Final exam PS 30 June 2005

Name:

TA:

Section number:

This is a closed book exam. The only thing you can take into this exam is yourself and writing instruments. 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. There are eight parts in this exam. Each part is weighted equally (12 points for each part). 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 the TA responsible for a given question is not in the room at the time, work on other parts of the exam and hold the question until that TA rotates to your exam location. When the end of the exam is announced, please stop working immediately. People who continue working after the end of the exam is announced will have their grades penalized by 25 percent. If you need to leave the room to use the bathroom during the exam, please write your name down on the bathroom log before you leave. A person cannot leave the room more than once during the exam (a person who leaves for a second time will be considered to have completed his or her exam). Please turn in your exam to one of the TAs. 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. Please turn off all cell phones. Good luck!

1	
2	
3	
4	
5	
6	
7	
8	
total	

Part 1.

Let's think about the Battle of Sexes game. In this game, a husband and a wife want to spend Saturday night together and there are two alternatives: going to Dodger Stadium to watch a baseball game or going to the Promenade for shopping. Although they both want to be together, the husband prefers watching a baseball game to going shopping. However, the wife prefers going to the Promenade over going to Dodger Stadium.

The best case for a person is going to a place which he/she prefers with his/her spouse. The second best case is being with his/her spouse but not going to his/her favorite place. The second worst case is going to a preferred place alone. The worst case is going to a place alone which is not preferred. In your answers to the following questions, use only the numbers 1, 2, 3, 4 for payoffs.

(a) Let's say they make decisions simultaneously. Represent the situation as a strategic form game and find the pure strategy Nash equilibria. (4 points)

(b) Let's assume that the husband decides first. Then, the wife can choose whether she will follow his decision (and go to the place that the husband goes to) or not (and go to a different place). Represent this situation as an extensive form game and solve the game by using backward induction. (4 points)

(c) Let's say that the wife decides first. Then, the husband can choose whether he will follow her decision (and go to the place that the wife goes to) or not (and go to a different place). Represent this situation as an extensive form game and solve the game by using backward induction. (4 points)

Part 2.
Say there are 5 candidates a, b, c, d and e and 25 people electing them. Five people have the following preference ordering (from best to worst): a,b,c,d,e (their best choice is a and their worst choice is e). Six people have the following ordering: c,d,e,b,a. Seven people have ordering e,d,c,b,a and seven people have ordering b,a,c,e,d.

(a) What is the total number of Borda points that get allocated? (2 points)

(b) What is the Borda Count for each of the 5 candidates ? (5 points)

Candidate	Borda Count
a	
b	
c	
d	
e	

(c) Does there exist a Condorcet winner? If so, show why. If not, show why not (5 points)

Part 3.

There is an election in a district. An incumbent first decides whether she will run for reelection or not. After seeing her decision, a challenger decides whether he will run for the office or not. After that, if the incumbent has decided to run for reelection, the incumbent has to decide whether she will spend a large amount of money or just a small amount of money on the campaign. If the incumbent has decided not to run for reelection, then the game ends after the challenger's decision.

If both people run and the incumbent spends a large amount of money, the incumbent will win. However, if both people run and the incumbent spends a small amount of money, the challenger will win. If only one person decides to run, then that person wins. If neither person decides to run, then neither person wins.

The default payoff is 0. If a person wins the office, his/her payoff will be increased by 10. If the challenger runs for office and loses, his payoff will be reduced by 5. If the incumbent spends a large amount of money, her payoff will be reduced by 5. If she spends a small amount of money, it will be reduced by 3.

(a) Draw an extensive form game and find the subgame perfect Nash equilibrium using backward induction. (4 points)

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

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

Part 4.
Ranch Heights is holding an election with two candidates running. In this election, the issues are how many police stations to build and how many schools to build. The two candidates decide which policy position to take. There are six groups of voters. 10% of people, Independent, don't like paying taxes so they like 0 police stations and 0 schools. 5% of people, Hard Left, want 0 police stations and 8 schools, or (0, 8). 35% of people, Left, want 0 police stations and 6 schools. 30% of people, Moderate, want 4 police stations and 4 schools. 15% of people, Right, want 6 police stations and 0 schools. 5% of people, Hard Right, want 8 police stations and 0 schools.
As in the Downsian model, each voter votes for the candidate which is closest to her own position or "ideal point." For example, if candidate A take the position of 1 police station and 1 school, and candidate B takes the position of 2 police stations and 4 schools, then candidate A gets 30 percent of the vote (Independent, Right, and Hard Right) and candidate B gets 70 percent (Moderate, Left, and Hard Left). Each candidate wants to maximize the total number of votes she gets.

