Stockholm University

Department of Economics

Course name:	**Economic Strategic Thinking**
Course code:	**EC2109**
Type of exam:	**MAIN**
Examiner:	**Robert Östling**
Number of credits:	**7,5 credits (hp)**
Date of exam:	**Monday 14 March 2016**
Examination time:	**3 hours (14:00-17:00)**

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

Use one cover sheet for all questions in Part A and one cover sheet per question 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.**

The exam consists of 7 questions. Each question is worth 8 to 35 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.

Your results will be made available on your "My Studies" account (www.mitt.su.se) on Tuesday 5 April 2016 at the latest.

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)

Alexis and Madison have been playing their own version of Rock-Papers-Scissors for a while. They have learnt to play it really well and suspect that their play is consistent with the mixed-strategy Nash equilibrium of the game, but they cannot quite figure out the solution. Can you help them? What is the mixed-strategy Nash equilibrium of this game?

		Madison		
		Rock	Paper	Scissors
Alexis	Handbag	1,0	0,1	0,-1
	Water	0,1	2,0	1,-1

(A) Alexis plays (1/2, 1/2) and Madison plays (1/3, 2/3, 0).
(B) Alexis plays (1/4, 3/4) and Madison plays (1/3, 1/3, 1/3).
(C) Alexis plays (1/3, 2/3) and Madison plays (2/4, 1/4, 1/4).
(D) Alexis plays (1/2, 1/2) and Madison plays (2/3, 1/3, 0).
(E) None of the above alternatives.

QUESTION 2 (8 POINTS)

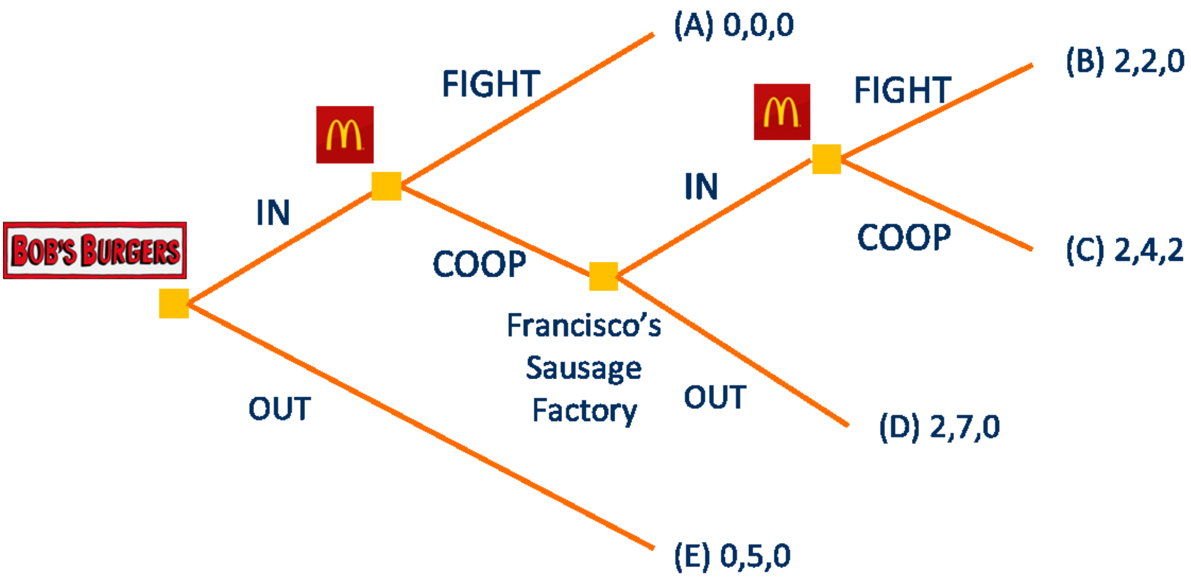
In which type of auction is it in your interest to bid truthfully (i.e. bid your valuation or best guess of the value of the object)? We assume that you want to maximize earnings and are risk neutral.

(A) Common-value English (= ascending open outcry) auction
(B) Private-value Dutch (= descending open outcry) auction
(C) Private-value sealed-bid second-price auction
(D) Private-value sealed-bid first-price auction
(E) All-pay auction

QUESTION 3 (8 POINTS)

(This game is a version of a famous game theory problem called the chain-store paradox.)

Bob is considering setting up a hamburger restaurant to compete with McDonald's down on Ocean Avenue. If he sets up his business, McDonald's faces a choice between competing aggressively or to cooperate with Bob. If Bob stays out from the market, he earns nothing and McDonald's earn $5 million. If he opens his business and McDonald's competes aggressively, they both earn zero, whereas if McDonald's plays nicely, they both earn $2 million. If Bob's Burgers makes a profit, Francisco is inspired to set up his own fast food restaurant in another part of town, Francisco's Sausage Factory, and he then faces the same situation as Bob. The game just described is summarized in the game tree below. Payoffs are denoted (B,M,F) where B is Bob's profit, M the profit of McDonald's and F is Francisco's profit. Assuming that all three players only care about maximizing their profits, what is the outcome in the subgame perfect Nash equilibrium?



