

## - Game Theory :-

We can say that playing a game is just a decision making process i.e. when you are playing a game with your opponent then you make a move and other person (opponent) makes a move. This is just dependend ~~on~~ upon the decision that you are making.

Decision making :

Type 1 : Under certainty → Every body is suppose to <sup>aware that he is</sup> ~~aware~~ make this move i.e. based on the knowledge about other persons move

Type 2 : Under risk

Type 3 : Under uncertainty

→ when there is some risk i.e. whether my move is going to be correct or not

↳ Situation where one person does not know what the other person is going to make the next move.

⇒ Game :- A general situation of conflict and competition in which two or more competitors are engaged in decision-making activities in anticipation of certain outcomes over time space.

⇒ Players :- Competitors or individual or an organization who are involved in playing the game.

Example :- • Two or more candidates contesting

an election with the objective of winning.

- Contractors filling bids to win business contract.

⇒ Types of game :-

1) Number of players :-

Two person game :- If a game involves only two players (competitors) then it is called two person game.

n- Person game :- If the no. of players are more than two, the game is referred as n- person game.

2) Based on Sum of gains and losses :- If in a game the gains of one player are exactly equal to the losses to another player, so that the total sum of the gains and losses (total payoff) equals zero, then game is said to be zero sum game.

Otherwise it is said to be non zero sum game. The problem faced by a large no. of business organizations come under this category).

⇒ Payoff :- The outcome of playing a game is called the payoff to the concerned player.

⇒ Payoff matrix :- The tabular display of the payoffs to players under various alternatives is called the payoff matrix of the game.

⇒ Strategy :- The strategy for a player is the list of all possible actions or moves that he can make for every outcome that might arise.

It is assumed that the rules governing the choices are known in advance to the players. The outcome resulting from a particular choice is also known to the players in advance and is expressed in terms of numerical values i.e. money, % of market share or utility.

However it is not necessary that players have a definite information about each others strategies.

⇒ Optimal strategy :- The particular strategy or complete plan by which a player optimizes his gains or losses without knowing the competitor's strategies is called optimal strategy.

⇒ Value of the game :- The expected outcome per play when players follow their optimal strategy is called the value of the game.

⇒ Generally there are two types of strategies:

1) Pure strategy :- If the game is such that each player can identify one and only one strategy

as the optimal strategy in each play of the game, then that strategy is referred to as the best strategy for that player and the game is referred to as a game of pure strategy or a pure game.

⇒ Mixed strategy :- If there is no one specific strategy as the best strategy for any player in a game, then game is referred to as a game of mixed strategy or a mixed game.

In such game each player has to choose different alternative courses of action from time to time.

⇒ 2x2 two person game and 2xn & mx2 games :-

2x2 :- When the no. of players in the game is two with each player has exactly two strategies, the game is referred to as 2x2 two person game.

2xm :- A game in which 1st player has precisely two strategies and the second player has 3 or more strategies is called an 2xn game.

mx2 :- A game in which the 1st player has 3 or more strategies and the second player has exactly 2 strategies is called an mx2 game.

3x3 and large game :- When the no. of players in the game is two and each has exactly three strategies, we call it as 3x3 two person game. It is said to be large game if each of the two players has 3 or more choices.

⇒ Maximin-Minimax principle :- The Maximum of the minimum gains is called the maximin value of the game and the corresponding strategy is called maximin strategy. Similarly the minimum of the maximum losses is called the minimax value of the game and the corresponding strategy is called the minimax strategy. If both the values are equal, then that would guarantee the best of the worst results.

Saddle point :- A saddle point of a game is that point or place in the payoff matrix whose the maximum of the row ~~and~~ minima is equal to the minimum of the column maxima. The payoff

at saddle point is called the value of the game and the corresponding strategies are called pure strategies.

Dominance :- One of the strategies of either player may be inferior to at least one of the remaining ones. The superior strategies are said to dominate the inferior ones.