

Intelligent Agents

Paper Exercise: Mechanism Design and Auctions Ungraded

Question 1: in eBay, often a single seller several identical items of the same kind (such as iphones) in auctions that attract different bidders and end at different times. This makes it difficult for bidders because they have to choose which auction to bid in. Is this an advantage or a disadvantage for the seller? Assuming rational buyers with independent valuations, would it be better for a seller to sell all the items in a single multi-unit auction?

Question 2: Consider a double auction for the same identical item, with the following valuations:

Sell	4	7	9	14	10	8	13	16	11
Buy	14	12	15	8	10	5	9	17	14

Determine the clearing price! Is any of the agents better off by giving a non-truthful price?

Could you imagine a better matching of buy and sell offers that would allow more trades to take place? Could it be possible to satisfy every buyer? How could one make this work as an auction mechanism?

Question 3: Suppose there is a seller who wishes to sell two items, Item A and Item B. There are three bidders. B1 is interested in Item A and has value 1. B2 is interested in Item B and has value 1. B3 is interested in both the items but not individual item. She values bundle to be 1.25. If the auctioneer uses a VCG mechanism, what is allocation of these objects? How much does each bidder pay? Does the auctioneer have an incentive to collude with any of the bidder?

Question 4: The Smiths (father Bob, mother Alice and teenager Chris) need to decide where to spend their summer vacation. The two options they have are to go to the mountains (M) or to the seaside (S), and their individual preferences for the two locations are expressed as "utilities" described in Figure 1. The Smiths decide to use a VCG tax mechanism in order to give them the incentives to truthfully reveal their preferences. Compute the taxes that will be paid by A, B and C. Explain your answer.

	M	S
A	-1	10
B	5	-2
C	5	4

Figure 1. Individual utilities each person obtains in case that the family spends the summer vacation in the mountains or at the seaside. If Alicia, Bob and Chris truthfully reveal their preferences (i.e. utilities), the Smiths will go to the seaside, as $(10+4-2) > (5+5-1)$.

Question 5: What can be done with the tax they paid?

Question 6: How could B and C collude to force a Mountain outcome, yet pay no VCG taxes? What does this say about the resistance of the VCG mechanism to collusion and coalitions?

Question 7: A group of students want to organize a block party. Depending on the size of the party, each of them has to work l hours, and will get a satisfaction $p(l)$ from the party. They have to agree on the size, and thus on the hours they are willing to work.
What shape can be attributed to each individual utility function $u(l)$? Can you design an incentive-compatible mechanism for this problem? What additional constraints would have to be considered to ensure that each agent will indeed participate in the group activity?

Question 8: What are the Nash equilibrium strategies in an English auction?