Nash Equlibria

Homework #3

Submitted by: Denes Csala

A.

1. In this pure coordination game, both of the joint actions are Nash equilibria: (a,c) and (b,d). In both cases, neither player can benefit by unilaterally changing its strategy, as this would yield a payoff of 0, instead of either 2 or 1.

   However, if both of the players play the first choice (a, c) with p = q = 1/3, there will no incentive for either of them to shift away from this strategy. Likewise, this is also a Nash equilibrium, a mixed one: ($a_{p = 1/3}$, $b_{p = 2/3}$; $c_{q = 1/3}$, $d_{q = 2/3}$)

2. As we have shown in HW2, the maximin strategy for both players of this game is (a, c) with p = q = 1/3. In The payoff of the maximin strategy for both players (symmetric game) is 2/3. The Nash equilibrium values are higher for both cases. The maximin strategy is a mixed Nash equilibrium in this case.
3. In this game, there are two pure Nash equilibra. However, the (a,b) strategy Pareto dominates the other, as the combined value of the payoffs is higher, so there is no incentive to deviate from this strategy.
4. As the row player, I would play the *a* strategy. If the other player has done his analysis and plays as rationally expected to maximize his/her profit, this leads to the Pareto optimal solution. Similarly, as the column player, I would play *c*.

B.

1. In this assurance game, there are two pure strategy Nash equilibria. (a,a) has the highest payoffs of the game, for both players simultaneously, so there is no incentive to deviate from that strategy for either of the players. They both are playing their best response strategies simultaneously. This is also true for the (b,b) case, which is the other pure strategy Nash equilibrium.

   There is no mixed strategy equilibrium for this game.

2. As we have shown in HW2, the maximin strategy for both players of this game is (b, b) with p = q = 1. In The payoff of the maximin strategy for both players (symmetric game) is 2. The maximin strategy in this case is one of the Nash equilibriums, namely the one that yields the smaller payoff.
3. The (a,a) strategy is a by default a Pareto optimal solution as there is no possibility for either of the players to play a strategy with higher payoff.
4. As the row player, I would play the *a* strategy. If the other player has done his analysis and plays as rationally expected to maximize his/her profit, this leads to the Pareto optimal solution. Similarly, as the column player, I would also play *a*.