MICROECONOMICS COMPREHENSIVE EXAMINATION
COURSE CODE: ECON F242
SEMESTER II 2022-2023

Time: 10.00 AM-1.00 PM **TOTAL MARKS: 35**

Attempt all questions in serial order (*Paper is printed on both sides*)

1. Consider a Cournot duopoly model with inverse demand given by, P=a-Q, where $Q=q_1+q_2$ is the aggregate quantity. Firm 1's cost function is $C_1(q_1)=cq_1$. Firm 2's cost function is $C_2(q_2)=c_H\, q_2$ with probability 0.5 and $C_2(q_2)=c_L\, q_2$ with probability 0.5, where $c_L<c_H$. Furthermore, information is asymmetric: firm 2 knows its cost function and firm 1's, but firm 1 knows its own cost function and only that firm 2's marginal cost is c_H with probability 0.5 and c_L with probability 0.5. All of this is common knowledge.

i) Find the best response functions. (**working required**) (6)

ii) Find the pure strategy Bayes-Nash equilibrium to this game. (**working required**)

2. Consider an industry where there are two firms, a large firm, Firm 1, and a small firm, Firm 2. The two firms produce identical products. Let x be the output of Firm 1 and y the output of Firm 2. Industry output is $Q=x+y$. The price P at which each unit of output can be sold is determined by the inverse demand function $P=130-10Q$. For each firm the cost of producing q units of output is $C(q)=10q+62.5$. Each firm is only interested in its own profits. The profit of Firm 1 depends on both x and y and is given by $\pi_1(x,y)=x[130-10(x+y)]-(10x+62.5)$, and similarly the profit function of Firm 2 is given by $\pi_2(x,y)=y[130-10(x+y)]-(10y+62.5)$. The two firms play the following sequential game. First Firm 1 chooses its own output x and commits to it; then Firm 2, after having observed Firm 1's output, chooses its own output y; then the price is determined according to the demand function and the two firms collect their own profits. In what follows assume, for simplicity, that x can only be 6 or 6.5 units and y can only be 2.5 or 3 units.

i) Represent this situation as an extensive game with perfect information clearly writing the strategies and payoffs at the terminal nodes. (6)

ii) Solve the game using backward induction.

3. Consider a Cournot industry composed of 3 firms, facing a demand Q=150-P. Initially, the three firms are identical and have the same marginal cost of Rs. 30. i) **Calculate the equilibrium quantities and equilibrium price?** Suppose that firm 1 and firm 2 decide to merge, and that, as a result, the merged firm will realize a savings in its variable cost (in other words, post-merger marginal cost would be equal to c < 30). ii) **Calculate the post-merger equilibrium quantity of the merged firm and the non-merged firm and compute the corresponding price and profits? iii) Calculate the new marginal cost in order for the merger to be profitable?** **(6)**

4a) Consider the following game: (3)

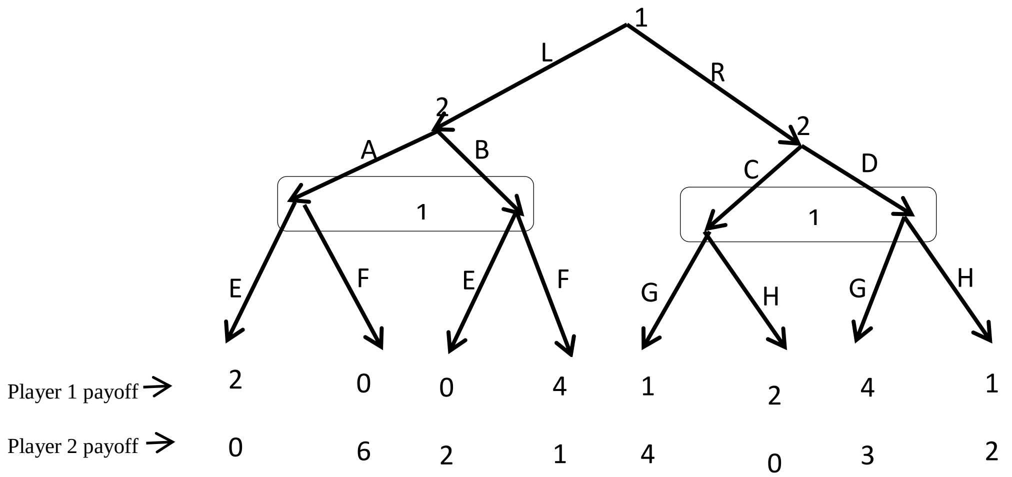
		Player 2	
		C	D
Player 1	A	**x,y**	3,0
	B	6,2	0,4

i)Suppose that x = 2 and y = 2. Find the mixed-strategy Nash equilibrium and calculate the payoffs of both players at the Nash equilibrium.

ii)For what values of x and y is $\left[\left(\frac{1}{5},\frac{4}{5}\right);\left(\frac{3}{4},\frac{1}{4}\right)\right]$ a mixed strategy Nash equilibrium.

4b) Explain the Bertrand Paradox in the context of a simultaneous one shot game in which firms compete in prices. (3)

5a) Consider the extensive-form game shown below. Draw the reduced game with the payoffs after solving for the proper subgames. Write the subgame-perfect Nash equilibrium. (3)



5b) The cournot model assumed that the firms acted independently. Suppose instead the two firms collude to set production quantities. Find the optimal production quantity and profit for each firm assuming the unit costs are the same for both firms, $c_1=c_2=c$. Does the solution exhibit a stable Nash equilibrium. Verify by setting up a numerical example. (3)

6a) Antonio and Bob cannot decide where to go to dinner. Antonio proposes the following procedure: she will write on a piece of paper either the number 2 or the number 4 or the number 6, while Bob will write on his piece of paper either the number 1 or 3 or 5. They will write their numbers secretly and independently. They then will show each other what they wrote and choose a restaurant according to the following rule: if the sum of the two numbers is 5 or less, they will go to a Mexican restaurant, if the sum is 7 they will go to an Italian restaurant and if the number is 9 or more they will go to a Japanese restaurant.

Let Antonio be player 1 (row player) and Bob player 2 (column player). Suppose that Antonio and Bob have the following preferences (where M stands for 'Mexican', I for 'Italian' and J for 'Japanese'):

For Antonio: M >I > J ; For Bob: I > M >J. Use utility function with values 1,2 and 3 [that is, if 'M' is the outcome Antonio has a payoff/utility of 3, whereas Bob has a utility of 2 and so on..] (2)

- **i) Determine, for each player, whether the player has strictly dominated strategies.**
- **ii) Determine, for each player, whether the player has weakly dominated strategies.**

6b) Under the state contingent preference theory in the insurance market assuming risk averse behavior of individuals, the fair premium is less than the risk premium. True/False. Give the well labelled diagrammatic representation to prove your claim. (3)