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:	**Wednesday 15 March 2017**
Examination time:	**3 hours (09:00-12:00)**

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

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 8 questions. Each question is worth 8 to 28 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 April 5 at the latest.

Good luck!

PART A: Multiple-choice questions

Indicate one alternative per question on the separate answer sheet provided. Correct answers give 8 points, incorrect answers minus 2 points.

QUESTION 1 (8 POINTS)

A child is at a friend's place and is asked by the friend whether she would like fruit or ice-cream as an afternoon snack. At the same time, the kid's parent is at home preparing dinner. The parent prefers pizza over a fish dish (utility 5 vs 4) if the child had fruit to eat in the afternoon. However, if the kid had ice cream in the afternoon, the parent feels terrible giving the child pizza for dinner (too much unhealthy food in a day) and suffers a utility cost of 4. The kid's utility from eating pizza is 5 and fish gives -3. Ice-cream gives the utility 5 whereas fruit gives 3. These utilities are summarized in the following game matrix.

		Parent	
		Pizza	Fish
Child	Fruit	8,5	0,4
	Ice cream	10,1	2,4

Comparing the pure-strategy Nash equilibrium when they choose actions simultaneously to the subgame perfect Nash equilibrium when one gets to choose first (and this is observed by the other), which of the following statements are true about move-order advantages in this game?

(A) Both the parent and child gain when the child moves first.
(B) Both the parent and child gain when the parent moves first.
(C) Only the child gains when the child moves first.
(D) Only the parent gains when the child moves first.
(E) The order of moves is irrelevant.

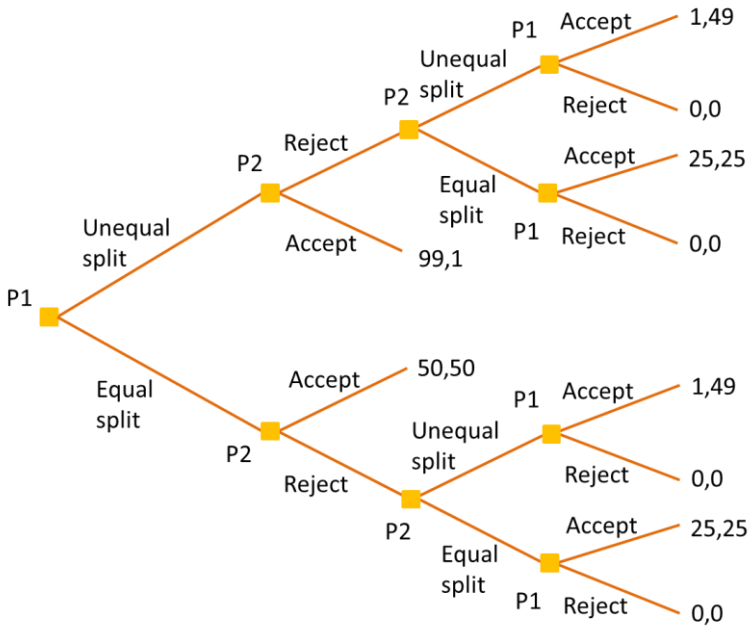
QUESTION 2 (8 POINTS)

Consider the following two-player game. What strategy profiles are pure-strategy Nash equilibria of this game?

		Column			
		W	X	Y	Z
Row	A	73,83	10,20	-4,8	0,84
	B	60,50	60,65	-10,15	0,30
	C	60,10	8,18	-5,20	0,0
	D	10,20	60,0	-9,2	0,30
	E	0,0	0,0	200,0	1,1

(A) (B,X) and (E,Z).
(B) (E,Z).
(C) (A,W), (E,Y) and (E,Z).
(D) (A,W), (B,X) and (E,Z).
(E) None of the above alternatives.

QUESTION 3 (8 POINTS)
Consider the "alternating-offers bargaining game" shown below in which Player 1 (P1) first proposes how to split 100 SEK (either 50-50 or 99-1). Player 2 (P2) then has the choice to accept or reject. If P2 accepts, the game is over and they each get what P1 proposed. If P2 rejects P1's proposal, the total amount to be shared shrinks and P2 gets to make a counterproposal how to split 50 SEK which P1 then has to either accept or reject. Assuming that players only care about getting as much money as possible, how much does P1 get in the subgame perfect Nash equilibrium?



