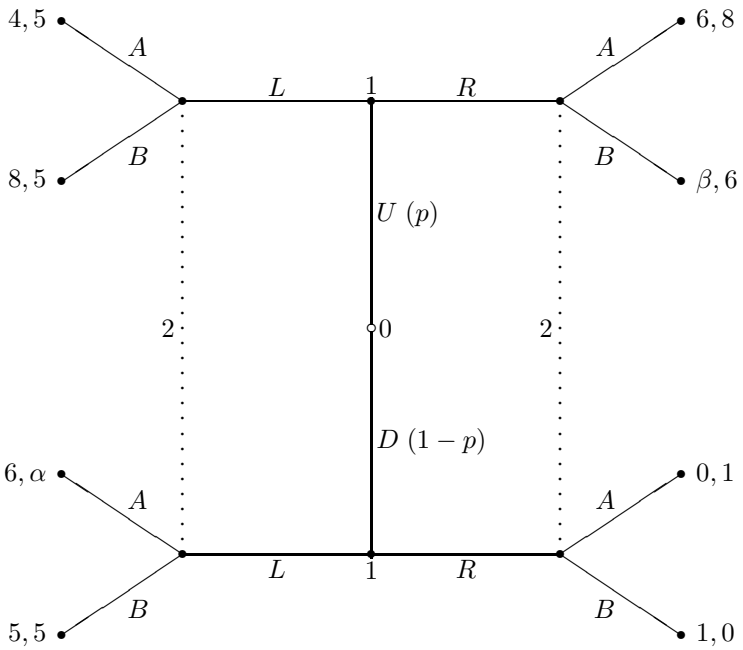
Microeconomic Theory II — Spring 2019

Final Exam — Mikhael Shor

Carefully explain and support your answers.

Question 1. Consider the following game. First, nature (player 0) selects U with probability p, $0 < p < 1$, or D with probability $1-p$. Next, player 1 selects L or R. Lastly, player 2 selects A or B. The game has three parameters: α, β, and p.



(a) Assume $\alpha = \beta = 0, p = \frac{1}{2}$. Derive all pure-strategy perfect Bayesian equilibria.

(b) For what values of the parameters does the above game have a separating equilibrium? Does this separating equilibrium satisfy the intuitive criterion?

(c) For what values of the parameters does the above game have a pooling equilibrium? Explain.

(d) Explain why *neither* of the above two answers (b and c) depends on the value of p. Carefully discuss if this is a general result or specific to this game.

Question 2. Consider a principal-agent model in which the agent has three levels of effort (low, medium, or high) and there are two possible outcomes (associated with revenues for the principal of either 0 or 90). The principal is risk neutral with profit given by revenues minus wages. The agent's utility is given by $u(w, e) = \sqrt{w} - c(e)$. The reservation utility is 0.

The probability of the good outcome (revenues of 90) is given by $\frac{1}{3}$, $\frac{1}{2}$, $\frac{2}{3}$, for low, medium, and high effort, respectively.
The cost of effort, $c(e)$, is 4, $4\frac{4}{5}$, 5, for low, medium, and high effort, respectively. By law, the agent's wage cannot be negative.

1. Assume that the principal can observe the agent's effort. What is the principal's optimal (profit maximizing) contract? Demonstrate or explain.

2. Assume that the principal cannot observe the agent's effort and the contract can depend only on realized revenue. What is the principal's optimal (profit maximizing) contract? Demonstrate or explain.

Question 3. The world's diamonds are controlled by two cartels, De Beers and ALROSA. Each year, at the annual diamond wholesaler convention, both cartels announce their mining targets for the year–the quantity of diamonds that they commit to mining–and the wholesalers commit to a wholesale price, w, as a function of these commitments.

This year, the convention has two time slots available for announcements: Tuesday at noon and Wednesday at noon. Both cartels can choose the same time slot (and announce in different rooms) or different time slots.

The timing of the game is as follows:

1. Both De Beers and ALROSA, $i \in \{D, A\}$, simultaneously select whether to announce on Tuesday or on Wednesday, $a_i \in \{T, W\}$. Then, the conference program is published and made publicly available.

2. Firms that chose to announce on Tuesday (if any) announce $m_i \in \Re$, the annual mining target. The minutes of Tuesday's meeting (including all announced mining targets) are published and made publicly available.

3. Firms that chose to announce on Wednesday (if any) announce m_i.

4. The diamond wholesalers announce a wholesale price given by $w = 1 - m_A - m_D$

5. De Beers and ALROSA realize profits of $\Pi_i = w\, m_i$

Determine the pure strategy subgame perfect equilibria.