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9913
7/2/25 AI - Game theory

Q.1 A game with imperfect information is a game where at least one player does not know all the previous actions or information about other players.
This happens when players make decisions without knowing everything about the game state.

* Example:- Rock, paper, scissors
In Rock, paper, Scissors, both players choose their move at same time without knowing what other has picked.
Since they cannot see their opponent choice before deciding, it is a game with imperfect information.

Q.2 A Bayesian game is a game in which players have incomplete information about some aspects of the game, such as preferences, payoffs or types of players.
However, they have probabilities about these unknown factors, which helps them make strategic decisions.

How they differ:-

1. Incomplete information vs complete information :-
In Bayesian games, players do not have full knowledge of payoffs.

2. Beliefs and probabilities :-
Bayesian games use probability distributions to model uncertainty.

3. Strategic decision making :-
Players in Bayesian games must ~~take~~ make decisions based on expectations and risk.

Q.3. The maximin strategy is a decision rule used in strictly competitive games (zero sum games), where a player chooses the option that maximizes their minimum payoff.

Application:-
In strictly competitive game where one player's gain is other's loss, the maximin strategy helps a player minimize risk by ensuring they get best possible outcome in worst case scenario.

Q.4 1] Monomorphic pure strategy equilibrium
i) In this equilibrium, all player always choose the same strategy every time game is played.
ii) There is no randomness in decision making.

2] Polymorphic mixed strategy equilibrium
i) In this equilibrium, players randomly choose between multiple strategies based on specific probabilities.
ii) This introduces variability in choice, preventing predictability

Q.5 In of infinitely repeated games, the same game is played repeatedly without a known ending.

Key results include:-

1. Possibility of Co-operation:-
Unlike one-shot games, repeated interactions allow for strategies like "Tit-for-tat", where players cooperate as long as the opponent does.

2. Threats and Punishments:-
Players can use future rewards or punishments to influence current decisions. For example, in pricing wars, firms may maintain high prices to avoid future retaliation.

Q.5→)

Subgame Perfect Equilibrium (SPE)

A subgame perfect equilibrium is a strategy that represents an optimal decision making process at every stage of the game. It prevents empty threats because each players strategy must be rational at every possible point in the game.