(A) 0
(B) 1
(C) 49
(D) 50
(E) 99

QUESTION 4 (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 (=open outcry, ascending) auction
(B) Private-value Dutch (=open outcry, descending) auction
(C) Private-value sealed-bid second-price auction
(D) Private-value sealed-bid first-price auction
(E) All-pay auction

QUESTION 5 (8 POINTS)
The relationship between North Korea and the US is quite tense. Suppose that North Korea has access to nuclear weapons that can reach the US and that they are considering a nuclear attack. If they both attack, that causes a lot of mutual harm, and the payoff is -10 to both parties, whereas if they both abstain they get a payoff of 10. Not attacking is risky, however, and the country that is hit by a unilateral attack gets a payoff of -20. This game has two pure strategy Nash equilibria and so far the efficient equilibrium has been played. Suppose that they instead switch to playing the mixed strategy equilibrium of this game. What would the probability of peace (i.e. both not attacking) be in this case?

		Kim Jong-un	
		Attack	No attack
Donald Trump	Attack	-10,-10	0,-20
	No attack	-20,0	10,10

(A) 75 percent
(B) 50 percent
(C) 33 percent
(D) 25 percent
(E) None of the above alternatives.

QUESTION 6 (8 POINTS)
Beverly and Francis run two firms that are producing health products. They are now both considering expanding and opening factories that produce homeopathic drugs (which are in high demand despite being useless). They both have to make a decision about how large the production capacity of their factories should be. Both of them choose capacity independently and simultaneously.

Beverly's profit function when Beverly chooses capacity Q_B is $\Pi_B = P \times Q_B - 5 \times Q_B$ and Francis' profit with capacity Q_F is $\Pi_F = P \times Q_F - 5 \times Q_F$. The price of the drug when they produce Q_B and Q_F units is $P = 125 - Q_B - Q_F$. Which capacity does Beverly choose in the Nash equilibrium of this game?

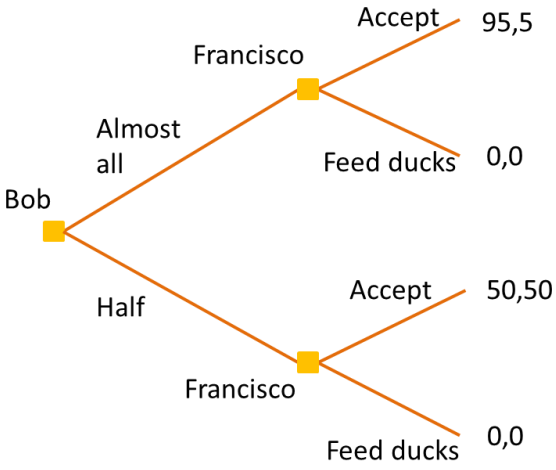
(A) 0
(B) 20
(C) 40
(D) 60
(E) None of the above alternatives.

PART B: Open-ended questions

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

QUESTION 7 (24 POINTS)

Bob and Francisco plan to share a cinnamon roll to celebrate their first anniversary. They have decided that Bob is going to take a part of the roll and that Francisco can then choose to either eat the rest of it or to give the whole roll to some ducks in a nearby pond. This situation can be represented by the game shown below. In part (A) to (C) of this question we assume that the numbers below represent calories and that Bob and Francisco only care about maximizing their own calorie intake.



(A) (6 POINTS) What is the subgame perfect Nash equilibrium of this game?

(B) (6 POINTS) Write down the payoff matrix for the simultaneous-move version of this game. Find all pure-strategy Nash equilibria of the game.

(C) (6 POINTS) Are there Nash equilibria that are not subgame perfect? If so, argue why these equilbria are not credible.

(D) (6 POINTS) Discuss what you think would happen in a real-life situation like this (i) among two people who know each other well and (ii) by students participating in an experiment that are anonymous to each other?

QUESTION 8 (28 POINTS)

Last week, the scientific journal *Proceedings of the National Academy of Sciences* (PNAS) published an article that uses data from a housing company in Stockholm. The results are summarized as follows in the abstract of the paper:

"We show that a simple and common price incentive is highly effective in reducing electric energy consumption (EEC). When EEC is billed and metered at the apartment level compared with when tenants have unlimited EEC included in the rent, annual EEC falls by about 25%. Moreover, the reduction in EEC comes almost exclusively from households with very high EEC before the policy change. The results suggest that most tenants benefit, whereas only a small group of free riders stand to lose from this policy change."

(A) (20 POINTS) How would you explain the findings of this paper drawing on what you have learnt in this course?

(B) (8 POINTS) The experiment involved thousands of tenants of a large housing company. Suppose instead that a similar policy change to apartment-level metering and billing was implemented in a small private housing association ("bostadsrättsförening" in Swedish) consisting of just a few apartments. Do you think the energy consumption reduction would be similar?