Assignment 4

Note: Throughout the assignment we assume that the row player in a zero sum game is a maximizer. For non-zero sum games both the players maximizes their payoff.

1. Ram and Krishna are participants in a television game show, seated in separate booths with no possibility of communicating with each other. Each of them is asked to submit, in a sealed envelope, one of the following two requests(requests that are guaranteed to be honoured):

   - Give me Rs 1000.
   - Give the other participant Rs 4000.

   This can be written as a game. How much will each participant get in equilibrium?

   Solution: 1000.

2. Which of the following statements are true?(Choose the correct options if there are multiple)

   1. For a zero sum game, a saddle point equilibrium is same as Nash equilibrium.
   2. In a symmetric zero sum game the value of the game is 0 and the optimal strategy of the row player is also the optimal strategy for column player.
   3. In prisoner's dilemma game there are only two Nash equilibria.
   4. The game of Rock-paper-scissor has a unique saddle point equilibrium in pure strategies.

   Solution: Correct options are: (1) and (2)

3. How many Nash equilibrium are there in the following game?

	L	C	R
T	1,2	2,1	1,0
M	2,1	0,1	0,0
B	0,1	0,0	1,2

   Solution: 2

4. Suppose there is a strictly dominated strategy in a game. What weight(probability) will it have in a mixed strategy Nash profile?

Solution: 0

5. Suppose there are two strategies of a player in a game which do not dominate each other. In Nash equilibrium, will the expected payoffs corresponding to these two pure strategies be same? Choose the correct option.

   1. Yes
   2. No

Solution: (1)

6. Consider the following game,

	Opera	Football
Opera	75,75	25,60
Football	60,25	60,60

   How many pure Nash equilibrium are there?

Solution: 2

7. In the above game, the expected utility obtained playing the mixed strategy Nash equilibrium is _____.

Solution: 60

8. Consider the following zero-sum game:

$$A = \begin{pmatrix} 10 & 13 & 8 & 5 \\ 9 & 7 & 11 & 8 \\ 7 & 9 & 7 & 6 \\ 6 & 8 & 8 & 5 \end{pmatrix}$$

   Let p and q be the mixed strategy profiles of the row player and the column player respectively. Which of the following pair of strategy profiles is a Nash equilibrium?

   1. $p = (\frac{1}{9}, \frac{8}{9}, 0, 0)$ and $q = (0, \frac{1}{3}, 0, \frac{2}{3})$
   2. $p = (\frac{1}{9}, 0, \frac{8}{9}, 0)$ and $q = (\frac{1}{3}, 0, \frac{2}{3}, 0)$
   3. $p = (\frac{8}{9}, \frac{1}{9}, 0, 0)$ and $q = (0, \frac{2}{3}, 0, \frac{1}{3})$
   4. $p = (\frac{8}{9}, 0, \frac{1}{9}, 0)$ and $q = (\frac{2}{3}, \frac{1}{3}, 0, 0)$

Solution: (1)

9. In the above game the value of the game is _____.

Solution: 0.6

10. Let there are two competing candidates trying to win an election. The candidates must choose their positions on the line segment [0,1] which correspond to the policies that they will implement after winning. The candidate with most votes win; if there is a draw then each candidate has 50% chance of winning. Each voter has a favourite policy on [0,1]: a voter will benefit more if her favourite policy is nearer to the winning candidate's policy. so, each voter will vote sincerely choosing the candidate whose policy is closest to her favourite policy. There is a median voter position m. Choose the correct option from below:

    1. The unique Nash equilibrium is both parties choosing position m(i.e, the strategy profile (m, m)).
    2. (m, m) is a Nash equilibrium but it is not unique.
    3. (m, m) is not a Nash equilibrium.
    4. $(0, 1), (1, 0)$ and (m, m) are Nash equilibrium.

Solution: (1)