GAME THEORY

INTRODUCTION-2

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1. **What is a Zero sum Game?**

   Ans : A game is termed as zero sum game if the sum of payments to all competitors after a play of the game is restricted to zero

   Definition:

   Let us consider a game with 'n' competitors and competitor '*i*' has N_i courses of action available to him. The total number of possible outcomes to a play of the game will be N_1, N_2,…….N_n. Let a particular outcome θ result in a payment p(I, θ)*to competitor i* .Then the game is called a zero sum game if for every possible outcome θ *,we have*

$$\sum_{i=1}^{n} p(i,\theta) \quad = 0$$

2. **What is a Constant sum Game?**

   Ans: . A game is termed as Constant sum game if the sum of payments to all competitors after a play of the game is restricted to a constant.

   Definition:

   Let us consider a game with 'n' competitors and competitor '*i*' has N_i courses of action available to him. The total number of possible outcomes to a play of the game will be N_1, N_2,…….N_n. Let a particular outcome θ result in a payment p(I, θ)*to competitor i* .Then the game is called a Constant sum game if for every possible outcome θ *,we have*

$$\sum_{i=1}^{n} p(i,\theta) \quad = k \text{ ; Where } k \text{ is a constant.}$$

3. **What is a Two Person Zero Sum game ?**
   Or
   What is a Rectangular game ?

   Ans: The simplest type of competitive situations are **two-person, zero-sum games**. These games involve only two players and they are called *zero-sum* games because

one player wins whatever the other player loses. In other words , the two person games in which the algebraic sum of gains and losses of both the players is zero is called a two person zero sum game or Rectangular Game as they are represented by a payoff matrix of rectangular shape.

Basic Characteristics of a Rectangular game:

a) A two-person game is characterized by the strategies of each player and the payoff matrix.
b) The payoff matrix shows the gain (positive or negative) for player A that would result from each combination of strategies for the two players. *The payoff matrix for player B is the negative or mirror image of the matrix for player A in a zero-sum game.*
c) The entries in the payoff matrix can be in any units as long as they represent the *utility (or value)* to the player.
d) There are two key assumptions about the behavior of the players. The first is that both players are *rational*. The second is that both players are *greedy* meaning that they choose their strategies in their own interest to earn maximum gain.

4. What is a Two Person Constant Sum game ?

Ans: , The two person games in which the algebraic sum of gains and losses of both the players is a constant is called a two person Constant sum game . In other words a Constant sum Game with only two players is called a two person constant sum game. In a two person constant-sum game , the pair of payoffs for each entry of the payoff matrix sum to the same constant C.