SECTION – 2

QUESTION-1.

ANSWER:-

Game theory concepts are used to develop effective competitive strategies for setting prices, the level of product quality, research and development, advertising, and other forms of nonprice competition in oligopoly markets. Game theory concepts have also been used to set public policy for currency market intervention in emerging markets and auction strategies for broadcast spectrum in the telecommunications industry. This brief introduction shows how managers can use a simple understanding of game theory concepts to make better managerial decisions.

Prisoner's Dilemma

Game theory is a general framework to help decision making when firm payoffs depend on actions taken by other firms. Because decision interdependence is a prime characteristic of oligopoly markets, game theory concepts have a wide variety of applications in the study of oligopoly. In a simultaneous-move game, each decision maker makes choices without specific knowledge of competitor counter moves. In a sequential-move game, decision makers make their move after observing competitor moves. If two firms set prices without knowledge of each other's decisions, it is a simultaneous-move game. If one firm sets its price only after observing its rival's price, the firm is said to be involved in a sequential-move game. In a oneshot game, the underlying interaction between competitors occurs only once; in a repeat game, there is an ongoing interaction between competitors.

A game theory strategy is a decision rule that describes the action taken by a decision maker at any point in time. Asimple introduction to game theory strategy is provided by perhaps the most famous of all simultaneous-move one-shot games: The so-called Prisoner's Dilemma.

Suppose two suspects, Bonnie and Clyde, are jointly accused of committing a specific crime, say inside trading. Furthermore, assume that the conviction of either suspect cannot be secured without a signed confession by one or both suspects. As shown in Table, if neither Bonnie nor Clyde confesses, the prosecutor will be unable to obtain a conviction, and both will be set free. If only one suspect confesses, turns state's evidence and implicates the other, then the one confessing will get the relatively light penalty of a having to pay a fine and serving probation, and the implicated party will receive the harsh sentence of 5 years in prison. If both suspects confess, then each will receive a stiff 2-year sentence. If both suspects are held in isolation, neither knows what the other will do, and a classic conflict-of-interest situation is created. Although each suspect can control the range of sentencing outcomes, neither can control the ultimate outcome. In this situation, there is no dominant strategy that results in the best result for either suspect regardless of the action taken by the other. Both would be better off if they could be assured that the other would not confess, because if neither confesses both are set free. However, in failing to confess, each is exposed to the risk that the other will confess. By not confessing, they would then receive the harsh sentence of 5

years in prison. This uncertainty creates the Prisoner's Dilemma. To confess, or not to confess—that is the question.

A secure strategy, sometimes called the maximin strategy, guarantees the best possible outcome given the worst possible scenario. In this case, the worst possible scenario for each suspect is that the other chooses to confess. Each suspect can avoid the worst possible outcome of receiving a harsh 5 years in prison sentence only by choosing to confess. For each suspect, the secure strategy is to confess, thereby becoming a prisoner, because neither could solve the riddle posed by the Prisoner's Dilemma. Though the Prisoner's Dilemma is posed within the scope of a bargaining problem between two suspects, it has obvious practical applications in business.

Competitors like Coca-Cola and Pepsi-Cola confront similar bargaining problems on a regular basis. Suppose each has to decide whether or not to offer a special discount to a large grocery store retailer.

Table shows that if neither offers discount pricing, a weekly profit of $12,500 will be earned by Coca-Cola, and $9,000 per week will be earned by its smaller competitor, Pepsi- Cola. This is the best possible scenario for both. However, if Coca-Cola is the only one to offer a discount, it will earn $10,000 per week, while Pepsi-Cola profits fall to $1,000 per week. If Pepsi-Cola offers a discount and Coca-Cola continues to charge the regular price, Pepsi-Cola profits will total $6,500 per week while Coca-Cola weekly profits fall to $1,500. The only secure means Coca-Cola has for avoiding the possibility of a meager $1,500 per week profit is to grant a discount price to the retailer, thereby assuring itself of a weekly profit of at least $4,000. Similarly, the only means Pepsi-Cola has of avoiding the possibility of meager profits of $1,000 per week is to also grant a discount price to the grocery retailer, thereby assuring itself of at least $2,000 in weekly profits. For both Coca-Cola and Pepsi-Cola, the only secure strategy is to offer discount prices, thereby assuring consumers of bargain prices and themselves of modest profits of $4,000 and $2,000 per week, respectively.

The Prisoner's Dilemma Payoff Matrix

Nash Equilibrium

In Table, each firm's secure strategy is to offer a discount price regardless of the other firm's actions. The outcome is that both firms offer discount prices and earn relatively modest profits. This outcome is also called a Nash equilibrium because, given the strategy of its competitor, neither firm can improve its own payoff by unilaterally changing its own strategy. In the case of Coca-Cola, given that Pepsi-Cola has chosen a discount pricing strategy, it too would decide to offer discount prices. When Pepsi-Cola offers discount prices, Coca-Cola can earn profits of $4,000 rather than $1,500 per week by also offering a discount. Similarly, when Coca-Cola offers discount prices, Pepsi-Cola can earn maximum profits of $2,000 per week, versus $1,000 per week, by also offering a discount.

