Candidate instructions

This is some important information about the take-home exam in ECON5200/9200. Please read this carefully before you start answering the exam.

Exam period: Monday, December 10 at 08.00 to Thursday December 13 at 10.00

Guidelines: You should upload your text in pdf format - one pdf file for each problem. Do not give the files a name which can identify you. We recommend that you use the course code and your candidate number and/or the number of the problem. Please note that the maximum file size is 1GB.

You can scroll back and forth in the problem set.

You should familiarize yourself with the rules that apply to the use of sources and citations. If you violate the rules, you may be suspected of cheating/attempted cheating.

The problem set: The problem set consists of three problems, with several sub-problems. The three problems will each count one third of the total grade. The sub-problems count as indicated.

Grading: The grades given: A-F, with A as the best and E as the weakest passing grade. F is fail.

Grades are given: Tuesday 8 January 2019.

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Problem 1

Please read carefully the paper "General Equilibrium with Uncertainty Loving Preferences" by Araujo, Chateauneuf, Gama, and Novinski, published in September 2018 in *Econometrica,* pp. 1859-1871. The paper deals with the existence of general equilibrium in a domain that is not covered by our textbook MWG. Then solve the following sub-problems.

1. (15% weight of Problem 1) With the help av an Edgeworth box, present the case of an exchange economy with a risk-averse and a risk-loving agent for which the competitive equilibrium does not exist. Explain why the competitive equilibrium does not exist.
2. (15% weight of Problem 1) Explain the conditions of Proposition 1.1 and how they establish existence of an Arrow-Debreu equilibrium.
3. (15% weight of Problem 1) Proposition 1.1 deals with the case of EU (expected utility) agents. Clarify which properties of EU that are not used in establishing the general result of Theorem 2.1.
4. (15% weight of Problem 1) The paper claims that the result of Theorem 2.1 encompasses a large class of decision markers sensitive to ambiguity (i.e., not haveing a single probability distribution over states). Yet, not all type of preferences can be accommodated. Using the case of maximin expected utility preferences, discuss an example of preferences that cannot be analyzed through the lenses of Theorem 2.1.
5. (15% weight of Problem 1) Propose a utility function that violates assumptions A2 and A3. Why does the theorem fail in this case?
6. (25% weight of Problem 1) Consider the case of example 1.1. Generalize it by assuming the following parametric form of utilities: $u^1(x) = 1 - e^{-ax}$ and $u^2(x) = e^{bx} - 1$ with $a, b > 0$. Interpret *a* and *b*. For each initial distribution of resources, determine the conditions on the parameters *a* and *b* that ensure the existence of a competitive equilibrium. How does this type of result differ from those in the paper? Which type of result do you think is more interesting?

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Problem 2

This problem concerns the *one deviation property* for the concept of a subgame perfect equilibrium in the context of extensive games. The property is also referred to as the *one-shot-deviation principle*, the *one-stage-deviation principle* and the *no-single improvement principle*. It is related to the notion of *unimprovability* for dynamic programming.

Please read carefully "The one-shot-deviation principle for sequential rationality" by Ebbe Henson, Hans Jørgen Jacobsen and Birgitte Sloth, in *Games and Economic Behavior* 1996, **12,** pp. 274-282. Then solve the following sub-problems.

1. (10% weight of Problem 2) What is meant by the *one deviation property* for the concept of a subgame perfect equilibrium? Sketch a proof of the result that the property holds for a finite horizon game with perfect information.
2. (10% weight of Problem 2) Why is the one deviation property extremely important for the applicability of the concept of subgame perfect equilibrium?
3. (10% weight of Problem 2) Give an example of an infinite horizon game for which the one deviation property does not hold.
4. (10% weight of Problem 2) Why does the one deviation property hold for Rubinstein's sequential bargaining game, even though the game has an infinite horizon?
5. (10% weight of Problem 2) What is meant by *continuity at infinity?* Under what conditions is a δ-discounted infinitely repeated game continuous at infinity.
6. (10% weight of Problem 2) Show that the *one deviation property* extends to infinitely horizon games that are continuous at infinity.
7. (30% weight of Problem 2) Use the analysis and results of "The one-shot-deviation principle for sequential rationality" by Hendon et al. (1996) to solve Exercise 227.1 of Osborne and Rubinstein (1994).
8. (10% weight of Problem 2) Why is the result that you have proven by solving Exercise 227.1 useful for establishing the following: For every trembling hand perfect equilibrium β of a finite extensive game with perfect recall, there is a belief system μ such that (β, μ) is a sequential equilibrium of the game.

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Problem 3

Please read carefully "Robustly Coalition-Proof Incentive Mechanisms for Public Good Provision are Voting Mechanisms and Vice Versa", by Bierbrauer and Hellwig, *Review of Economic Studies*, 2016, 83(4), pp. 1440-64. Then solve the following sub-problems.

1. (25% weight of Problem 3) In the example in Section 3.1 of the paper, suppose $n = 2$ and that each type is equally likely and that types are independently distributed. Please derive the "expected externality mechanism" and show when it satisfies budget balance.
2. (15% weight of Problem 3) Try to define a version of "coalition proofness" motivated by the paper.
3. (15% weight of Problem 3) Consider our lectures on social choice: If freferences are single-peaked on the set of alternatives, is selecting the median alternative coalition-proof? Explain.
4. (15% weight of Problem 3) Consider Theorem 1 in the paoper. Show that truth-telling is incentive compatible for the social choice funcitons that are escribed in the theorem.
5. (15% weight of Problem 3) Based on the theorem, describe the set of all "UB-robustly implementable and robustly coalition-proof" social choice functions which also satisfy budget balance.
6. (15% weight of Problem 3) Based on the theorem, describe the set of all "UB-robustly implementable and robustly coalition-proof" social choice functions which also satisfy budget balance and individual rationality.

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