

Indian Institute of Technology, Guwahati
End Semester Examination.
Industrial Organization HS 214

Full Marks: 45.
Time: Three hours.

All the questions are compulsory.

1. Find the Nash equilibria and Subgame Perfect Nash equilibrium of the following extensive game. Explain (5)

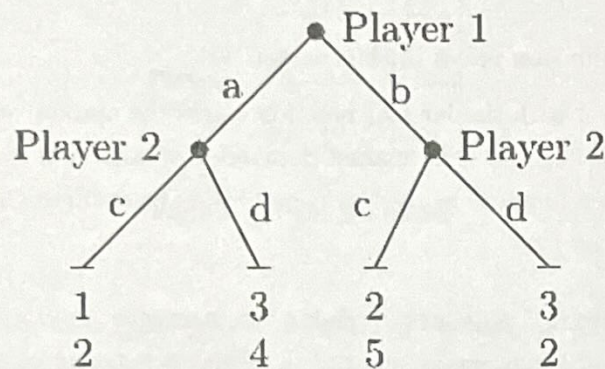


Figure 1: Game Tree

2. Suppose three firms are producing a homogeneous good and competing in terms of quantity of output. The market demand function is $100 - 2p = Q$, where p is the price and Q is market demand. The cost function of firm i is $c(q_i) = 2q_i$, $i = 1, 2, 3$. The firms are similar in terms of cost function. Find the Cournot output of each firm. (4)
3. Suppose there are two firms producing a homogeneous good and competing in price. The market demand function is $50 - 3p = Q$ where p is the price and Q is market demand. The cost function of firm i is $c(q_i) = 3q_i$, $i = 1, 2$. The firms are similar in terms of cost function. If the firms set same price, the market demand is shared equally. The buyers buy from the firm setting the lowest price. What is the equilibrium price in this market when the firms choose their price simultaneously? (4)
4. Suppose there are three firms 1, 2 and 3 producing a homogeneous good and competing in terms of quantity of output. The market demand function is $60 - p = Q$ where p is the price and Q is market demand. The cost function of firm i is $c(q_i) = q_i^2$, $i = 1, 2, 3$.

Suppose Firm 1 and Firm 2 choose their quantity in stage I and Firm 3 observes the quantity of firm 1 and 2 and produces output in stage II. What is the Subgame Perfect Nash equilibrium of this two stage game? (4)

5. Suppose there are two firms producing a homogeneous good and competing in price. The market demand function is $40 - p = Q$ where p is the price and Q is market demand. The cost function of firm i is $c(q_i) = 2q_i + q_i^2$, $i = 1, 2$. The firms are similar in terms of cost. The firms have to meet the market demand at the price it has set. If the firms set same price, the market demand is shared equally. The buyers buy from the firm setting the lowest price. The firms set prices simultaneously

(a) Find the Nash equilibrium prices in this market. (4)

(b) Suppose another firm with similar cost function enters the market, so three firms are setting price simultaneously. The market demand is shared equally if the firms set the same price. What happens to the Nash equilibrium prices derived in part a) when there are three firms? (4)

6. Suppose there are two firms 1 and 2 producing a homogeneous good and competing in prices. The market demand function is $20 - 2p = Q$ where p is the price and Q is market demand. Suppose the capacity of Firm 1 is 4 and Firm 2 is 7. The firms cannot produce more than their capacity. The cost for producing upto the capacity is zero for each firm. If the firms set same price, the market demand is shared proportionately to their capacity. The firms do efficient rationing if it cannot meet the demand at any price. The buyers buy from the firm setting the lowest price. What is the equilibrium price in this market when the firms choose their price simultaneously? (5)

7. Consider the normal form game given in Figure 2, it is played between two players and repeated two times. Device a strategy such that a Pareto superior outcome relative to Nash equilibrium outcomes is chosen in at least one period. Show that such a strategy is a Nash equilibrium and also Subgame Perfect Nash equilibrium of this repeated game. (5)

8. Consider the normal form game given in Figure 3. It is played between two players and repeated for infinite periods. The discount rate of each player is same given by δ and $0 < \delta < 1$. Find the conditions on the discount rate such that Pareto superior Nash outcome is played in each period. Show that it is a Nash equilibrium and also a Subgame Perfect Nash equilibrium of this repeated game. (5)

		Player 2		
		T_1	T_2	T_3
Player 1	S_1	2, 2	6, 0	1, 1
	S_2	0, 6	5, 5	0, 3
	S_3	1, 1	2, 0	4, 4

Figure 2: Pay-off matrix

		Player 2	
		T_1	T_2
Player 1	S_1	1, 1	2, 0
	S_2	0, 2	3, 3

Figure 3: Pay-off matrix

9. Consider the normal form game given in Figure 4. It is played between two players and repeated for infinite periods. The discount rate of each player is same given by δ and $0 < \delta < 1$. In this normal form game $\{S_1, T_1\}$ is a unique Nash equilibrium outcome. Is it possible to have a set of conditions on the values of x such that $\{S_2, T_2\}$ set of actions is played in each period repeatedly (Nash Equilibrium and Subgame Perfect Nash equilibrium of this repeated game) for all values of δ ? Explain (5)

		Player 2	
		T_1	T_2
Player 1	S_1	2, 2	4, 0
	S_2	0, 4	x, x

Figure 4: Pay-off matrix