UNIVERSITY OF OSLO
DEPARTMENT OF ECONOMICS

Exam: **ECON4230/4235 – Microeconomic Theory**

Date of exam: Friday, December 3, 2010 **Grades are given: December 21, 2010**

Time for exam: 14:30 p.m. – 17:30 p.m.

The problem set covers 3 pages

Resources allowed:
- No resources allowed

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

Corrected version

The exam consists of 4 problems. They count as indicated. Start by reading through the whole exam, and make sure that you allocate time to answering questions you find easy. You can get a good grade even if there are parts of problems that you do not have time to solve.

Problem 1 (25 %) *General equilibrium analysis*

True or false? Each of the statements below is concerned with an exchange economy. For each of these statements, if true, try to explain why, and if false, describe a situation where the statement is not true.

a) If each consumer chooses a consumption bundle which he/she can afford (given a vector of positive prices and his/her initial endowment), then the resulting allocation is feasible.
b) If each consumer has monotone preferences and consumes the best bundle among those he/she can afford (given a vector of positive prices and his/her initial endowment), and all markets but one clear, then also the last market clears.
c) If the pair of an allocation and a price vector is a Walrasian equilibrium, then it is not possible to make all consumers better off.
d) If it is not possible to make one consumer better off without making another consumer worse off, then there exist an initial endowment and a price vector such that the pair of the allocation and the price vector is a Walrasian equilbirum.
e) If the preferences of one of the consumers are not convex (or equivalently, if the utility function of one of the consumers is not quasi-concave), then there does not exist a Walrasian equilibrium.

Problem 2 (25 %) *Theory of the firm*

Consider a firm which produces an output by means of two inputs. The firm takes the output price, p, and the input prices, w_1 and w_2, as given, and chooses quantities of the output, y, and the inputs, x_1 and x_2, in order to maximize profit.

a) Explain what is meant by the firm's profit function.
b) Explain intuitively why the firm's profit function is convex as a function of p. (Alternatively, give a formal proof of the result that the firm's profit function is convex as a function of p, w_1 and w_2.)
c) Explain why the convexity of the profit function implies that y cannot decrease when p is increased.
d) Is it possible that y does not change when p is increased? (If yes, provide an example; if not, argue why.)
e) Is it possible that profit is not a differentiable function of p? (If yes, provide an example; if not, argue why.)

Problem 3 (25 %) *Partial equilibrium analysis*

Consider a market where the demand function is given by $y = D(p) = p^{-b}$, with $b > 0$.

(a) Assume first that there is a monopoly firm supplying the market with cost function $C(y) = cy$, with $c > 0$. For which values of b does a profit maximizing price exist? What is the profit maximizing price when it exists?
(b) Explain why a profit maximizing price may fail to exist in the situation in part (a).
(c) Assume next that there are n firms supplying the market, where each firm i has the same cost function $C(y_i) = cy_i$, with $c > 0$. Assume that the firms set their quantities simultaneously and independently of each other, and that the market price is determined such that the market demand at that price is equal to the sum of the firms' quantities. Show that a symmetric Nash equilibrium (where all firms produce the same positive quantity) exists if $b > 1/n$. What is the equilibrium price in this case?
(d) Explain why an equilibrium fails to exist in the situation in part (c) if $b \leq 1/n$.
(e) What are the welfare effects of having a higher number of firms supplying the market in the case where the symmetric Nash equilibrium exists?

Problem 4 (25%) *Expected utility*

Let W denote a consumer's wealth, and suppose that there is a probability p that the consumer will lose his entire wealth, e.g. through theft or fires, and would be left with wealth

0 . The consumer may insure his wealth by paying a premium x. Suppose the consumer is an expected utility maximizer and let u denote the vonNeumann-Morgenstern utility function.

(a) Show that if the consumer is just indifferent to purchasing the insurance or not, then $u(W-x) = pu(0) + (1-p)u(W)$.
(b) If the individual is risk neutral, what would be the value of x?
(c) Show that if the consumer is risk averse then $u(W - x/2) > 0.5\,u(W) + 0.5\,u(W-x)$.

Now consider a product called probabilistic insurance, where the subject pays only half the premium, and if the damage occur, then with equal probability either (i) the subject has to pay the rest of the premium and the insurance company cover the losses, or (ii) the insurance company refunds the premium but does not cover the losses.

(d) Show that after a damage has occurred, the subject's expected utility is $0.5u(0) + 0.5u(W-x)$.
(e) Show that if the consumer is risk averse and just indifferent to purchasing the insurance or not, as in (a), then the consumer prefers probabilistic insurance to regular insurance.