Final exam PS 30 December 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 and other electronic gadgets. Good luck!

1	
2	
3	
4	
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8	
total	

Version 3

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Part 1.

(a) There are two taco sellers in a town, Jose and Alex. They each set their taco prices at either $5, $10, or $12. Jose has 3,000 loyal customers who will buy Jose's tacos regardless of price. Alex has 4,000 loyal customers who will buy Alex's tacos regardless of price. There are also 3,000 floating customers in a town. If Jose and Alex have different prices, these floating customers will buy from whoever offers the lower price. However, they will NOT buy any taco if Jose and Alex have same price because these floating customers will lose their interest in having tacos.

(a) Represent this as a strategic form game. Payoffs are each seller's revenues. (2 points)

(b) Find all pure strategy and mixed strategy Nash equilibria. (3 points)

(Part 1 continued)

Now, 1,000 customers who used to be loyal to Alex have changed their minds and become loyal to Jose. Therefore, Jose now has 4,000 loyal customers and Alex has 3,000 loyal customers. There are still 3,000 floating customers.

(c) Represent this as a strategic form game. Payoffs are each seller's revenues. (2 points)

(d) Find all pure strategy and mixed strategy Nash equilibria. (3 points).

(e) Jose has more loyal customers in the second story. How did this change affect Jose's behavior? Specifically, how did it change the probability that Jose sets the highest price? (2 points)

Part 2.

(a) Here are five people's (1, 2, 3, 4, 5) preference orders over four candidates (a, b, c, d), where the most-preferred is listed first and the least-preferred is listed last (for example, person 1 likes a best and d worst).

1	2	3	4	5
a	a	a	c	c
b	c	b	b	b
c	d	c	d	d
d	b	d	a	a

(a) Who is the plurality winner? (2 points)

(b) Who is the Borda count winner? (2 points)

(c) Who is the approval voting winner, when people vote for their top two choices? (2 points)

(d) Is there a Condorcet winner? If so, who? (2 points)

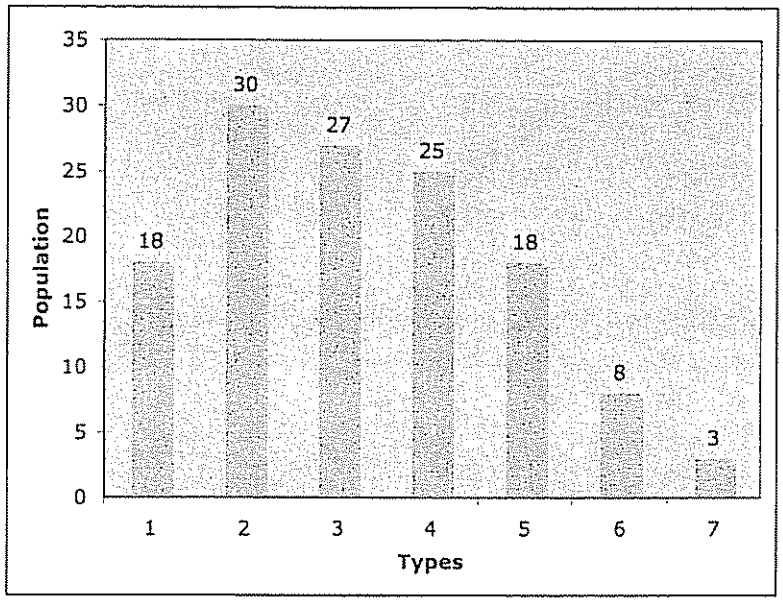
(Part 2 continued)

(e) There are 15 people in a town. They are going to elect a representative. There are 7 candidates (a, b, c, d, e, f, g). The 15 people will vote for candidates who are on the top of their preference orders. If a candidate gets a majority (8 votes), the candidate will win. However, if no candidate wins a majority, there will be a second round. In the second round, the candidate(s) who got the least votes will be eliminated. Then, the 15 people will vote again, given that some candidate or candidates were eliminated already. (For example, if candidate 'b' was eliminated after the first round, the person 1 will vote for candidate 'g' in the second round.) If there is a candidate who gets a majority, the candidate is a winner. However, if there is no winner even in the second round, they will have a third round, and so forth. Who will be the winner in the end AND how many votes will that candidate get? (4 points)

