

## Exercise 2.1

### A. Theoretical Review Questions

- Describe some methods which are useful in decision-making under uncertainty.
- What are the basics of decision making under uncertainty? Illustrate with suitable examples.
- Explain clearly the following terms:  
(i) Decision alternative (ii) State of nature (iii) Payoff table and (iv) opportunity loss.

### B. Practical Problems

- A Coca-Cola distributor buys the bottles for Rs. 6 and sells them for Rs 10 each. All the bottles left over are worthless. His daily sales of cold drinks are never less than 10 and not more than 12. Prepare payoff table and Regret table.
- A beer distributor buys kegs for Rs. 8 each and sells them for Rs. 12 each. All the kegs left at the end of the day are worthless. The daily sales of kegs in the past have not been less than 20 and not more than 22. Prepare payoff table and Regret (or loss) table.
- A distribution of past daily sales of a commodity is as follows:  
Daily sales (units): 1000 1200 1400  
If selling price per unit is Rs. 40 and cost price per unit is Rs. 25 and salvage price is Rs. 5, construct payoff table and regret (loss) table.
- The following matrix gives the payoff (in Rs. Lakh) of different strategies  $S_1$ ,  $S_2$  and  $S_3$  against different conditions  $N_1$ ,  $N_2$ ,  $N_3$  and  $N_4$ .

Strategy (Supply)	States of nature (demand)			
	High demand ( $N_1$ )	Moderate demand ( $N_2$ )	Low demand ( $N_3$ )	Failure ( $N_4$ )
Expand ( $A_1$ )	6500	3000	-2000	-5000
Build ( $A_2$ )	9000	5000	-3000	-10000
Subcontract ( $A_3$ )	3000	1500	-1000	-2000

Indicate the decision taken under the following approaches:

- Optimistic criterion
  - Pessimistic criterion
  - Minimax regret criterion
  - Laplace criterion
  - Hurwitz criterion, if the coefficient of optimism is 0.80.
- The research department has recommended to the marketing department to launch a shampoo of three different types. The marketing manager has to decide one of the types of shampoo to be launched under the following estimated payoffs (in Rs.) for various levels of sales:

Types of Shampoo	Estimated levels of sales		
	15000	10000	5000
1. Egg Shampoo	30	10	10
2. Clinic Shampoo	40	15	5
3. Deluxe Shampoo	55	20	3

What will be the marketing manager's decision, if the criterion adopted be

- maximax
  - maximin
  - minimax regret?
  - Equal likelihood (Laplace criterion)?
  - Criterion of realism if coefficient of optimum is 0.60?
- Yogurt Hut, Ltd sells natural yogurt in a college community. Julie Stoneman, the manager, is filling out the orders for next week's supply of yogurt. She is uncertain what sales will be. Julie has the table below as a historical representation of profits given certain sales and buying level combinations

Weekly sales	Actions		
	Buy 200	Buy 300	Buy 400
200	\$50	\$25	\$0
300	\$50	\$75	\$50
400	\$50	\$75	\$100

Using the maximax decision criterion, what advice can you give Julie about quantities of yogurt to buy for next week?

- A businessman has three alternatives open to him and each of which can be followed by any of the four possible events. The conditional payoffs for each action-event combination are given below:

Actions	Events			
	A	B	C	D
$S_1$	8	0	-10	6
$S_2$	-4	12	18	-2
$S_3$	14	9	9	8

What action should be chosen, if the criterion of choice is (i) maximax (ii) maximin (iii) minimax regret (iv) Laplace criterion? (v) Hurwitz criterion if the coefficient of pessimism is 0.60?

8. A newspaper vendor buys a new started local paper at the rate of Rs. 5 and sells it at the rate of Rs. 10. The unsold papers do not have any value. The vendor knows that he cannot sell more than 20 papers in a day and the minimum sale would not be less than 18. How many papers should he buy based on (i) maximax criterion (ii) maximin criterion and (iii) minimax regret criterion

## Answers

### B. Practical Problems

1.

Payoff table

Strategies	States of nature		
	10	11	12
10	Rs. 40	Rs. 40	Rs. 40
11	Rs. 34	Rs. 44	Rs. 44
12	Rs. 28	Rs. 38	Rs. 48

Regret table

Strategies	States of nature		
	10	11	12
10	Rs. 0	Rs. 4	Rs. 8
11	Rs. 6	Rs. 0	Rs. 4
12	Rs. 12	Rs. 6	Rs. 0

2.

Payoff table

Strategies	No. of kegs sold		
	20	21	22
20	Rs. 80	Rs. 80	Rs. 80
21	Rs. 72	Rs. 84	Rs. 84
22	Rs. 64	Rs. 76	Rs. 88

Regret table

Strategies	No. of kegs sold		
	20	21	22
20	Rs. 0	Rs. 4	Rs. 8
21	Rs. 8	Rs. 0	Rs. 4
22	Rs. 16	Rs. 8	Rs. 0

3.

Payoff table (in Rs.)

Strategies	States of nature		
	1000	1200	1400
1000	15000	15000	15000
1200	11000	18000	18000
1400	7000	14000	21000

Regret table (in Rs.)

Strategies	States of nature		
	1000	1200	1400
1000	0	3000	6000
1200	4000	0	3000
1400	8000	4000	0

4. (i)  $S_2$  (ii)  $S_3$  (iii)  $S_1$  (iv)  $S_1$  (v)  $S_2$  5. (i) 3 (ii) 1 (iii) 3 (iv) 3 (v) 3

6. Buy 400 7. (i)  $S_3$  (ii)  $S_3$  (iii)  $S_1$  (iv)  $S_3$  (v)  $S_2$  8. (i) 20 (ii) 18 (iii) 19