Algorithmic Game Theory

Spring 2014

Assignment 1

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Due date: **Feb 27, 2014**

*Please write your solutions in the free space after problem statements. Hand in the hard copy of your solutions in **Feb 27, 2014** session.*

1. Find all Nash equilibria and correlated equilibria of the following game. Explain why there is no other Nash equilibria or correlated equilibria.

	A	B	C
A	2,2	3,1	2,3
B	1,3	1,1	-1,4
C	3,2	2,-1	1,3

2. In number-distance game each player selects a number from set {-1,0,2}. The utility of the first player is |A-B| and the utility of the second player is A-|A-B|, where A is the number that first player selects and B is the number that the second player selects. Present a Nash equilibrium of the number-distance game.

3. Is there any game with at least 2 correlated equilibria s.t. in one of them both of the players make more profits?

4. Consider a first price auction with three players. Assume that the value of the good for each player is drawn uniformly at random from [0,1], and this is a common knowledge of the players know this fact. What is the best bid for each player?

5. Consider an English auction and assume that the owner can pretends to be one of the bidders and places bids on the item. If the owner wins, she do not pay anything and the item remains her property. There is K bidder (other than the owner) and the value of the good for each bidder is drawn uniformly at random from [0,d]. Also the value of the good for the owner is v. The auction increases by e which is vanishingly small compare to d. What is the owner's optimal bidding strategy?

6. Find a Minmax strategy and a Maxmin strategy of the first player in the following game.

	A	B
A	0,0	0.2,1
B	1,0.5	-20,-10

7. Find all Minmax strategies and Maxmin strategies of the first player in the Rock-Paper-Scissors game mentioned in the class.

8. Recall that a game G is ***simple*** if for every coalition S, either $v(S) = 1$ or $v(S) = 0$ and in addition $v(N) = 1$, where N is the grand coalition. A player i is a **veto player** if $v(S) = 0$ for any $S \subseteq N - \{i\}$.

Part A) Prove that in a simple game, the core is empty if there is no veto player.

Part B) Prove that in a simple game in which there are veto players, the core is exactly the set all payoff vectors in which non-veto players get 0.