Midterm exam   PS 30   November 2006

Name:

TA:

Section number:

This is a closed book exam. The only thing you can take into this exam is yourself and writing instruments. No calculators, computers, cell phones, etc. are allowed. Everything you write should be your own work. Cases of academic dishonesty will be referred to the Dean of Students office, which has the power to suspend and expel students. Partial credit will be given: math mistakes will not jeopardize your grade. This exam has five parts. Each part is weighted equally (12 points each). Please show all steps of your work and explain what you are doing at each step. Correct answers alone are worth nothing without a clear and correct explanation of where the answers come from. Clarity and legibility are factors in the grade.

If you have a question, raise your hand and hold up the number of fingers which corresponds to the part you have questions about (if you have a question on Part 2, hold up two fingers). If you need to leave the room during the exam (to use the restroom for example), you need to sign your name on the restroom log before leaving. You can only leave the room once.

When the end of the exam is announced, please stop working immediately. The exams of people who continue working after the end of the exam is announced will have their scores penalized by 30 percent. Please turn in your exam to your TA. When you hand in your exam, please write your name down on the log. Please write all answers on this exam—if you write on the reverse side of pages, please indicate this clearly. Good luck!

Part 1. Say we have Hilary Clinton and Condoleezza Rice in the 2008 presidential election. Each can either run a negative campaign that reveals the opponent's shortcomings or run a positive campaign that focuses on policies. If one runs a negative campaign and the other doesn't, the former will surely beat the latter, which is the best outcome for the winner and the worst for the loser. If both of them run a positive campaign, the winner is not easily predicted; however, this situation is better than the situation in which both go for a negative campaign.

a. Represent the situation between Clinton and Rice as a strategic form game. (8 points)

b. Find all pure strategy Nash equilibria of this game. (4 points)

Part 2. Consider the following game.

	2a	2b	2c	2d	2e
1a	20, 6	6, 1	5, 8	4, 0	2, 2
1b	18, 4	5, 5	5, 5	12, 0	4, 3
1c	0, 4	0, 3	0, 2	0, 10	0, 1
1d	9, 25	5, 0	1, 4	10, 0	7, 7
1e	10, 1	6, 3	2, 3	4, 0	9, 9

a. Find all Pure Strategy Nash Equilibria. (4 points)

b. Iteratively eliminate all (strongly and weakly) dominated strategies, showing your order of elimination. (5 points)

c. Find the Mixed Strategy Nash Equilibrium of the remaining game. (3 points)
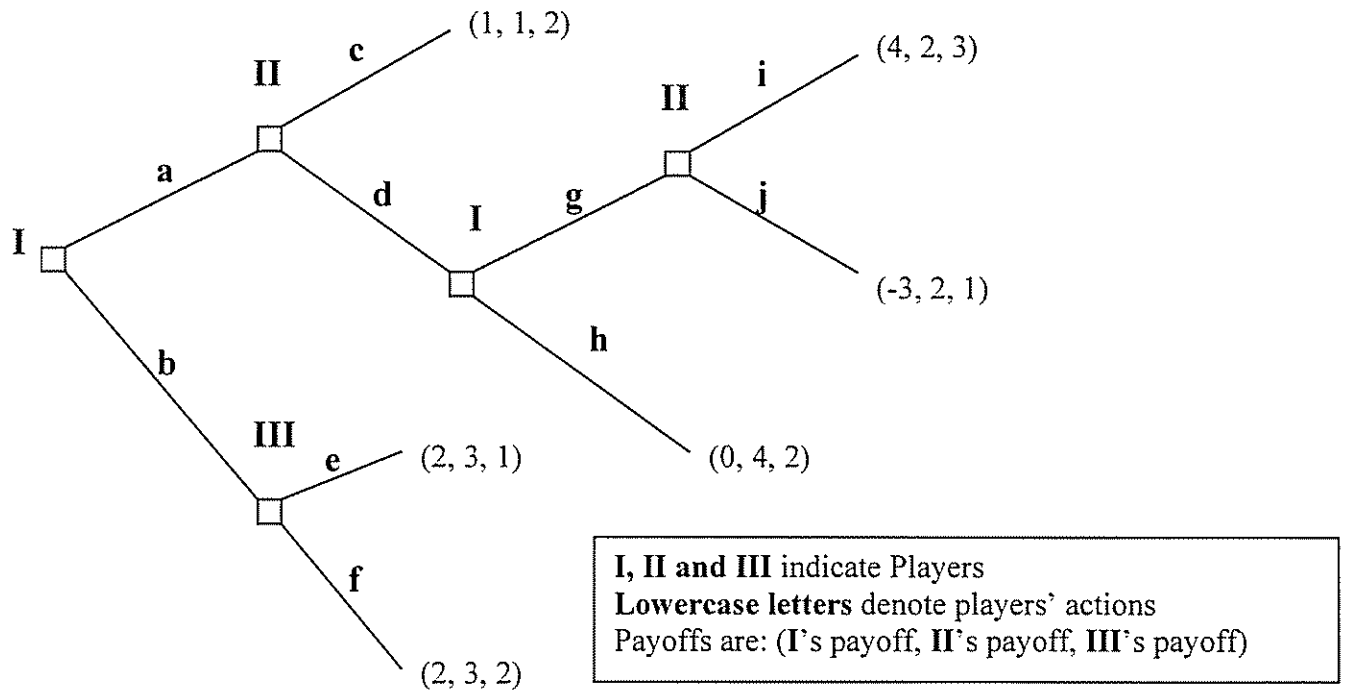
Part 3. Consider the following three-person game. Country A, B and C are all in an alliance together and are trying to decide if they should join a new international institution to prevent proliferation of Weapons of Massive Destruction (WMD). Each country has one vote and can vote either to join or to not join.

