Exam 3220-4220 Fall 2022

Problem 1 (Microeconomic Theory)

Part A Consumer Theory

Weight 25%

A central result in consumer theory is that the marginal rate of substitution between two goods *i* and *j* equals their relative price:

$$MRS_{ij} = \frac{p_i}{p_j}.$$

Explain the assumptions on preferences, prices and goods underlying this result, how the result may be derived and how it may be interpreted in economic terms.

Part B General Equilibrium

Weight 25%

Consider an exchange economy with a given number of consumers and goods. Explain how such an economy may be represented and how equilibrium may be characterised. Discuss the economic interpretation of equilibrium conditions.

Problem 2 (Game theory and the economics of information)

Part A: Rationalizable strategies and mixed-strategy Nash equilibrium

Weight: 18% *(with equal weight* = 9% *on each subproblem)*

Consider the following normal form game.

	L	C	R
U	3, 1	5, 0	2, 3
M	2, 2	1, 4	6, 1
D	5, 0	2, 1	3, 1

(a) Show that U and M are rationalizable for player 1, and C and R are rationalizable for player 2.

(b) The game has a unique Nash equilibrium, in mixed strategies. Find the mixed strategies that the players use in this Nash equilibrium.

Part B: Auction under incomplete information

Weight: 12%

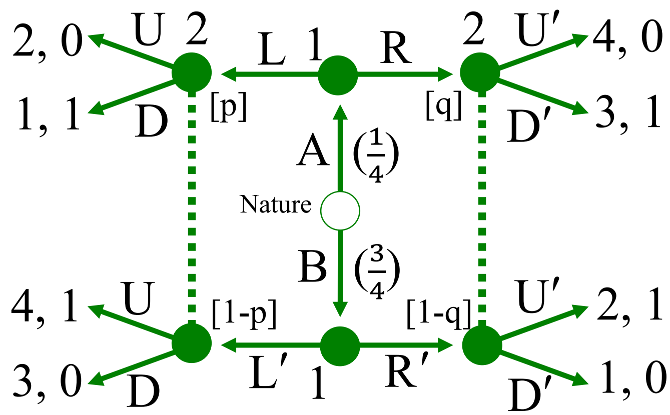
Consider a private value first-price sealed-bid auction with two bidders who both are risk-neutral, have valuations that are identically and independently distributed on the interval $[0, 1]$ and can submit bids in the interval $[0, 1]$. In a private value first-price sealed-bid auction the bidders are first informed of their valuations, they then submit their bids, the item is assigned to the bidder with the highest bid (and with equal probability to each if the two bids are equal), and the winner pays the highest bid (i.e., his own bid). The utility of the winner equals his/her valuation minus the payment, while the other bidder has zero utility.

Explain why bidders bid lower than their valuation. Use the expression in Jehle and Reny Theorem 9.1 to argue that bidders in a symmetric equilibrium bid the expected valuation of the other bidder conditional on winning. What does this imply in the case where valuations are uniformly distributed? Why does this result indicate that revenues for the seller is the same as in the second-price sealed-bid auction, where the item is assigned to the bidder with the highest bid (and with equal probability to each if the two bids are equal), and the winner pays the second highest bid.

Part C: Perfect Bayesian equilibrium

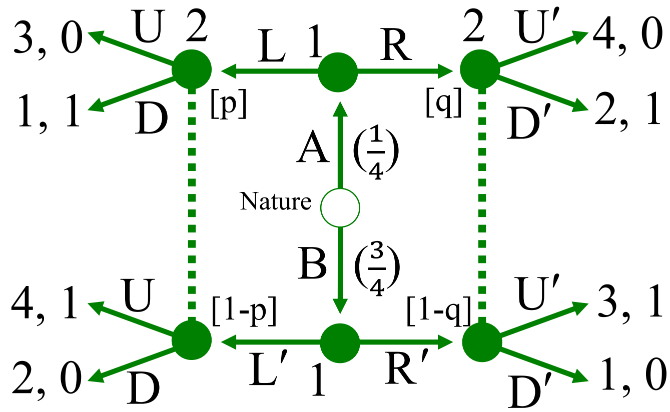
Weight: 20% *(with equal weight* = 10% *on each subproblem)*

(a) Consider the following extensive form game, where the first number is the payoff of player 1 and the second number is the payoff of player 2. Notice that the probability that player 1 is of type A is $\frac{1}{4}$, and the probability that player 1 is of type B is $\frac{3}{4}$.



Show that this game has a separating Perfect Bayesian equilibrium. Does the game has any other Perfect Bayesian equilibrium?

(b) Consider the following variant of the extensive form game under (a), where the payoff of player 1 has been changed somewhat, but where the game otherwise is unchanged.



Show that this game has a pooling Perfect Bayesian equilibrium. Does the game has any other Perfect Bayesian equilibrium?