

# Econ 327: Game Theory

## Practice Final Exam

University of Oregon

March 20, 2024

### Version 1

Question	1.	2.	3.	4.	Total
Points	8	16	20	16	60
Score					

- Complete *all* questions and parts. All questions will be graded.
- Carefully explain all your answers on short and long answer questions.

An incorrect answer with clear explanation will earn partial credit, an incorrect answer with no work will get zero points.

- If you do not understand what a question is asking for, ask for clarification.

#### Allowed Materials:

- A single 5" by 3" note card
- A non-programmable calculator
- Pencils, color pens, eraser, ruler/straight-edge etc.

Name \_\_\_\_\_

Answer the questions in the spaces provided on the question sheets. If you run out of room for an answer, continue on the back of the page or another sheet of paper.
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## Short Answer

### Question 1. (8 P.)

You are the Dean of the Faculty at St. Anford University. You hire Assistant Professors for a probationary period of 7 years, after which they come up for tenure and are either promoted and gain a job for life or turned down, in which case they must find another job elsewhere. Your Assistant Professors come in two types, Good and Brilliant. Any types worse than Good have already been weeded out in the hiring process, but you cannot directly distinguish between Good and Brilliant types. Each individual Assistant Professor knows whether he or she is Brilliant or merely Good. You would like to tenure only the Brilliant types. The payoff from a tenured career at St. Anford is \$6 million; think of this as the expected discounted present value of salaries, consulting fees, and book royalties, plus the monetary equivalent of the pride and joy that the faculty member and his or her family would get from being tenured at St. Anford. Anyone denied tenure at St. Anford will get a faculty position at Boondocks College, and the present value of that career is \$1 million. Your faculty can do research and publish the findings. But each publication requires effort and time and causes strain on the family; all these are costly to the faculty member. The monetary equivalent of this cost is \$25,000 per publication for a Brilliant Assistant Professor and \$50,000 per publication for a Good one. You can set a minimum number,  $N$ , of publications that an Assistant Professor must produce in order to achieve tenure.

A) (4 P.) What is the minimum number  $N$  you could require so that only *brilliant* professors apply and *good* professors don't apply?

B) (4 P.) What is the maximum number  $N$  that you could require so that *brilliant* professors still want to apply?

## Long Answer

### Question 2. (16 P.)

Consider the strategic form game below:

		$P_2$			
		<b>Hall</b>	<b>Office</b>	<b>Library</b>	<b>Bathroom</b>
$P_1$	<b>Roof</b>	0 , 2	1 , 1	0 , 2	5, 0
	<b>Mezzanine</b>	1 , 1	0 , 2	0 , 2	4, 0
	<b>Ground</b>	0 , 2	0 , 2	1 , 0	3, -1

A) (4 P.) Find any **pure strategy** Nash equilibria

B) (6 P.) Consider the following mixed strategy profile:

- Player 1 plays 1/3 **Roof**, 0 **Mezzanine**, and 2/3 **Ground**
- Player 2 plays 0 **Hall**, 1/2 **Office**, 1/2 **Library**, and 0 **Bathroom**

Check whether this is a **mixed strategy Nash equilibrium** and explain why or why not.

C) (6 P.) Now consider the strategy profile:

- Player 1 plays 1/4 **Roof**, 1/2 **Mezzanine**, and 1/4 **Ground**
- Player 2 plays 1/3 **Hall**, 1/3 **Office**, 1/3 **Library**, and 0 **Bathroom**

Check whether this is a **mixed strategy Nash equilibrium** and explain why or why not.

**Question 3.** (20 P.)

Consider a Wild West shootout between Earp and the Stranger.

With probability .75, the Stranger is a Gunslinger type and the table shows Earp's and the Stranger's payoffs

		Gunslinger Stranger	
		Draw	Wait
Earp	Draw	2, 3	3, 1
	Wait	1, 4	8, 2

But with probability .25, the Stranger is a Cowpoke type and the table shows Earp's and the Stranger's payoffs

		Cowpoke Stranger	
		Draw	Wait
Earp	Draw	5, 2	4, 1
	Wait	6, 3	8, 4

A) (4 P.) What is the Nash equilibrium **when Earp is always a Gunslinger**?

B) (4 P.) What is the Nash equilibrium **when Earp is always a Cowpoke**?

C) (6 P.) Show whether there is a *Separating* equilibrium where a Gunslinger Stranger will choose Draw and a Cowpoke Stranger will choose Wait.

D) (6 P.) Consider a strategic move variation where the Gunslinger can commit to only playing Wait before Nature has assigned them a type.

Is this type of commitment *credible*? Why or why not?

**Question 4.** (16 P.)

Consider the strategic form game below:

		Column	
		Cooperate	Defect
Row	Cooperate	8 , 8	0, 10
	Defect	10 , 0	3 , 3

- A) (4 P.) What will happen when this game is a *one-shot* game and neither player can make any strategic moves?
- B) (2 P.) Will this outcome be *Pareto optimal*?
- C) (4 P.) What could you change about the structure of this game to ensure that a socially optimal outcome will be reached in equilibrium?
- D) (6 P.) Suppose that both players have a *discount factor* of  $\delta = 3/4$ . Can a strategy profile of both players using *grim trigger* strategies be sustained in the game where the strategic form game above is repeated infinitely?  
Show all calculations and explain your answer.