of cake. Previous experience indicates the daily demand as given below : **[7]**

Daily demand	0	15	25	35	45	50
Probability	0.01	0.15	0.20	0.50	0.12	0.02

Using random numbers given below estimate demand for next 10 days :
21, 27, 47, 54, 60, 39, 43, 91, 25, 20

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Q5) Solve the following :

a) A machine is set to deliver packets of given tensile strength. 10 samples of size 5 each were recorded as follows : **[5]**

Sample No.	1	2	3	4	5	6	7	8	9	10
Mean	15	17	15	18	17	14	18	15	17	16
Range	7	7	4	9	8	7	12	4	11	5

Compute the control limits for R-Chart. Comment on whether the process is under control. (Use $n = 5$, $A_2 = 0.577$, $D_3 = 0$, $D_4 = 2.115$)

b) The following data refers to defect found at the inspection of the first 10 samples of size 100 each. Use them to obtain upper and lower control limits for percentage defective in samples of 100. **[5]**

Sample No.	1	2	3	4	5	6	7	8	9	10
No. of defectives	2	1	1	3	2	3	4	2	2	0

c) A machine is set to deliver packets of given tensile strength. 10 samples of size 5 each were recorded as follows : **[5]**

Sample No.	1	2	3	4	5	6	7	8	9	10
Mean	16	17	15	18	14	17	18	15	17	15
Range	7	11	4	9	7	8	12	4	7	5

Find control limits for mean chart. (Use $n = 5, A_2 = 0.577, D_3 = 0, D_4 = 2.115$)

Q6) Answer any two of the following :

a) Write a short note on Assignable Causes. **[5]**

b) Suppose that there are five jobs, each of which has to be processed on two machines A and B in the order AB. Processing times (Hrs) are given in the following table : **[5]**

Job	1	2	3	4	5
Machine A	6	2	10	4	11
Machine B	3	7	8	9	5

Determine a sequence in which these jobs should be processed so as to minimize the total processing time.

c) In a game of tossing coins player A is paid Rs. 8.00 if two coins turn both heads and Rs. 1.00 if two coins turn both tails by player B. Player B is paid Rs. 3.00 when the two coins do not match by player A. Write the payoff matrix for player A and find the value of the game. **[5]**

d) What are the different environments in which decisions are made? **[5]**



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