



Stockholm  
University

Department of Economics

**Course name:** Economic Strategic Thinking  
**Course code:** EC2109  
**Type of exam:** Re-take  
**Examiner:** Robert Östling  
**Number of credits:** 7,5 credits  
**Date of exam:** Sunday April 29 2018  
**Examination time:** 3 hours (09:00-12:00)

**Write your exam identification number on each answer sheet (the number stated in the upper right hand corner on your exam cover).**

**Use the multiple-choice answer sheet for all questions in Part A and separate answer sheets for the questions in Part B.** Explain notions/concepts and symbols. If you think that a question is vaguely formulated, specify the conditions used for solving it. Only legible exams will be marked. **No aids are allowed.**

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The exam consists of 7 questions. Each question is worth 8 to 30 points, 100 points in total. For the grade E 45 points are required, for D 50 points, C 60 points, B 75 points and A 90 points.

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Your results will be made available on your Ladok account ([www.student.ladok.se](http://www.student.ladok.se)) within 15 working days from the date of the examination.

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**Good luck!**

## PART A: Multiple-choice questions

Indicate one alternative per question only. Correct answers give 8 points, incorrect answers minus 2 points.

### QUESTION 1 (8 POINTS)

Two firms, A and B, have to decide how much production capacity to invest in. Firm A first makes a decision. Firm B observes Firm A's chosen quantity and then chooses capacity. Firm A's profit when Firm A chooses capacity  $Q_A$  is  $\Pi_A = P \times Q_A - 5 \times Q_A$  and Firm B's profit with capacity  $Q_B$  is  $\Pi_B = P \times Q_B - 5 \times Q_B$ . The price  $P$  is determined after both firms have chosen capacity and is equal to  $P = 125 - Q_A - Q_B$ . Which capacity does Firm A choose in the subgame perfect Nash equilibrium of this game (assuming both firms maximize profits)?

- (A) 0
- (B) 30
- (C) 40
- (D) 60
- (E) None of the above alternatives.

### QUESTION 2 (8 POINTS)

A kicker in a penalty shoot-out has to kick the ball to the left or to the right, whereas the goalkeeper simultaneously dives to the left or to the right. The kicker tries to maximize the probability of scoring and the goalkeeper tries to maximize the probability that the kicker does not score. These probabilities are shown in the payoff matrix below, i.e., 80,20 means there is an 80 percent chance the kicker does not score and a 20 percent that the kicker scores.

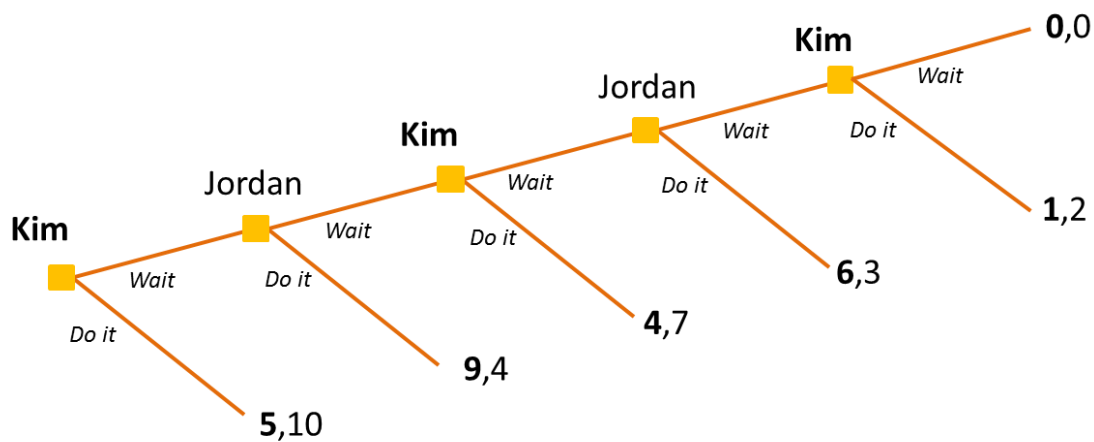
		Kicker	
		Left	Right
Goalkeeper	Left	80,20	0,100
	Right	0,100	80,20

Suppose the kicker has an injured leg so that the probability that the kicker scores when kicking left and the goalkeeper dives to the left decreases to 10 percent. In other words, the payoff in the upper left corner changes from 80,20 to 90,10. How does this change affect the mixed-strategy Nash equilibrium of the game?

- (A) The mixed-strategy Nash equilibrium is unchanged.
- (B) Both the goalkeeper and kicker are more likely to kick/dive to the left.
- (C) The goalkeeper is more likely to dive to the right and the kicker more likely to kick to the left.
- (D) The goalkeeper is more likely to dive to the left and the kicker more likely to kick to the right.
- (E) Both the goalkeeper and kicker are more likely to kick/dive to the right.