(A) Bob's Burgers enters and McDonald's fight back.
(B) Both Bob's Burgers and Francisco's Sausage Factory enter, McDonald's cooperates with Bob but fight back when Francisco enter.
(C) Both Bob's Burgers and Francisco's Sausage Factory enter, McDonald's cooperates with both.
(D) Bob's Burgers enters, McDonald's cooperates, but then Francisco stays out.
(E) Bob's Burgers stays out.

QUESTION 4 (8 POINTS)
Consider the following two-player simultaneous-move game. How many pure strategy Nash equilibria does the game have and which are these equilibria?

		Column			
		W	X	Y	Z
Row	A	200,200	-100,201	-200,202	-300,203
	B	201,-100	201,200	499,300	-200,-100
	C	202,-200	-300,300	500,200	-100,-100
	D	203,-300	200,200	100,200	-50,-100
	E	205,-400	-100,-300	-100,-200	-25,-100

(A) The game only has no pure strategy Nash equilibrium.
(B) The only pure-strategy Nash equilibrium is (A,W).
(C) The only pure-strategy Nash equilibrium is (E,Z).
(D) There are two pure-strategy Nash equilibria: (D,X) and (E,Z).
(E) There are three pure-strategy Nash equilibria: (A,W), (B,Y) and (E,Z).

QUESTION 5 (8 POINTS)
Suppose there are two types of used-car dealers. High-quality dealers only sell used cars that they have carefully checked, so the risk that the cars they sell needs to be repaired in a year is 20%. Low-quality dealers are not so careful in checking cars that they sell, and the risk that cars bought from them breaks down and need repairing is 50% in a year. It costs dealers 20000 SEK to repair a car if it breaks down. Suppose the high-quality dealer offers a warranty of X years that covers all repairs. The expected cost of an X year warranty is consequently 0.5*X*20000 for the low-quality dealer and 0.2*X*20000 for the high-quality dealer. Suppose that both used-car dealers somehow get cars for free and that consumers are willing to buy high-quality cars for 100000 SEK, but low-quality cars for only 50000 SEK. If no warranty is provided, customers assume the car is a low quality car. For what range of X values can a warranty be used as a signal to credibly distinguish high-quality dealers from a low-quality dealers?

(A) There is no separating outcome in this case.
(B) A warranty between 5 and 25 years would work to separate high and low-quality dealers.
(C) A warranty shorter than 12.5 years would work to separate high and low-quality dealers.
(D) A warranty of at least 5 years would work to separate high and low-quality dealers.
(E) A warranty between 5 and 12.5 years would work to separate high and low-quality dealers.

PART B: Open-ended questions

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

QUESTION 6 (35 POINTS)

Three students are working together on some joint project. Each student independently and simultaneously chooses how much time to devote to the project. Suppose they have the choice whether to put in no time at all, spend 1 day or 2 days on the project. The students have an extra job that pays them 1500 SEK for one day of work, so this is the cost of spending time on the project. Their payoff (measured in SEK) from the project depends on how much time all three students devote to the project. (The payoff could for example result from higher expected future earnings due to better grades if the project is related to their university studies). For part (A) to (D) of the question, we assume that the students strive to maximize their monetary earnings.

(A) (7 POINTS) What is the pure-strategy Nash equilibrium if the monetary benefit to each student is 4000 SEK multiplied by the **average** numbers of days spent on the project? Hint: Let the sum of the contribution of the other two players be denoted Y. Then the payoff from spending X days is $4000*(X+Y)/3 – 1500*X$.

(B) (7 POINTS) What are the pure-strategy Nash equilibria if the benefit is 4000 SEK multiplied by the number of days spent by the student that spent the **least** time on the project?

(C) (7 POINTS) What are the pure-strategy Nash equilibria if the benefit is 4000 SEK multiplied by the number of days spent by the student that spends **the most** time on the project?

(D) (7 POINTS) In terms of the different types of simultaneous-move two-player games with two strategies for each player that were discussed in class (Hi-Lo Coordination, Chicken, etc), which are most similar to the case in (A), (B) and (C)? Motivate your answer.

(E) (7 POINTS) Suppose that you and two other students are playing this game and that you could choose whether the project payoff was determined as in (A) or (B). Which situation would you choose to be in? Make sure to relate your answer both to theory and empirical evidence discussed in the course.

QUESTION 7 (25 POINTS)

According to media reports, the EU and Turkey last week made the following agreement:

> All refugees going by boat from Turkey to EU will be directly sent back to Turkey. For every refugee that is sent back, EU will admit another refugee from Turkey. Refugees that tried to enter EU via boat and are sent back to Turkey will be put last in the queue of refugees that EU admits.

Although it is very unclear whether this is a correct interpretation of the agreement and whether it will actually be implemented, let us assume for both parts of this question that this is the agreement that will be implemented and that both Turkey and EU will stick to it. We focus on game-theoretical aspects of this agreement, and leave other important considerations aside (for example whether the agreement is consistent with international law and human rights).

(A) (15 POINTS) Use your newly acquired game theory skills to predict how many refugees that EU will accept as a part of this agreement with Turkey! Motivate your answer. (EU might admit refugees outside this agreement, but this is outside the scope of this question.)

(B) (10 POINTS) Discuss whether there are any strategic moves that the involved parties (EU, Turkey and the refugees) could make to improve their situation? I realize that you might have a strong opinion about how many refugees EU should admit, but for the purpose of this question, we assume that both EU and Turkey wants to lower the number of refugees they take responsibility for and that all refugees prefer EU over Turkey.