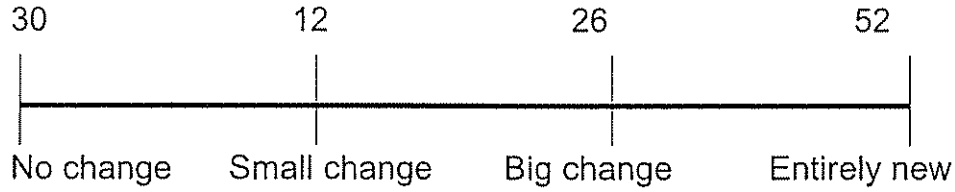
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
b	e	e	f	d	c	e	a	g	g	c	d	e	g	g
g	b	d	a	c	e	a	e	f	c	d	b	d	c	f
c	a	f	d	b	b	b	g	a	f	b	a	c	d	a
a	g	a	b	a	d	c	b	c	a	e	c	b	e	e
f	d	g	c	g	g	d	f	e	e	a	e	f	f	b
e	c	b	e	e	a	f	c	d	b	g	f	g	a	d
d	f	c	g	f	f	g	d	b	d	f	g	a	b	c

Part 3.

(a) Two candidates are running for President in "Polistan" in the newly independent country's first elections. There are 7 "types" of people in the population, as shown in the figure below. For example, there are 18 people of type 1 and 8 people of type 6. Each candidate chooses a position from 1 to 7, and each voter votes for the candidate whose position is closest to their own, as in the Downsian model. Each candidate tries to maximize his/her total number of votes. Where will each candidate locate? (4 points)



(b) Say Candidate 1 narrowly wins the election and becomes President. He now wants to revise the country's constitution entirely in order to improve property rights and other laws that will be conducive to economic growth. However, not everyone in Parliament agrees with him: 30 members want no change at all, 12 want only a small change, 26 want a big change, and 52 agree with the President's position of an entirely new constitution. A two-thirds majority is required for any change to be made. What will the President propose? (4 points)

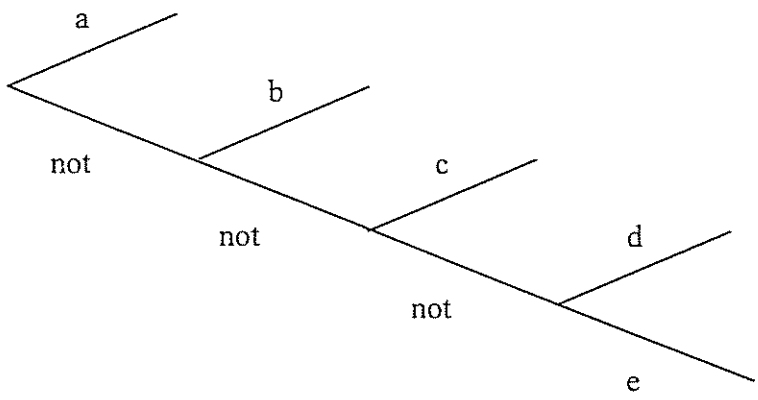


(c) The new President is not happy with the change in the constitution that was approved by the Parliament. He has therefore decided to take the issue to the public to vote for it in a referendum. The referendum will be held in 1 week. During this time the opposition will campaign against the President. A survey (shown below) shows the results of a survey in which citizens were asked their preferences. For example, 20% of the population most prefers a small change in the constitution. Using the Downsian model, which position should the two parties take (they decide simultaneously) to maximize the total number of votes they receive? (4 points)