(a) Now, let's try to make a prediction, finding Pure Strategy Nash Equilibria. First, simplify the game a lot by considering only the following strategies: (0,0), (0,3), (2,6), (3,0), (4,4), (6,2). Here, (3,0) means for example 3 police stations and 0 schools. Each of the two candidates thus has 6 possible strategies. Write this as a strategic form game and make a prediction by finding all pure strategy Nash equilibria. (6 points)

(b) Let's say that candidate A, Democrat, announces her issue position first. Because A is a Democrat, she can only choose policy positions (0,0), (2,6), or (4,4). Candidate B, who is a Republican, can only choose policy positions (0,0), (4,4), or (6,2). Represent this game as an extensive form game and find a subgame perfect Nash equilibrium. (6 points)

Part 5.
There are 10 people who are deciding whether to join revolt or not. Two people have a threshold of 2. Four people have a threshold of 4. Four people have a threshold of 5.

(a) Find all pure strategy Nash equilibria of this game. (2 points)

(b) Say that you are a policeman who is trying to stop a revolt. You can give tickets to increase a person's threshold: each ticket you give someone increases their threshold by 1. You want to use the fewest possible number of tickets. How many tickets do you have to give to whom, to ensure there is no revolt? (4 points)

(c) Now, say that the people with threshold 5 now have a threshold of 7 because they have an increased fear of getting caught. Now what are all pure strategy Nash equilibria? (3 points)

(d) Return to the original situation. Now say that the four people with threshold of 4 have a threshold of 5 instead. Also, say that one of people with threshold of 2 now has a threshold of 0. What are all pure strategy Nash equilibria? (3 points)

Part 6.

Say that we have a threshold model in which there are 5 people A, B, C, D and E. If the total number of other people who participate is greater than or equal to a person's lower threshold and smaller than or equal to a person's upper threshold, the person wants to participate (denoted as '**p**'). Otherwise the person does not want to participate (denoted as '**n**').

The lower and upper thresholds for the 5 people are listed in the table below (feel free to use the rest of the table for your calculations).

Person	Lower Threshold	Upper Threshold
A	1	2
B	1	3
C	2	4
D	3	5
E	4	6

(a) Is the situation where everyone participates a Nash Equilibrium? What about when no one participates? Circle the right answers below. (2 points)

Is (p,p,p,p,p) a Nash Equilibrium? Yes No
Is (n,n,n,n,n) a Nash Equilibrium? Yes No

(b) Assume that on the first day (Day 1) person A and B participate and persons C, D, and E do not. What happens the next day (Day 2)? What about on Day 7? Day 8? Fill in the corresponding columns in the table below. (6 points)

Person	Lower Thresh.	Upper Thresh.
A	1	2
B	1	3
C	2	4
D	3	5
E	4	6

Day 1	2	3	4	5	6	7	8

(c) Describe the situation on Day 43 by filling in the table below. (4 points)

Person	Day 43
A	
B	
C	
D	
E	

Part 7.

(a) Find all (pure strategy and mixed strategy) Nash equilibria of this game.

	A	B
A	2, 9, 5	10, 8, 5
B	3, 1, 5	5, 2, 5

A

	A	B
A	0, 3, 0	6, 4, 0
B	0, 1, 0	6, 0, 0

B

(b) Find all (pure strategy and mixed strategy) Nash equilibria of this game.

	A	B
A	2, 9, 5	10, 8, 8
B	3, 10, 4	5, 2, 3

A

	A	B
A	1, 5, 0	6, 4, 6
B	0, 1, 8	7, 0, 2

B

Part 8.

Three schools are trying to find graduation speakers for 3pm on June 19, 2005. They've each narrowed their list down to the same three speakers. UCLA wants (in order from best to worst): Colin Powell, Bill Gates, or Bono. USC, not to be outdone by its rival, has the same preference ordering. Cal wants Bono the most, then Bill Gates, and finally Colin Powell the least. The speakers, however, also have certain preferences. Colin Powell needs to make a visit to Rand in Santa Monica, so he prefers UCLA the most, then USC, then Cal the least. Bill Gates also wants to visit Rand, so he has the same order of preferences as Colin Powell. Bono was impressed with USC's marching band at the MTV music awards, so he prefers USC most, then Cal, and then UCLA least.

(a) Among the set of stable matchings, which matching is preferred most by the speakers? (3 points)

(b) Among the set of stable matchings, which matching is preferred most by the schools? (3 points)

(c) Are there any other stable matchings? Answer yes or no. If yes, show all other stable matchings. If not, explain why not. (3 points)

(d) American Idol Bo Bice's schedule has suddenly opened up and he is now available to speak on June 19. All the schools prefer him to everyone else. Bo Bice likes UCLA the best, Cal second, and USC least. Among the set of stable matchings, which one is now most preferred by the speakers? Which person does not get invited to speak? (3 points)