Theory of Games

In real life situation we are ~~two~~ pt face struggles and competition. In many practical problems having competitive situation, where there are two or more opponent parties with the conflicting interest, it requires ~~division~~ decision making and in this problem the actions to be taken by ~~B~~ one depends upon the action taken by the other, called opponents. As for example: candidates for an election, ~~countries~~ countries involving military battles etc have their conflicting interest.

Consider a particular example,. Let, A and B be ~~two~~ two business man working in the same field, there must be some conflicts of interest between them regarding business maters. In terms of mathematical terminology, the business man A and B are called as players and the business is called a game.

Suppose, A has three executives, A_1, A_2 and A_3 and B has four executives B_1, B_2, B_3 and B_4 to control their respective business. We make a restriction that both players utilize the services of their executives only one at a time to control their whole business. The selection of a perticuler executives is called the ~~stati~~ strategy taken by the players. and the selection of only one single ~~one~~ strategy by a player, ignoring the strategy taken by his opponent is called a pure strategy. Now we further make two assumptions.

1. The player A is in a batter position, then

the player A is called a maximizing play and the player B is called a minimizing p

2. The total gain of one player is exactly equal to the total loss of the other players. i.e. the sum total is zero, for this reason the type of game is known as "Two person Zero sum game"

In general if the player A takes m pu strategies and B takes n pure strategies, the game is called "Two person zero sum game" or "m×n" rectanguler game".

If $m=n$, then the game is called a square game.

■ **Pay-off Matrix :** A pay-off matrix is a real matr (a_{ij}). for $i=1,2,\dots,m; j=1,2,\dots,n$, where a_{ij}, the elements of the matrix indicates the game of the maximization player for using i^{th} and j^{th} move of the row and column players respecti

∴ For two players A and B, if the player A takes p pures strategies $A_1, A_2, \dots, A_m$ and if the player B takes pures strategies $B_1, B_2, \dots, B_n$; then the pay-off matrix for the rectanguler m×n games is as follows.

Player B

$$\text{Player A}\quad \begin{array}{c|cccccc|}
 & B_1 & B_2 & B_3 & \cdots & & B_n \\
\hline
A_1 & a_{11} & a_{12} & a_{13} & \cdots & & a_{1n} \\
A_2 & a_{21} & a_{22} & a_{23} & \cdots & & a_{2n} \\
A_3 & \vdots & \vdots & \vdots & \vdots & & \vdots \\
\vdots & & & & & & \\
A_n & a_{n1} & a_{n2} & a_{n3} & \cdots & & a_{nn} \\
\hline
\end{array}$$

Where $\{a_{ij}\}$ indicates that if the player A takes i^{th} pure strategy A_i and if the player takes j^{th} pure strategy B_j, then the ~~game~~ gain of the player A is a_{ij} units, where as the loss of the player B is a_{ij} units. So, the total sum is zero.