Econ 223 Midterm Examination: September 6, 2004
This is a closed book exam: no notes, no books, no cell-phones, no calculators just you

MAKE SURE: ***your answers*** are written in the ***answer book*** with your name and signature on the label. Also make sure you put your name on the loose paper answer sheet for the multi-choice template to question 4. If you don't identify your multi-choice answer sheet (a loose sheet) as your own or fail to turn it in you will not receive credit for this question.

There are 5 questions for a grand total of 100. Answer all questions in the answer booklet provided.

Question 1	18 marks	Dixit and Skeath's classifications of games
Question 2	12 marks	identifying and counting strategies
Question 3	20 marks	alternating offer bargaining
Question 4	30 marks	2x2 simultaneous games (Multi choice)
Question 5	20 marks	Tough Love: Teens and parents

Q1 pure types of games (18 Marks)

Dixit and Skeath (DS), the author's of the textbook for the course, classify games into a number of various "pure types" by asking and answering some interesting questions. Identify these types and briefly explain the key concepts/distinctions used to interpret and understand each type. *(By "briefly" I mean in **no more than** 1-2 sentences; you do **not** have to provide example games in your explanations.)*

Q2 Strategies in sequential games. (4 parts; 3 marks each part; 12 marks total)

2.a the game tree below (Figure 2.1) represents a stylized 3 player (A, B, C) sequential game (no payoffs are shown at the terminal nodes). ***How many*** strategies does each player, A, B and C, have in this game? List B's strategies (you do not have to list A's or C's).

Figure 2.1

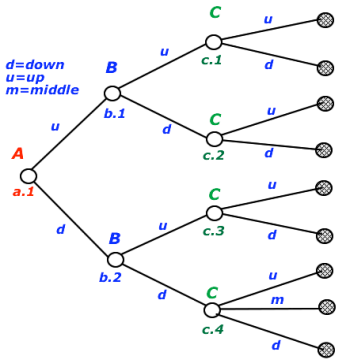
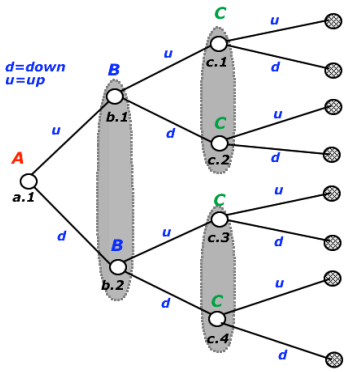


Figure 2.2



The game tree above (Figure 2.2) represents another stylized 3 player (A,B,C) sequential game (no payoffs are shown at the terminal nodes). The grey regions enclosed in dashed lines are ***information sets***.

2.b: In this game, what does player C knows when he makes his move?

2.c: ***How many*** strategies does each player, A, B and C, have in this game? List C's strategies (you do not have to list A's or B's).

2.d: Sketch and label the game tree for this game with the following, changed, information structure: B knows what A does when she moves, and C knows what B does but not what A does when it is C's turn to move.

Q3 Alternating offer bargaining. (2 parts ; 20 marks total; 7/13for a/b)

Spring is on us and the grass needs cutting. The neighborhood Kid (K) and an Old Lady (OL) are bargaining today, Saturday, about how much the OL is going to pay the Kid to cut the grass. The OL wants the grass cut, and indeed is prepared to pay up to $40 to get the job done today. Being self-interested she would prefer to pay the Kid less than more, and she calculates her net personal *payoff* as $40, her top-dollar value, **minus** whatever she has to offer the Kid to get the job done…as long as it's done today. For example if the Kid takes the job for $18 the Old Lady's *payoff* is $40-$18=$22. If the Kid rejects her offer, the game ends, the grass doesn't get cut and the Old Lady's payoff is 0, as is the Kid's payoff. The Kid wants the money but doesn't like to work. If he gets offered $x to do the job and accepts it, he calculates his net personal *payoff* as $x minus $15, $x-$15. For example, if the OL offers him $18 for cutting the grass his net personal payoff, if he accepts the work, is $18-$15=$3. The Kid generally won't accept any work unless he gets a strictly positive net personal payoff…but he is desperate enough, and self interested enough, to accept the job if his net personal payoff is something positive rather than zero.

Q3.a If the OL moves first, making a wage offer (in dollar amounts from 1,2,3…to 40) and the Kid moves second, either accepting or rejecting, use rollback reasoning to predict what strategies will be chosen and what the resulting payoffs will be.

