UNIVERSITY OF OSLO
DEPARTMENT OF ECONOMICS

Postponed exam: **ECON4240 – Equilibrium, Welfare and Information**

Date of exam: Friday, May 26, 2017

Time for exam: 09:00 a.m. – 12:00 noon

The problem set covers 4 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.

Exam ECON 4240 Equilibrium, Welfare and Information, Spring 2017, POSTPONED EXAM

Total: 80 points.

Part 1. (18 points)

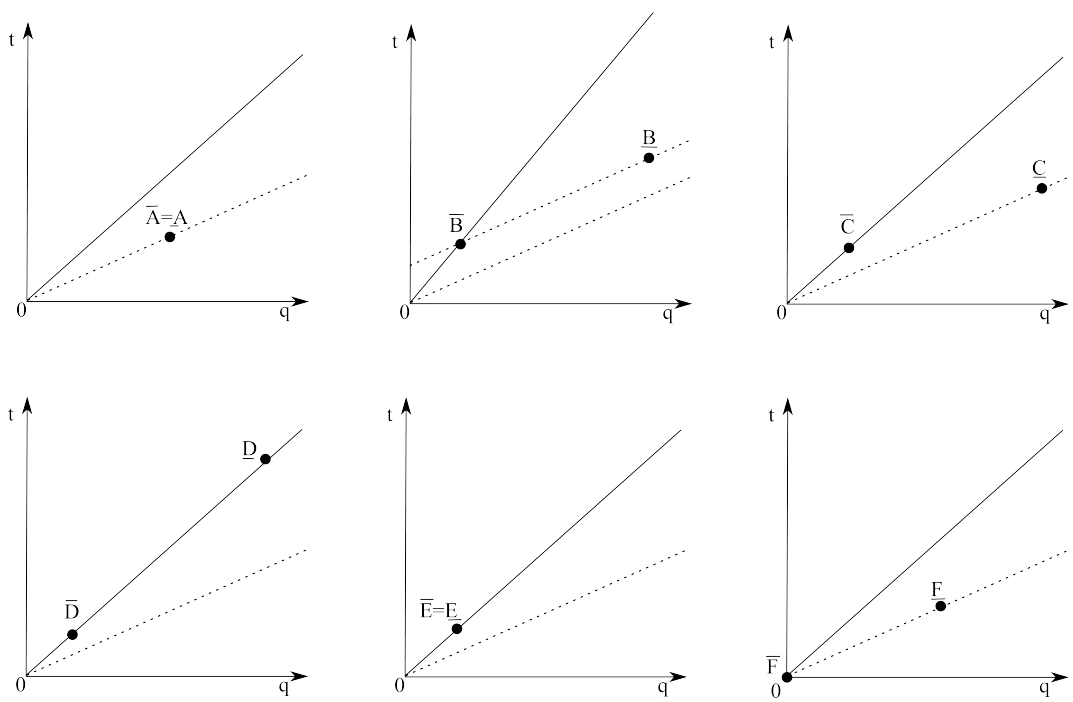
Consider the standard Adverse Selection model analyzed in class and in the textbook: a Principal P with utility function $V = S(q) - t$ and $S' > 0, \quad S'' < 0$, delegates the production of q units of a good to an Agent A. A has utility function $U = t - \theta q$, where $\theta \in \left\{\underline{\theta}, \overline{\theta}\right\}$ and $\overline{\theta} > \underline{\theta} > 0$. The outside option of A is equal to 0.

The graphs below plot some indifference curves of the two types of A in the space of contracts (t, q), together with several menus of contracts.

Which menus satisfy the participations constraints (PC) of both types of A? Which menus satisfy the incentive compatibility constraints (ICC) of both types of A?

Report your answers in the separate answer sheet! No explanations required.

For example you can write: *"G) PC: No ; ICC: Yes."* or *"G) PC: □ ; ICC: ☒."* if you think menus G) satisfy the ICCs but not the PCs.



Part 2. (26 points)

A landlord needs to design a contract with a farmer. The farmer can exert high effort in farming at a cost of γ, or exert low effort, at no cost. The agricultural yield y can be low or high: $y \in \{\underline{y}, \overline{y}\}$ where $0 < \underline{y} < \overline{y}$. The probability of high yield $\overline{y}$ is $p_1 \in (0,1)$ in case of high effort, and $p_0 \in (0,1)$ in case of low effort, where $p_1 > p_0$.
Assume that the landlord cannot observe the farmer's effort decision but the landlord can commit to pay the farmer an amount w that depends on the realized yield y. The landlord's utility is $U = y - w$. The farmer has utility: $V = 2w - \gamma$ if he exerts high effort, $V = 2w$ otherwise, and his outside option is equal to 0. Assume that high effort is socially efficient: $(p_1 - p_0)(\overline{y} - \underline{y}) > \gamma$. Assume also that the farmer is very poor, i.e. he has no assets at all.

The timing is as follows: a) the landlord offers a contract to the farmer; b) the farmer accepts or refuses the offer; c) the farmer decides whether to exert high effort or not; d) the yield y is realized, and the contract is executed.

Question 2.1 (8 points)

Derive the optimal contract that induces the farmer to exert high effort.

Question 2.2 (9 points)

Derive the expected cost to be sustained by the landlord to induce the farmer to exert high effort. Is the cost increasing or decreasing in p_0? Provide the economic interpretation behind this result.

Question 2.3 (9 points)

Consider the following alternative contracts: the landlord receives from the farmer a fixed rent R in both states of the world, but the farmer keeps all the realized yield y. Show that for any contract of this type, if the farmer accepts the contract, then the farmer chooses high effort. Find the smallest value of R for which the farmer accepts a contact of this type.

Part 3. (14 points)

Brief answers are sufficient.

Question 3.1 (7 points)

What are the characteristics of a perfectly competitive market?

Question 3.2 (7 points)

What is the difference between partial and general equilibrium analysis?

Part 4. (22 points)

Question 4.1 (8 points)

Albert and Betty share an apartment. They only eat carrots. Say c_A and c_B denote respectively the consumption of carrots by Albert and Betty. Assume there are 10 carrots and utilities of Albert and Betty are respectively:

$U_A = Ac_a$,

$U_B = c_b$.

where A is a real number, strictly larger than 0. Find all Pareto efficient allocations of carrots.

Question 4.2 (14 points)

Let's modify the previous questions by assuming that Betty practices playing drums. Albert loves the sound of drums. Say d denotes the number of hours that Betty spends playing drums. Suppose there are 24 hours available to play drums, 10 carrots are available, and let utilities of Albert and Betty be respectively:

$U_A^d = c_a + d$

$U_B^d = c_b - (3 - d)^2$

(so in terms of the previous question $A = 1$). Suppose Albert and Betty can voluntarily stipulate binding agreements regarding the hours of practice and the division of the carrots. If there is no agreement, they just consume their own carrots and Betty practices as long as she likes.

(a) (6 points) Argue that in any Pareto efficient allocation d is at least as large as 3.

(b) (8 points) If Albert is initially allocated all 10 carrots find the (unique) Pareto efficient allocation that can be the result of a voluntary, binding agreement.