The three countries join the institution if two out of three vote to join or if three out of three vote to join. Otherwise, the three countries will not join. Each country will gain 4 if they join the institution. However, each country will lose 1 if she herself votes to join. Thus, the best scenario for a country is if she herself votes to not join and the other two vote to join.

a.   Represent this situation as a strategic form game.   (6 points)

b.   Find all pure strategy Nash equilibria.   (6 points)

Part 4. Consider the following game.

I, II and III indicate Players
Lowercase letters denote players' actions
Payoffs are: (I's payoff, II's payoff, III's payoff)

a. List all the strategies for each player. (2 points)

Player I: Player II: Player III:

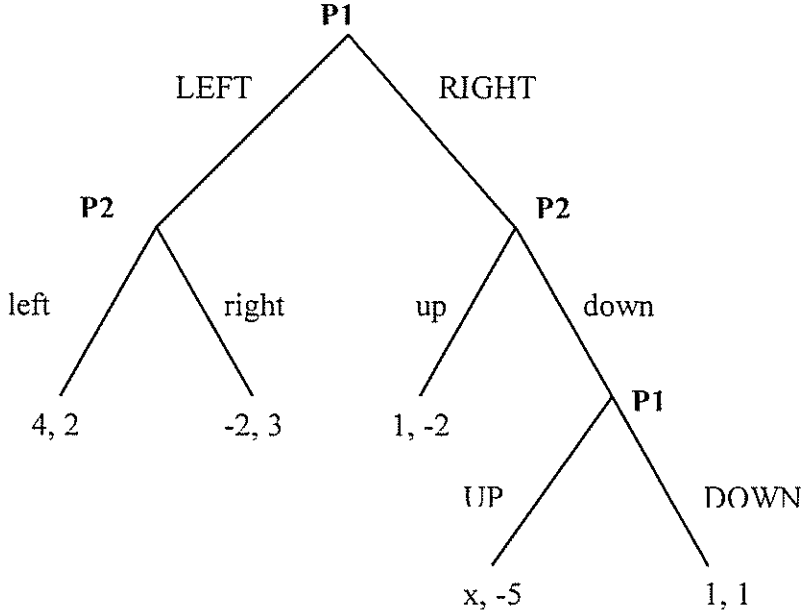b. Represent the above game as a strategic form game. (4 points)

c. Find all the Pure Strategy Nash Equilibria (PSNE). Circle all PSNE in the strategic form game you made. (2 points)

d. Draw Subgame Perfect Nash Equilibria (SPNE) as arrows in the game tree (if there is more than one SPNE, draw each separately). (2 points)

e. Which PSNE are subgame perfect? Write out the strategy profile(s) in words, like (I's strategy, II's strategy, III's strategy). (2 points)

Part 5.

a. Convert the following game into strategic form. Payoffs are written as (Player 1, Player 2). (3 points)

P1

LEFT   RIGHT

P2   **P2**

left   right   up   down

4, 2   -2, 3   1, -2   **P1**

UP   DOWN

x, -5   1, 1

a. For what values of x is there only one pure strategy Nash Equilbrium? For what values of x are there two pure strategy Nash Equilibria? For what values of x are there three pure strategy Nash Equilibria? What are the Nash Equilibria in each case? (3 points)

b. Now consider the case where x = -5. Identify all pure strategy Nash Equilibria. (3 points) Now identify which of these is also a Subgame Perfect NE by drawing the game tree with arrows and also specifying the strategies in words. (3 points)