Clearly, profits are less than if they colluded and both charged regular prices. As seen in Table, Coca-Cola would earn $12,500 per week and Pepsi-Cola would earn $9,000 per week if both charged regular prices. This is a business manifestation of the Prisoner's Dilemma because the dual discount pricing Nash equilibrium is inferior from the firms' viewpoint to a

collusive outcome where both competitors agree to charge regular prices. Of course, if firms collude and agree to charge high prices, consumers are made worse off.

Nash Bargaining

A Nash bargaining game is another application of the simultaneous-move, one-shot game. In Nash bargaining, two competitors or players "bargain" over some item of value. In a simultaneous-move, one-shot game, the players have only one chance to reach an agreement. For example, suppose the board of directors specifies a $1 million profit-sharing pool provided that both management and workers can come to agreement concerning how such profits are to be distributed. For simplicity, assume that this pool can only be distributed in amounts of $0, $500,000, and $1 million. If the sum of the amounts requested by each party totals more than $1 million, neither party receives anything. If the sum of the amounts requested by each party totals no more than $1 million, each party receives the amount requested. Table shows the nine possible outcomes from such a profit-sharing bargaining game. If the workers request $1 million, the only way that they would get any money at all is if management requests nothing. Similarly, if management requests $1 million, the only way they get money is if workers request nothing. If either party requests nothing, Nash equilibrium solutions are achieved when the other party requests the full $1 million. Thus, the ($1 million, $0) and ($0, $1 million) solutions are both Nash equilibriums. However, suppose the workers request $500,000; then the Nash equilibrium response from management would be to also request $500,000. If management requests $500,000, then the Nash equilibrium response from workers would be to also request $500,000. Thus, the ($500,000, $500,000) payoff is also a Nash equilibrium. This game involves three Nash equilibriums out of nine possible solutions. In each Nash equilibrium, the entire profit-sharing pool is paid out. In the six remaining outcomes, some of the profit-sharing pool would not be distributed. Such suboptimal outcomes can and do occur in real-life situations.

A Hypothetical Prisoner's Dilemma Faced by Coca-Cola and Pepsi-Cola

Hypothetical Prisoner's Dilemma Faced by Coca-Cola and Pepsi-Cola

However, in contemplating the bargaining process, workers are apt to note that a request for $0 is dominated by asking for either $500,000 or $1 million. If you do not ask for anything, you are sure of getting nothing. Similarly, management will never do worse, and may do better, if it asks for something. As a result, the $0 request strategy is dominated for both parties and will tend not to be followed. In addition, a request for the entire $1 million by either party will not be successful unless the other party requests nothing. Because a $0 request by either party is not likely, neither party is likely to request the full $1 million. In this case, the logical and rational request from each party is $500,000, or an equal 50/50 sharing of the profit pool.

Repeat Games

The study of one-shot pricing and product quality games might lead one to conclude that even tacit collusion is impossible. This is not true because competitors often interact on a continuous basis. In such circumstances, firms are said to be involved in repeat games.

When a competitive game is repeated over and over, firms receive sequential payoffs that shape current and future strategies. For example, in Table, both Coca-Cola and Pepsi-Cola might tacitly or secretly agree to charge regular prices so long as the other party continues to do so. If neither firm cheats on such a collusive agreement, discounts will never be offered, and maximum profits will be earned. Although there is an obvious risk involved with charging regular prices, there is also an obvious cost if either or both firms offer discount pricing. If each firm is convinced that the other will maintain regular prices, both will enjoy high profits. This resolve is increased if each firm is convinced that the other will quickly match any discount pricing strategy. In fact, it is rational for colluding firms to quickly and severely punish colluding competitors who “cheat” by lowering prices.

However, although it is important to recognize that the repeat nature of competitor interactions can sometimes harm consumers, it is equally important to recognize that repetitive interactions in the marketplace provide necessary incentives for firms to produce high-quality goods. In any one-shot game, it would pay firms with high-quality reputations to produce low-cost or shoddy goods. In the real world, the ongoing interaction between firms and their customers provides incentives for firms to maintain product consistency. For example, both Coca-Cola and Pepsi-Cola have well-deserved reputations for providing uniformly highquality soft drinks. They have both invested millions of dollars in product development and quality control to ensure that consumers can depend upon the taste, smell, and feel of Coca- Cola and Pepsi-Cola products. Moreover, because the value of millions of dollars spent on brand-name advertising would be lost if product quality were to deteriorate, that brandname advertising is itself a type of quality assurance provided to customers of Coca-Cola and Pepsi-Cola. At Wal-Mart, Satisfaction Guaranteed, or your money back, is more than just a slogan. It is their business; it is what separates Wal-Mart from fly-by-night operators or low-quality discount stores. Similarly, customers of DaimlerChrysler depend upon that company’s welldeserved reputation for producing high-quality cars, trucks, and minivans. Like any written guarantee or insurance policy, repeat transactions in the marketplace give consumers confidence that they will get what they pay for.