University of California, Davis -- Department of Economics

ECN 122 : Game Theory Professor Giacomo Bonanno

Spring 2024 - FIRST MIDTERM EXAM **Version 2**

Answer all questions. **If you don't explain (= show your work for) your answers you will get no credit.**

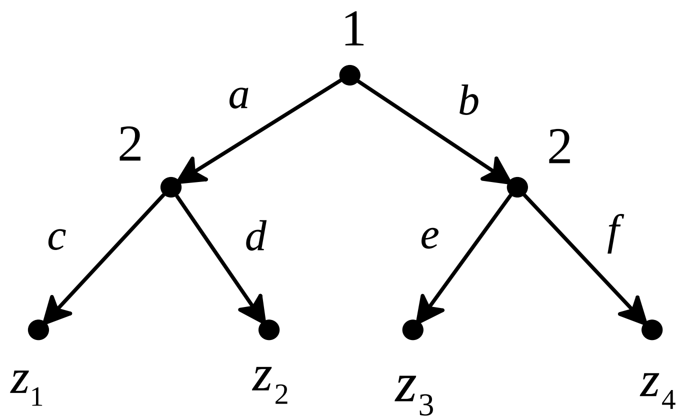
NAME:______________________________University ID:_____________________

CIRCLE THE NAME OF YOUR TA: Kalyani Chaudhuri or **Junghwan Ryu**

If you don't know the name of your TA, then write your Section Number: ________________

- **By writing your name on this exam you certify that you have not violated the University's Code of Academic Contact** (for example, you have not copied from the work of another student and you have not knowingly facilitated cheating by another student).
- **If you submit the exam without writing your name and ID, you will get a score of 0 for this exam.**
- **If you do not stop writing when told so (at the end), a penalty of 10 points will be deducted from your score.**

1. [26 points] Consider the following extensive-form game-frame with perfect information:



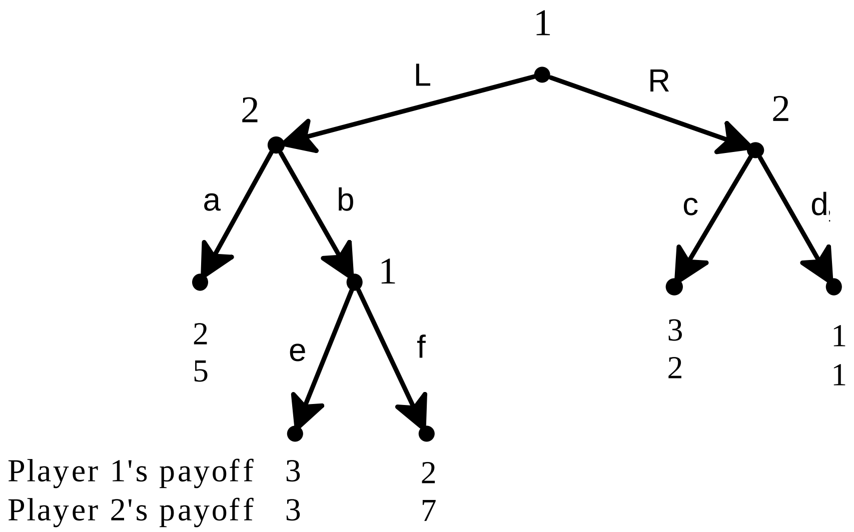
The players have complete and transitive preferences over the set of outcomes $\{z_1, z_2, z_3, z_4\}$ and the preferences are such that the corresponding game has exactly three backward-induction solutions, namely $(a,(d,f))$, $(b,(d,f))$ and $(b,(d,e))$.

(a) [8 points] What can you infer about the preferences of Player 1?

(b) [8 points] What can you infer about the preferences of Player 2?

(c) [10 points] Write all the complete and transitive preference relations of **Player 1** that are compatible with the above information.

2. [27 points] Consider the following perfect-information game.



(a) [10 points] Write the corresponding strategic form.

(b) [10 points] List all the (pure-strategy) Nash equilibria.

(c) [7 points] Which of the Nash equilibria is also a backward induction solution?

3. [35 points] Consider the following game with ordinal payoffs (*a* and *b* can be any non-negative integers):

Player 2

Player 1	F	G	H
A	2 , 1	1 , 0	3 , 4
B	3 , 2	2 , ***b***	4 , 2
C	***a*** , 3	1 , 4	3 , 4
D	2 , 4	0 , 3	2 , 3
E	1 , 2	0 , 1	3 , 2

(a) [3 points] For what values of *b* does Player 2 have a **weakly dominant** strategy?

(b) **(b.1)** [2 points] For what values of *a* does Player 1 have a **strictly dominant** strategy?

(b.2) [2 points] Name the strategy.

(c) **(c.1)** [2 points] For what values of *a* does Player 1 have a **weakly but not strictly dominant** strategy?

(c.2) [2 points] Name the strategy.

(d) [6 points] For what values of *a* and *b* does the game have an **odd** number of pure-strategy Nash equilibria? Name the Nash equilibria.

Player 1		Player 2: F	G	H
	A	2 , 1	1 , 0	3 , 4
	B	3 , 2	2 , ***b***	4 , 2
	C	***a*** , 3	1 , 4	3 , 4
	D	2 , 4	0 , 3	2 , 3
	E	1 , 2	0 , 1	3 , 2

(e) [6 points] For what values of *a* and *b* does the game have an **even** number of pure-strategy Nash equilibria? Name the Nash equilibria.

(f) [6 points] For what values of *a* and *b* does the iterated deletion of **weakly** dominated strategies lead to two strategy profiles? Name the two profiles.

(g) [6 points] For what values of *a* and *b* does the iterated deletion of **weakly** dominated strategies lead to a unique strategy profile? Name the profile.

4. [12 points] Consider the following two-player strategic-form game. Player 1 has five strategies: a, b, c, d and e and Player 2 has four strategies: k, m, n and s.

For Player 1:

- a is equivalent to b
- c strictly dominates b
- c is equivalent to d
- b weakly dominates e

For Player 2:

- k is equivalent to m
- m strictly dominates s
- s weakly dominates n

List all the pure-strategy Nash equilibria of this game.