Q3.b Let's complicate the game a little by adding two more possible bargaining rounds and a strict order of bargaining – as we did in our classroom games. The Kid knows the OL is anxious to get the job done this Saturday rather than next Saturday, or even later. So he might consider rejecting her offer to cut the grass this week and suggest waiting till next week, and making a counter-offer himself in terms of payment and seeing whether the OL will accept or reject. The OL can then accept or reject this. If she accepts the game ends, the grass is cut next week and payments are made; but if she rejects there is one last opportunity – she can make a counter-counter offer for the job to be done 2 weeks away. (All wage payments, if any, take place today….even if the work doesn't get done until later). They both know that the OL is not willing to pay as much as $40 for a job done next week, or the following week. She is only willing to pay **at most** $30 top-dollar today for the job to be done next week, and **at most** $20 top-dollar today for the job to be done the week after that. As above she calculates her net personal payoffs by subtracting what she has to pay the Kid from her "top-dollar" value. So for example, if she and the Kid made an agreement for him to cut the grass two weeks away for $18 say, her net personal payoff is$20-$18=$2. If the Kid rejects her counter offer to do the job on the last Saturday the game ends and they both receive $0 in net personal payoffs. Assume offers and counter offers are made in units of $1 (ie no fractions) and that in the case of indifference , eg between working or not, or between getting the lawn cut or not, either party has to be offered a positive net personal payoff to motivate them to change from one transaction to another. The question here is: Use your knowledge of game theory to predict the rollback equilibrium strategies, outcomes, and payoffs. Explain your reasoning.

Q4 Simultaneous games Multiple Choice (Answer template provided; 3 marks per question 30 marks in total).

The 10 payoff matrices below describe various types of 2x2 simultaneous games. Payoffs to players are the numbers 1,2,3,4 indicating preference rank. Higher is better, so for example 4=best & 1=worst. **On the answer sheet provided** write down the option, or set of options, from the following list ("a" through "i") that most accurately describes the game AND identify all pure strategy equilibrium strategies for each game (in some cases more than one option may be appropriate). *Use the answer sheet provided and the codes for the options below. You do NOT have to rewrite the payoff matrix in your answer booklet nor on your multi choice answer sheet.*

a) A prisoner's dilemma game
b) A game with a dominant strategy equilibrium
c) A game with no Nash Equilibrium in pure strategies
d) A dominance solvable game
e) An assurance game
f) A pure coordination game
g) A game of chicken
h) A game of battle of the sexes
i) A constant sum game

Game 4.1

	L	R
T	1 , 4	2 , 3
B	3 , 2	4 , 1

Game 4.2

	L	R
T	1 , 1	2 , 2
B	2 , 2	1 , 1

Game 4.3

	L	R
T	3 , 3	3 , 4
B	4 , 3	1 , 1

Game 4.4

	L	R
T	2 , 4	3 , 3
B	1 , 1	1 , 2

Game 4.5

	L	R
T	3 , 3	1 , 4
B	4 , 1	2 , 2

Game 4.6

	L	R
T	3 , 4	2 , 2
B	1 , 1	4 , 3

Game 4.7

	L	R
T	1 , 2	3 , 3
B	4 , 4	2 , 1

Game 4.8

	L	R
T	1 , 4	3 , 2
B	2 , 3	4 , 1

Game 4.9

	L	R
T	1 , 1	3 , 4
B	1 , 2	4 , 1

Game 4.10

	L	R
T	2 , 3	3 , 4
B	1 , 2	4 , 1

Q5 2 Tough Love (20 marks, 10 for each part, 2 parts)

Teenager/parent relationships are complex. But let's examine a simplified version of one small piece of interaction we might call the "tough love" game . A young teenager has to make a choice between staying out late on a school night (LATE) or being home early (EARLY). Her parent has to decide between being TOUGH, aggressively challenging and interrogating their daughter, or being SOFT, avoiding any confrontation and not mentioning the incident. IF the parent and teenager were playing a simultaneous game the payoffs for the various strategy combinations would look like those in the following table, with a poor , ranks 2,3, dominance solvable Nash Equilibrium with the parent being tough and the teen coming home late (those mutually preferred payoffs with the teen coming home early and the parent being soft 3,4 just aren't an equilibrium). Being tough doesn't work here because the teen "doesn't care" in one sense, ie she has a dominant strategy to stay out late, in this game.

		PARENT	
TEENAGER		SOFT	TOUGH
	EARLY	3 , 4	1 , 2
	LATE	4 , 1	2 , 3

But perhaps the real game being played here is sequential not simultaneous, with the Teenager moving first, and the Parent moving second. Using the same payoffs as in the Table:

Q5a Draw and clearly label the game tree for this sequential game and analyse the game pruning relevant branches to show the rollback path of play and outcomes.

Q5b Take the sequential game in 5a and analyse it as a simultaneous game: ie, identify the strategies for all players, draw an appropriate payoff matrix for the game, and analyse this simultaneous game. Find all of the pure strategy Nash equilibria for this game and briefly explain the similarities and differences from your answer to part 5a.