SHRI RAM COLLEGE OF COMMERCE
University of Delhi
Intermediate Microeconomics – 2
Assignment -1

COURSE: BA (H)Economics
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Session: 2019-2020
Semester -4

1. King Solomon is faced with two women, Elizabeth and Mary, who both claim to be the mother of an infant. King Solomon does not know the true mother. If the true mother gets the child, then she gets a utility of 100. On the other hand, the woman who is not the true mother only gets a utility of 50 if given the child. By not getting the child, both women get zero utility. King Solomon sets up the following game.

   Step 1: He will ask Elizabeth whether the child is hers. If she answers negatively, the child will be given to Mary. If she answers affirmatively, the king will continue to the next step.

   Step 2. He will ask Mary whether the child is hers. If she answers negatively, the child will be given to Elizabeth. If she answers affirmatively, the king will ask Mary to pay 75 and Elizabeth to pay 10 and give the child to Mary. Utility from money is linear, i.e., paying p gives a utility of −p.

   Since King Solomon does not know the true mother, there are two extensive form games possible - denote them as Γ_M (where Mary is the true mother) and Γ_E (where Elizabeth is the true mother). **(a)** Describe Γ_M and Γ_E.
   (b) Argue that there is a unique subgame perfect equilibrium of each of the games where the true mother gets the infant.

2. Agents 1 and 2 plan to arrive at an event. Each of them can arrive at any of the times in $T = \{0, 1, ..., 10\}$. If agent $i \in \{1, 2\}$ arrives at $t_i \in T$ and agent $j \neq i$ arrives at $t_j \in T$, then the payoff of agent i is

$$u_i(t_1, t_2) = \begin{cases} 2 - (t_i - t_j)^2 & \text{if } t_i < t_j \\ -(t_i - t_j)^2 & \text{otherwise} \end{cases}$$

   Describe a strictly dominated strategy.

3. Consider the following 2-player game. For (a), (b), (c) below, we do not consider mixed strategies (i.e., do not consider the mixed extension of this game).

	L	C	R
A	$(1,0)$	$(3,0)$	$(2,1)$
B	$(3,1)$	$(2,1)$	$(1,2)$
C	$(2,1)$	$(1,6)$	$(0,0)$

a) Is there a strategy of player 1 that is strictly dominated? Is there a strategy of player 2 that is never a best response? Is there a strategy of player 2 that is strictly dominated?
b) What outcome is reached of we carry out an iterated elimination of strictly dominated strategies (IESDS) in this game?
c) Describe the minimum rationality assumptions needed to carry out IESDS.

4. Consider the following game-theoretic model of the equilibrium determination of cleanliness (and effort distribution) of two quarantined roommates. In the game, the two roommates simultaneously choose the efforts e_1, e_2 to spend on apartment cleaning. They get utility from the cleanliness of the apartment (which is a function of the sum of efforts) and disutility from the efforts they personally expend.

$$u_1(e_1, e_2) = k \log(e_1 + e_2) - e_1$$
$$u_2(e_1, e_2) = \log(e_1 + e_2) - e_2$$

$e_1, e_2 \geq 0$, $k>1$

(a) Find the two players' best response functions.
(b) Find the pure strategy Nash Equilibrium of the game. How does the equilibrium distribution of the effort reflect the differences in the players' tastes?

5. Players 1 and 2 are bargaining over how to split one rupee. Both players simultaneously name shares they would like to have, s_1 and s_2, where $0 \leq s_1, s_2 \leq 1$. If $s1 + s2 \leq 1$, then the players receive the shares they named; $s1+s2 > 1$, then both players receive zero. What are the pure strategy Nash equilibria of this game?