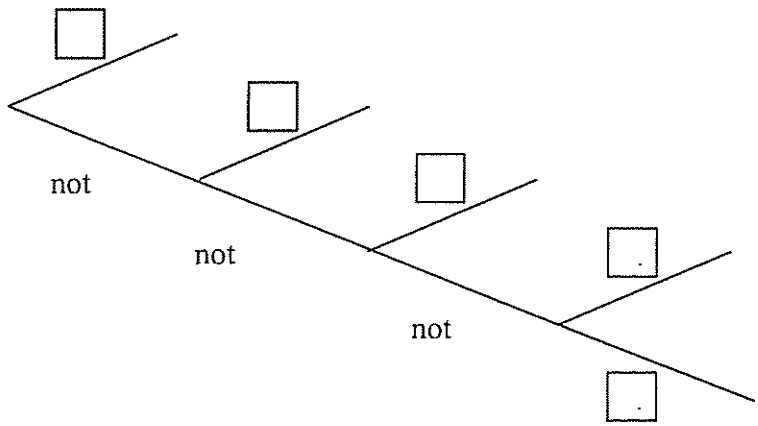
Preference	% Respondents
No Change	24
Small Change	20
Big Change	26
New Constitution	30

Part 4.
Say that there are three people deciding by majority rule over five candidates a, b, c, d, and e. Person 1's preferences (from best to worst) are c, d, b, a, e. Person 2's preferences (from best to worst) are b, d, e, a, c. Person 3's preferences (from best to worst) are e, c, d, b, a. Consider voting agendas in which people vote on candidates sequentially.

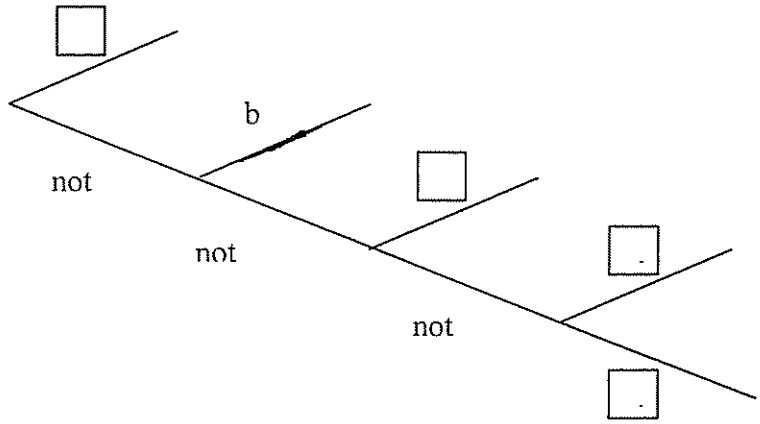
We can write an agenda as a tree. For example, in the following tree, people first vote on a or not. If a loses, then they vote on b or not. If b loses, then they vote on c or not. If c loses, then they vote on d versus e.



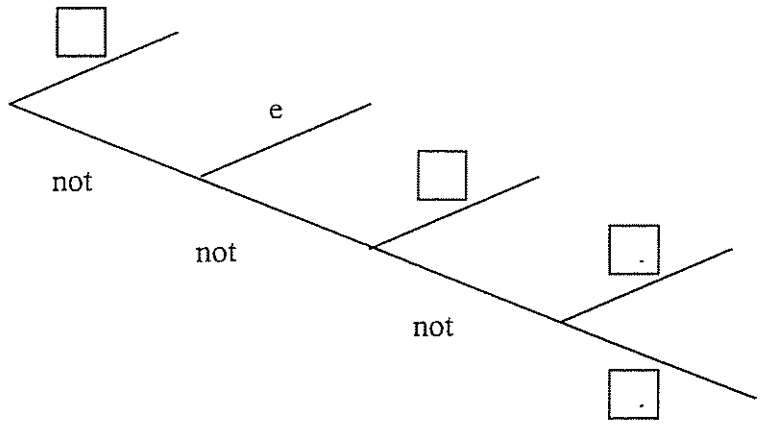
(a) Is there an agenda in which they decide on e? If so, fill in the blanks on the agenda below. If not, explain why not. (3 points)



