HS 224: Game Theory and Economics
BTech 4th Semester, End Semester Test
Total Marks 40, Time 180 minutes, Date: 4th May, 2018
[*Answers should be accompanied by proper elaboration*]

1. Recall the setting of the second price sealed-bid auction discussed in the class. Find all the Nash equlibria if only two players are playing the game. [7]

2. Chris Evert and Martina Navratilova are playing a game of lawn tennis. Evert can hit two kinds of shots, Down the Line (DL, a hard, straight shot), or Cross Court (CC, a soft, diagonal shot). Navratilova can prepare herself for each of them. The payoffs are given by the following table (the numbers may be interpreted as the percentage of times a player wins a point).

		Navratilova: DL	Navratilova: CC
Evert	DL	50, 50	80, 20
	CC	90, 10	20, 80

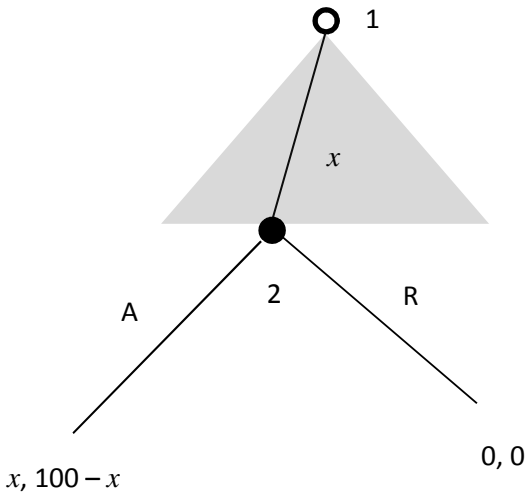
(a) What are the pure strategy and mixed strategy equilibria of the game? What is the expected payoff of Evert in the mixed strategy equilibrium? [1+3+1]
(b) Evert injures herself and her DL shots become weaker. As a result the payoffs change and are given by the following table. Find the mixed strategy equilibria now. Is Evert playing DL with lesser probability compared to (a)? Why? What is her expected payoff in the equilibrium? [2+2+1]

		Navratilova: DL	Navratilova: CC
Evert	DL	30, 70	60, 40
	CC	90, 10	20, 80

3. Find all Nash equilibria of the following game. [6]

		B: L	**B**: M	**B**: R
A	U	2,0	3,1	1,2
	D	1,3	2,1	2,0

4. At the Roman Colosseum n lions are tied in a row. Each lion can only reach the lion(s) adjacent to it. Suppose you are going to be thrown to the first lion. The first lion may decide to eat you, or not to eat. If it eats it becomes heavy and cannot fight. The second lion then can eat it. If it does not eat, in case of an attack from the second lion both will die. Similarly, if the second lion eats the first one then the third lion may decide to attack and eat the second, and so on. Each lion wants live rather than die. In either case of living and dying it wants to eat rather than remain hungry. Living and staying hungry is better than dying after eating. The lions are the players.
   (a) Specify this as an extensive game of perfect information and draw the game tree for three lions. [2+2]
   (b) The emperor has allowed you choose the number of lions (n) as long as $n > 2$. What n shall you choose in order to survive? Give the reason. [3]



5. In the ultimatum game illustrated above, can there be a Nash equilibrium where player 1 makes an offer with $x = 50$? Explain. [5]

6. [The Rotten Kid Theorem] Parent (P) and her child (C) have their private incomes as $P(a)$ and $C(a)$ respectively. $P(a) > C(a)$. Here a is an action taken by the child which affects both the incomes. In stage 1 C chooses a. C is selfish and is concerned about the money he has. In stage 2 P decides how much on her income she will transfer to C. P is concerned about C. P's payoff is the minimum of the money she has and the money the child has. Treat the situation as an extensive game with perfect information. Show that in the subgame perfect equilibrium the child maximizes the sum of his own and the parent's income. [5]