UNIVERSITY OF OSLO
DEPARTMENT OF ECONOMICS

Postponed exam: **ECON4240 – Equilibrium, welfare and information**

Date of exam: Wednesday, June 4, 2014

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

The problem set covers 3 pages (incl. cover sheet)

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.

ECON 4240 Exam: Spring 2014

PART I: ECONOMICS OF INFORMATION

Problem 1. (20 points)

Assume a single firm and a single consumer. The firm's product may be of high (H) or low quality (L); probability of being high quality is λ. The firm knows the quality of its product but the consumer does not observe the quality before purchase. Assume that the consumer is risk neutral.

For $i = L, H$, the consumer's valuation is given by v_i and the costs of production by c_i. The consumer desires at most one unit of the product. Finally, the firm's price is regulated and is set at p.

Assume $v_H > p > v_L > c_H > c_L$.

(i) Given p, under what conditions (involving the other variables) will the consumer buy the product?

(ii) Suppose that before the consumer decides to buy, the firm (which knows its type) can advertise. Advertising conveys no information directly, but consumers can observe the total amount of money spent on advertising; call it A. Can there be a *separating* perfect Bayesian equilibrium, that is, an equilibrium in which the consumer rationally expects firms with different quality levels to pick different levels of advertising? If yes, describe one; if no, then argue why not.

Problem 2. (30 points)

Consider the following hidden action model in which the owner is risk neutral while the manager has preferences defined over the mean (expected value) and the variance (denoted by *Var*) of his income w and his effort level e as follows:

Expected utility=$E[w] - \phi Var(w) - g(e)$, where $g'(0) = 0$ and $g'(e), g''(e), g'''(e)$ are all strictly positive for $e > 0$, and $lim_{e \to \infty} g'(e) = \infty$.

Conditional on effort e, the realization of profit π is normally distributed with mean e and variance σ^2.

(i) Restrict attention to linear compensation schemes for this part of the question. So, $w(\pi) = \alpha + \beta\pi$. Show that the manager's expected utility given $w(\pi), e$, and σ^2 is represented by $\alpha + \beta e - \phi\beta^2\sigma^2 - g(e)$.

(ii) What is the optimal contract when effort is observable?

(iii) What is the optimal *linear compensation scheme* (see part (i) above) when effort is *not* observable?

Part II: General Equilibrium Analysis

Problem 3. (20 points)

Consider a two–firm Cournot model with constant return to scale, in which firms' cost differ. Let c_j denote firm j's cost per unit of output produced, and assume that $c_1 > c_2$. Assume also that the inverse demand is $p(q) = a - bq$ with $a > c_1$.

(a) Derive the Nash equilibrium of this model.

(b) Under what conditions, does the Nash equilibrium found in point (a) involve only one firm producing? Which will be this?

(c) When the equilibrium involves both firms producing, how do the equilibrium outputs and profits vary when the firm 1's cost changes?

Problem 4. (30 points)

Consider a pure-exchange economy, consisting in two consumers, denoted by $i = 1, 2$, who trade two commodities, denoted by $l = 1, 2$. Each consumer i is characterized by an endowment vector, $\omega_i \in R^2_+$. Both consumers' preferences are respectively represented by the same Cobb-Douglas utility function: $u_i(x_{1i}, x_{2i}) = x_{1i}^{1/3} x_{2i}^{2/3}$, where x_{li} denotes the consumption good l by agent i.

(a) Assuming that the consumers' endowments are $\omega_1 = (1, 2)$ and $\omega_2 = (2, 1)$, respectively, construct the Edgeworth Box relative to the economy under consideration. With reference to the same economy, define the following notions: competitive equilibrium, Pareto-efficient allocation, Pareto set, contract curve.

(b) Find the equation describing the Pareto set; then, taking commodity 1 as the numeraire, hence positing $p_1 \equiv 1$, find the competitive equilibrium allocation and price system.

(c) Draw your results in the Edgeworth Box.

(d) Suppose now that consumers' preferences are described by the following quasi-linear utility function: $u_i(x_{1i}, x_{2i}) = x_{1i} + \log x_{2i}$. Explain in words why this type of preferences rule out the wealth effects usually associated with price changes. How such peculiar properties of consumers' preferences affect the Pareto set?