**QUESTION 3 (8 POINTS)**

Kim or Jordan have to empty a septic tank of a neighbour. They prefer to do it sooner rather than later, but each of them prefers the other to do it. The situation is shown in the game tree below. What is the outcome of the subgame perfect Nash equilibrium of this game?



- (A) Kim empties the tank at the first node
- (B) Kim empties the tank at the third node
- (C) Kim empties the tank at the last node
- (D) Jordan empties the tank at the second node
- (E) Jordan empties the tank at the fourth node

**QUESTION 4 (8 POINTS)**

Consider the following two-player game. How many pure strategy Nash equilibria does the game have and what is the sum of payoffs to both players in the efficient pure-strategy equilibrium?

		Column			
		W	X	Y	Z
Row	A	83,83	20,20	4,8	0,90
	B	70,50	65,65	0,15	0,70
	C	70,10	18,18	5,20	0,0
	D	20,20	70,0	1,2	0,100
	E	10,0	10,0	2,0	1,1

- (A) One pure-strategy NE and payoff sum is 2.
- (B) One pure-strategy NE and payoff sum is 166.
- (C) Two pure-strategy NE and payoff sum in efficient pure-strategy NE is 25.
- (D) Three pure-strategy NE and payoff sum in efficient pure-strategy NE is 130.
- (E) None of the above alternatives.

**QUESTION 5 (8 POINTS)**

Consider the following simultaneous-move game in which Player 1 can be of two types, either type A or B. If Player 1 is of type A, the payoffs are as in the top matrix, whereas the payoffs are shown in the bottom matrix if Player 1 is of type B. Player 1 knows his/her own type, but Player 2 does not know Player 1's type. The probability that player 1 is of type A is 20% and the probability that player B is of type B is 80%. What is the outcome in the pure-strategy Bayesian Nash equilibrium (BNE) of this simultaneous-move game?

20%		<b>Player 2</b>	
		Left	Right
<b>Player 1 (Type A)</b>	Top	0,0	40,100
	Bottom	100,40	0,0
80%		<b>Player 2</b>	
		Left	Right
<b>Player 1 (Type B)</b>	Top	0,0	-20,100
	Bottom	100,40	0,0

- (A) There are two BNE resulting in either Bottom-Left or Top-Right.
- (B) There is one BNE resulting in Bottom-Left.
- (C) There is one BNE resulting in Top-Right.
- (D) The game does not have a pure-strategy BNE.
- (E) None of the above alternatives is correct.

## PART B: Open-ended questions

Clearly motivate your answers to the following questions and explain any calculations that you make!

### QUESTION 6 (30 POINTS)

Rikard Forslid and Sten Nyberg, two economists at Stockholm University, argues in a recent paper that the sequencing of moves in the Brexit negotiations is important for the outcome of the negotiations. They assume that UK unilaterally decides on labor mobility between UK and EU, whereas EU decides on trade policy. A simplified description of the strategic situation is given in the payoff matrix below.

		EU	
		Free trade	Trade restrictions
UK	Free labor mobility	75,100	0,75
	Restricted labor mobility	100,50	50,60

EU has a preference for free trade and free labor mobility. However, if UK restricts labor mobility, EU prefers to restrict trade because EU is worried that other countries might follow UK's example and leave the union. UK prefers free trade too, but they want to restrict labor mobility.

(A) (6 POINTS) What is the Nash equilibrium of the game if EU and UK choose actions simultaneously and independently of each other?

(B) (6 POINTS) What is the subgame perfect Nash equilibrium if UK first decides on labor mobility and EU decides on trade policy after observing UK's choice?

(C) (6 POINTS) What is the subgame perfect Nash equilibrium if EU first decides on trade policy and UK decide on labor mobility after observing EU's choice?

(D) (6 POINTS) Given your answers in (A) to (C), which move order would you suggest in the Brexit negotiations?

(E) (6 POINTS) UK Prime Minister Theresa May is likely to be worried if the Brexit negotiations result in free labor mobility. Please suggest at least one strategic move that she could make in order to make it more likely that the negotiations result in free trade and restricted labor mobility (i.e. the bottom left outcome in the payoff matrix)?

### QUESTION 7 (30 POINTS)

The average corporate income tax (i.e. the tax corporations pay on profits) in OECD countries has gradually decreased over time, from around 50 percent in the early 1980s to less than 30 percent today.

(A) (20 POINTS) Please discuss this trend towards lower corporate income taxes in light of the strategic incentives that countries face when they set corporate tax rates.

(B) (10 POINTS) Suggest and discuss at least two strategic moves that could be used to break the trend towards lower corporate tax rates.