BACHELOR OF ARTS EXAMINATION, 2025

3rd Year, 2nd Semester

DEPARTMENT OF ECONOMICS

Subject Code : ARTS/ECO/B/DSE/6.1/3

TOPICS IN MICROECONOMICS - II

Time : Two Hours **Full Marks : 30**

Attempt question no. 1 and any one from the rest:

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(1). (a). Three students are arguing over a cake in a game theory class. The teacher, in a bid to teach them some game theory, decides the following bargaining scheme. Student 1 must propose a division (for three of them) of the cake. If Student 2 and 3 agree, then the proposed division is implemented. Otherwise, the teacher eats p proportion of the cake and gets Student 1 out of the class. Next, Student 2 must propose a division (for Student 2 and Student 3) of the remaining cake. If Student 3 agrees, then the [roposal is implemented. Otherwise, the teacher eats q proportion of the (remaining) cake and gives the rest to Student 3 who eats it.

Assume that the students always agree when they are indifferent and there is no discounting.

(i) Find the Subgame Perfect **proposal** by Student 1 for arbitrary values of p and q?

(ii) State the subgame perfect **outcome** for arbitrary values of p and q?

(iii) What will be the subgame perfect outcome of this game when $p = q = \frac{1}{2}$?

(iv) When can Student-1 keep (almost) the entire cake for her?

(6+1+1+1)

(b) Consider a simultaneous move game with two players, Player 1 and Player 2. Each player has two actions A and B. If both chooses A then player 1 and player 2 respectively gets $1 + e$ and 1 where $e > 0$. If both chooses B then player 1 and player 2 respectively gets 1 and $1 + e$. If Player 1 chooses A and Player 2 chooses B then each player gets nothing. Similarly, if Player 2 chooses A and Player 1 chooses B then also each player gets nothing. If optimal mixed strategy solution of the game is that player 1 plays A with probability p and player 2 plays A with probability q such that $0 < p, q < 1$ then how does $(1 - q)$ behave with changes in e? (6)

(2). (a). Consider a first-price, sealed-bid auction in which bidders simultaneously submit sealed bids with the object going to the highest bidder at a price equal to the highest bid. Suppose that there are two bidders 1 and 2 and that their values for the object are chosen independently from a uniform distribution over [0, 2]. Think of a player's type as being the value that the player places on the object. Player i's payoff is $v - b_i$ when she wins the object by bidding b_i when her value is v, given $i = 1, 2$. Her payoff is 0 if she does not win the object. In case of a tie, player-1 gets the good.

Let $b_i(v)$ denote the bid made by player i of type v. Restrict yourself to linear $b_i(v)$. Find out the optimal bidding function. (9)

(b). An incomplete information game can be viewed as a game of imperfect information- Explain true, false or uncertain. (6)

(3). (a). Consider a Cournot duopoly model with linear inverse demand given by $p = 1 - q_1 - q_2$ where q_i is the output of firm i = 1, 2. Firm 1's cost function is given by $C(q_1) = \frac{1}{2} q_1$ and this is known to both the firms. But firm 2's cost function is known only to firm 2 and firm 1 has the following belief on firm 1's cost function:

$$C(q_2) = \frac{7}{10} q_2 \quad \text{with Prob } 1/2$$
$$= \frac{3}{10} q_2 \quad \text{with Prob } 1/2$$

In other words firm-2 has two possible types, high cost type with probability $1/2$ and low cost type with probability $1/2$. This belief is common knowledge. Assume that both the firms choose quantities simultaneously.

Compute the Cournot equilibrium under incomplete information and also try to provide intuitions to your results. (9)

(b). Explain the following concepts:

(i). Hidden Action (ii). Hidden Information. (3+3)

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