UNIVERSITY OF OSLO
DEPARTMENT OF ECONOMICS

Exam: **ECON4240 – Equilibrium, Welfare and Information**

Date of exam: Friday, May 11, 2018 **Grades are given:** May 31, 2018

Time for exam: 09.00 a.m. – 12.00 noon

The problem set covers 5 pages (incl. cover sheet)

Resources allowed:

- No written or printed resources – or calculator - is allowed (except if you have been granted use of a dictionary from the Faculty of Social Sciences)

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

4240 - Equilibrium, Welfare & Information
Final Exam, Spring term 2018

If you get stuck, and have questions or if the text/problem below is confusing/unclear, please do the following: Make and state clearly your assumptions (/interpretations of the text), and continue your analysis based on that.

Problem 1 [20%]

Please circle the letter (A-D) in front of the (unique) correct sentence or answer for each of questions i-viii) below.

i) The second fundamental theorem of welfare economics

A. states that markets always clear.

B. states that market equilibria satisfying certain assumptions are Pareto efficient.

C. characterizes conditions under which we can implement an allocation as a market equilibrium.

D. characterizes conditions under which externalities are absent.

ii) Pareto optimal allocations in an economy

A. characterize the correct utility levels of agents in the absence of externalities.

B. is a normative principle based on equal opportunity.

C. can include allocations where one person consumes everything.

D. imply that Martians consume 50% of vegetable oil.

iii) Proving existence of a competitive equilibrium we made use of the fact that

A. every open set has a closed subset.

B. every continuous function from a closed compact set onto itself has a fixed point.

C. any monotonic function over an open set has a point satisfying $f(x) = x$.

D. any monotonic function has $n \in N$ intersections with 45 degree line.

iv) A model where firms choose their capacities in the first stage and set prices in the second stage

A. results in production patterns similar to those of the Cournot model.

B. delivers the socially optimal product supply.

C. is called the standard Bertrand model.

D. finds that Martians dislike vegetable oil.

v) Adverse selection arises because:

A. insurance buyers have more information than insurance sellers.

B. insurance sellers have more information than insurance buyers.

C. individuals can select which insurance company to patronize.

D. insurance companies can exercise too much control over whom to insure.

vi) Adverse selection in competitive insurance markets harms

A. high risk individuals.

B. low risk individuals.

C. everyone.

D. none of the above.

vii) Issues of moral hazard in credit markets are normally reflected in:

A. borrowers likely choosing a risky project with the possibility of higher returns over a safe project with lower returns.

B. banks lending to bad borrowers even if the probability of success for a safe project is high.

C. borrowers always choosing the safe project even if it implies lower returns.

D. high levels of interest rates charged to similar borrowers.

viii) With moral hazard and a risk averse agent:

A. the principal can exploit the fears of the agent and ensure a larger profit.

B. the principal would optimally bear all the risks.

C. the principal would optimally ask the agent to share profits.

D. none of the above.

Problem 2 [40%]
Two agents, denoted a and b, live in a 2-commodity exchange economy and have the following utility functions:

$$\begin{aligned} U(x^a) &= x_1^a \, x_2^a \\ U(x^b) &= \log(x_1^b) + x_2^b \end{aligned}$$

Initial endowments are $w^a = (18, 4)$ and $w^b = (3, 6)$. All agents are price takers.
Note: The super-indices a and b label the individuals and are not powers.

i) Derive the first agent's demand function $x_1^a(p_1, p_2)$ as a function of prices only.

ii) Derive the second agent's demand function $x_1^b(p_1, p_2)$ as a function of prices only. When optimizing her consumption of the second good please assume an interior solution and briefly comment on the meaning of the corresponding "first order condition".
Note: If you are confused, just proceed as you usually would.

iii) Calculate the excess demand function $z_1(p_1, p_2)$ for the first consumption good and determine the equilibrium price ration and the equilibrium consumption levels.

iv) Assume now that person b's utility function changes to the form

$$U(x^b) = \log(x_1^b) + x_2^b \, \frac{17}{x_1^a}$$

(a) What economic phenomenon does this additional contribution to person b's utility represent?
(name it and describe the economic situation briefly in words)

(b) How does the market equilibrium change?
(no calculation required)

(c) Is the market equilibrium Pareto efficient? If not, suggest a qualitative trade that would improve the situation.

(d) Briefly discuss a policy instrument of your choice that might be useful in this situation, and be specific about how to apply it. Does the regulator need to know the endowments of the individuals to set the right level of the policy?

Problem 3 [40%]
Firm A is a monopolistic producer of a medicine. The firm can produce different levels of quality $q \geq 0$. For each quality q, the unit cost of production is q^2.
Consumer B can purchase only one unit of the medicine. B chooses the quality q depending on the price p_q set by the monopolist (for each quality produced). The utility function of B is: $U = \theta q - p_q$ with $\theta > 0$, if she buys a good of quality q; and $U = 0$, if no good is purchased.

i) Determine the first best solution for the producer (complete information).

ii) Now, assume instead that $\theta \in \left\{\underline{\theta}, \bar{\theta}\right\}$, with $\bar{\theta} > \underline{\theta} > 0$, is not observed by the producer. Market studies reveal to the producer that $Prob\left(\theta = \bar{\theta}\right) = \pi$, with $\pi \in (0, 1)$. State the maximization problem of the producer and compute the second-best solution.
[Hint: note that the high type consumer is the one with the high marginal utility $\bar{\theta}$!]

iii) Assume now that B can hire firm A to produce a medicine of quality q. Assume there are only two levels of quality $q \in \{0, 1\}$, which are not observable by the consumer: B only knows that the high quality medicine is more likely to bring her back to good health. More precisely, let us measure health condition by the random variable $\tilde{\theta}$ which takes values $\theta \in \left\{\underline{\theta}, \bar{\theta}\right\}$ with $Prob\left(\theta = \bar{\theta} \,|q = 1\right) = \pi_1 > \pi_0 = Prob\left(\theta = \bar{\theta} \,|q = 0\right)$. The technology of A and the utility function of B are unchanged. The realization of $\tilde{\theta}$ is observable and can be used in court. Thus, B can offer to the firm a contract that pays a price that depends on the realization of $\tilde{\theta}$, say $p\left(\tilde{\theta}\right)$. State the maximization problem of the consumer (asymmetric information case) and determine the second-best optimum.

iv) What is the implication of introducing limited liability of the firm? Discuss briefly.