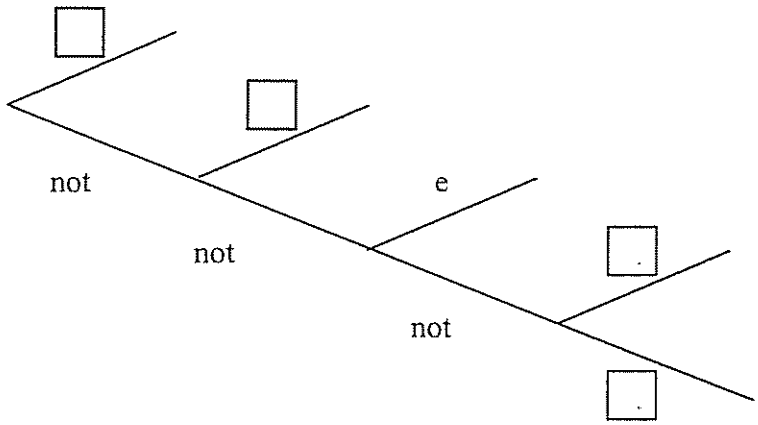
(b) Assume that b is voted on in the second round (see the agenda below). Can you fill in the blanks in the agenda below so that e is chosen? If so, fill in the blanks. If not, explain why not. (3 points)



(c) Assume that e is voted on in the second round (see the agenda below). Can you fill in the blanks in the agenda below so that e is chosen? If so, fill in the blanks. If not, explain why not. (3 points)



(d) Assume that e is voted on in the third round (see the agenda below). Can you fill in the blanks in the agenda below so that e is chosen? If so, fill in the blanks. If not, explain why not. (3 points)



Part 5.
In a simplified version of "Battleship," say that there are six spaces, numbered 1, 2, 3, 4, 5, 6. Person 1 chooses to fire a missle at one of these six spaces. Person 2 has a ship which is three spaces long, and chooses where to put the ship on the board: she can either put it on spaces 1, 2, and 3, on spaces 2, 3, and 4, on spaces 3, 4, and 5, or on spaces 4, 5, and 6. The people make their choices simultaneously.

(a) Say that person 1 gets a payoff of 1 if her missile hits person 2's ship and a payoff of 0 if her missile misses. Say person 2 gets a payoff of 0 if the missile hits and a payoff of 1 if the missile misses. Model this as a strategic form game and make a prediction. (4 points)

(b) Now say that there are 7 spaces. Thus person 1 has 7 possible strategies and person 2 has 5 possible strategies. Model this as a strategic form game and make a prediction. (4 points)

(c) Assume again that there are 6 spaces. Now say that if person 1's missile hits the center of person 2's ship, then person 1 gets a payoff of 2. If person 1's missile hits the "edges" of person 2's ship, then person 1 gets a payoff of 1. If person 1's missile misses, she gets a payoff of 0. Person 2 still gets 0 if her ship is hit (anywhere) and 1 if the missile misses.

For example, if person 1 fires the missile at 4 and person 2's ship is on 3, 4, 5, then person 1 gets payoff 2 and person 2 gets payoff 0. If person 1 fires the missile at 3 and person 2's ship is on 3, 4, 5, then person 1 gets payoff 1 and person 2 gets payoff 0. Model this as a strategic form game and make a prediction. (4 points)

Part 6. Say that person 1 and person 2 are playing a drinking game which goes like this. There are m beers in the refrigerator. Person 1 goes first by drinking either 1 or 2 beers. Then person 2 can drink either 1 or 2 beers. Then person 1 can drink either 1 or 2 beers, and so forth. In other words, when it is a person's turn to drink, she can drink either 1 or 2 beers. Whoever drinks the last beer loses, and the other person wins. Winning the game yields a payoff of 1 and losing yields a payoff of 0. However, there is an additional feature to the game: there is a "magic number" x (which is greater than 0 and less than m). If after your turn, there are exactly x beers left, then you lose the game and also have to go out and buy more beer; this has a payoff of -3 for the loser and a payoff of 1 for the winner.

