Strategic Behavior

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Sample Final Exam

Total points: 40

Time: 120 minutes.

This exam consists of three compulsory questions. The answers should be written clearly and legibly in the space provided next to the question. The process by which an answer is derived must be clearly indicated. Good luck.

NAME:

STUDENT-ID:

1. Consider the following signaling game with one sender and one receiver, two possible types of the sender, two possible messages for the sender and two possible actions for the receiver. Derive a separating perfect Bayesian equilibrium for the above game.

[10 points]

2. Consider the following normal form game with two players:

$1 \downarrow 2 \rightarrow$	L	R
U	$10, 10$	$0, 20$
D	$20, 0$	$0, 0$

(a) Derive the unique Nash equilibrium of this one-shot game.

(b) What is (are) the subgame perfect outcome(s) if this game is repeated T times where T is finite? Explain why.

[In the repeated game, each player's payoff is the discounted sum of one period payoff over T periods.]

[5+5=10 points.]

(c) Now, consider an infinitely repeated version of this game. Under what condition is there a subgame perfect equilibrium where the players play (U, L) every period on the equilibrium path? Describe the equilibrium strategies and show that they constitute a subgame perfect Nash Equilibrium.

[In the repeated game, each player's payoff is the discounted sum of one period payoff over infinite horizon.]

[10 points]

3. Consider the following symmetric static Cournot duopoly game of two-sided incomplete formation. Two firms sell in a homogenous good market where the inverse demand is given by

$$P(Q) = 1 - Q$$

where Q is the aggregate output of the two firms. Both firms produce at constant unit cost. The unit cost of each firm is private information - known only to the firm but not to the other firm. It is however common knowledge that the unit cost of each firm is c_H with probability $\frac{1}{2}$ and c_L with probability $\frac{1}{2}$ where

$$0 \leq c_L < c_H < 1.$$

The two firms simultaneously choose their output. Derive a symmetric Bayes Nash equilibrium of this game.

[10 points]

[Hint: Let (q_1^H, q_1^L) denote the strategy of firm 1 i.e., its output when it is of type H and of type L respectively. Likewise, (q_2^H, q_2^L) denote the strategy of firm 2. Derive the reaction function of firm 1 when it is of type H and when it is of type L. Then, use the fact that in a symmetric equilibrium $q_1^H = q_2^H = q^H, q_1^L = q_2^L = q^L$ and solve for (q^H, q^L) from the two equations in two unknowns.]