

(First Question)

**We know that once the decision has been made, it can not be changed after the state of nature occurs. So**

- (i) Discuss three classes of the decision.
- (ii) Utilities and decisions under risk.

(Second Question)

**Consider the payoff table is given by**

Decision	State of the nature		
	(1)	(2)	(3)
(a)	5	7	8
(b)	6	6	6
(c)	3	9	1

**Assume that this is a decision with no knowledge about the state of nature.**

- (a) What is the optimal decision if Laplace criteria are used?
- (b) What is the optimal decision if maximin criteria are used?
- (c) What is the optimal decision if maximax criteria are used?
- (d) Create the payoff table in which the entries are Regret.
- (e) What is the optimal decision if the minimax regret criteria are used?

(Third Question)

- (i) **Define** ---Dominance Principle, Game Value.
- (ii) For the Payoff table of the second question, deduce the formulation of its corresponding Linear Programming explaining the idea of each player as a pure strategy.

(Fourth Question)

**(A) Put true or false, explaining your choice**

- (A) Decision trees involve sequences of decisions and random outcomes.
- (B) In decision theory, returns are independent on the action of indifferent adversary termed "nature"
- (C) Many deterministic optimization models can be thought of as decision making under certainty, where there is only one state of nature and one selects a decision that maximizes returns.

**(B) Multiple Choices**

- (A) Maximin return, maximax return and the minmax regret are criteria that
- (i) Lead to the same optimal decision.
  - (ii) Can be used without probability.
  - (iii) Both (i) and (ii)
- (B) Which of the following criteria does not apply to decision making under uncertainty?
- (i) Maximin return
  - (ii) Maximax return
  - (iii) Minimax regret
  - (iv) Maximize expected return
- (C) The concept of utility is a way to
- (i) Measure the attractive of money
  - (ii) Take into account aversion to risk
  - (iii) Take into account inclination to take risk
  - (iv) Both (i) and (ii)

With all my best regards  
Dr M.Bayoumi Ali Hassan.

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Try all questions

- 1- Explain the differences between decisions under certainty, decisions under risk and decisions under uncertainty. Write one model for each case.
- 2- Explain the recourse problem in stochastic programming. Give examples.
- 3- During the study of this course you were asked to make presentation of some subjects. Mention these subjects and write a paragraph about every one.
- 4- Explain with an example the idea of " the value of perfect information".
- 5- Monica is considering the possibility of starting a company to produce sailboats. She estimates that the market study will cost her \$10,000. The study can be either successful or not successful. Her basic decisions are to build a large plant, a small plant, or no plant at all. With a favorable market, Monica can expect to make \$90,000 from the large plant or 60,000 from the smaller plant. If the market is unfavorable, Monica estimates that she would lose \$30,000 with a large plant, while she would lose only \$20,000 with the small plant. Monica estimates that the probability of a favorable market given a successful study is 0.8. The probability of unfavorable market given an unsuccessful study result is estimated to be 0.9. Monica feels that there is a 50-50 chance that the study will be successful. Without doing any market study, she estimates that the probability of a successful market is 0.6. What would you recommend?
- 6- Explain with an example the concept of the minimax regret approach.
- 7- Assume a two- person zero- sum game, where each player has three strategies, with one strategy that dominates the other two. Assume a numerical payoff matrix for that game and solve it.

8- Why PERT falls into the category of decisions under risk?

9- Solve the following problem:

$$\text{Max } Z = cx$$

Subject to

$$x + y \leq 1,$$

$$x, y \geq 0$$

where  $c$  is a random variable that takes the values 1, 2 and 3 with equal probabilities.

10 - Write (  $\checkmark$  ) or ( X ): note: The wrong answer will be assigned a minus mark.

ملحوظة: الورقة التي بها هذا السؤال يتم تدبيرها مع ورقة الاجابة

- ( ) The minimax criterion selects each player's strategy that yields the best of the worst possible outcomes.
- ( ) The expected value of a decision is found by summing the product of the payoff associated with an outcome and the probability that the outcome will occur.
- ( ) Decision trees involve sequences of decisions and random outcomes.
- ( ) Regret means the opportunity cost of not making the best decision for a given state of nature.
- ( ) A decision tree is a graphical device for analyzing Decisions under risk.
- ( ) The Poisson distribution describes a discrete random variable.
- ( ) The states of nature refer to the future events, not under the control of the decision maker.
- ( ) A decision is said to dominate another decision if the payoffs of every state of nature for one is at least equal to the corresponding payoffs for the other and is better for at least one state of nature.
- ( ) In the decision tree, the round nodes correspond to the states of nature and the square nodes correspond to the decision alternatives.
- ( ) The number of customers in the queuing system means the number waiting in line.

Good Luck