(a) Say that $m = 5$ and $x = 4$. Model this as an extensive form game and find a subgame perfect Nash equilibrium. (4 points)

(b) Say that $m = 5$ and $x = 3$. Model this as an extensive form game and find a subgame perfect Nash equilibrium. (4 points)

(c) Now let m and x be any number. Find a subgame perfect Nash equilibrium. For what values of m and x can person 1 guarantee a win? For what values of m and x can person 2 guarantee a win? (4 points)

Part 7.

Letter-writing Campaign.

Genocide has been taking place in the southern province of Sudan called Darfur. Horrified by this, 7 UCLA students are wondering whether engage in a weekly letter-writing campaign in order to get the US government to act.
Each of these students has a propensity to act that is determined by the number of other people that they see acting: this is a collective action problem.
If someone sees that too few people are writing letters on a given week, she/he will think that the campaign will not be fruitful and will spend her/his energy on something else the following week (for example, fundraising to buy a full page in the daily bruin).
If someone sees that a lot of people are involved in the campaign on a given week, they will feel that their contribution does not matter so much because so many other people are writing letters already and she/he will engage in something else the following week (for example, joining a letter-writing campaign to convince their congressperson to support universal healthcare).

To sum up, someone will only be active with the Darfur Action Committee on a particular week if enough other people (no less than their lower threshold) but not too many other people (no more than their upper threshold) wrote letters the previous week. We denote an active participant with the letter '**P**' and a non-active student with the letter '**N**'. The name of the 7 students are Alice, Bob, Charlie, Diane, Emily, Frances and George (which we can shorten to A, B, C, D, E, F, and G)

The lower and upper thresholds for the 7 students are listed in the table below (feel free to use the rest of the table as draft paper).

Student	Lower Thresh.	Upper Thresh.
A	0	6
B	1	6
C	3	5
D	3	5
E	4	6
F	4	5
G	5	6

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

(p,p,p,p,p,p,p) is a Nash Equilibrium yes no
(n,n,n,n,n,n,n) is a Nash Equilibrium yes no

(b) Write down a Nash Equilibrium which is neither (p,p,p,p,p,p,p) or (n,n,n,n,n,n,n). Fill in the table below. (2 points)

Student	A	B	C	D	E	F	G
Action							

(c) Assume that on week 1 everyone but G is participating. What happens on week 2? What about on week 5? On week 6? Fill the corresponding columns in the table bellow. (6 points)

Student	Lower Thresh.	Upper Thresh.
A	0	6
B	1	6
C	3	5
D	3	5
E	4	6
F	4	5
G	5	6

Week 1	2	3	4	5	6
P					
P					
P					
P					
P					
P					
N					

(d) Describe the situation on week 23 by filling the table below. (2 points)

Student	Week 23
A	
B	
C	
D	
E	
F	
G	

Part 8.

Help me find my match !

After visiting UCLA's Career Center, you decide that you want to become a matchmaker.
You are applying to the *School of Matchmaking & Relationship Sciences* that describes itself as "an academy for would-be Cupids" but you have to prove that you are worthy of admission before they will let you in.
You are provided with the profiles of 10 heterosexual singles that are looking for their soul-mate.
There are 5 men (A through E) and 5 women (V through Z). After careful study of their profiles, you have determined that their preference ordering is as described in the table below.

Man	Likes best	<----------	----------	---------->	Likes worst
A	V	W	X	Y	Z
B	V	X	W	Z	Y
C	V	W	Z	Y	X
D	Y	Z	V	W	X
E	Y	Z	V	W	X
Woman	Likes best	<----------	----------	---------->	Likes worst
V	A	B	C	D	E
W	C	D	A	B	E
X	D	B	C	A	E
Y	C	A	B	E	D
Z	C	B	D	A	E

(a) How many possible matchings are there? (4 points)

Write you answer here →

(b) Assuming that the men are paying for access to your services, provide a stable matching that would make them as happy as possible. (4 points)

Man	Match
A	
B	
C	
D	
E	

(c) Assuming that the women are paying for access to your services, provide a stable matching that would make them as happy as possible. (4 points)

Woman	Match
V	
W	
X	
Y	
Z	