UNIVERSITY OF OSLO
DEPARTMENT OF ECONOMICS

Exam: **ECON3200/4200 – Microeconomics and Game Theory**

Date of exam: Monday, November 28, 2016 **Grades are given:** December 20, 2016

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

The problem set covers 3 pages

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.

Problem 1 (30%, each sub-problem counts equally)

Tristan runs a small business and produces wine. The market is perfectly competitive.

(a) The production function F transforms grapes, denoted z_g, into wine, denoted q_w, and has the following form: $q_w \leq F(z_g) = z_g^2$. Discuss whether F satisfies the following properties: possibility of inaction, no free production, and increasing/decreasing/constant returns to scale.

(b) For the production function F, argue that the profit maximization has no solution.

(c) Assume instead that the production function is $q_w \leq \phi(z_g) = z_g^{\frac{1}{2}} - 1$. Discuss whether ϕ satisfies the properties listed in a).

(d) For the production function ϕ, find the cost and supply functions of the firm.

(e) How do you interpret the value of the cost function at $q_w = 0$?

Problem 2 (20%, each sub-problem counts equally)

Andrea has preferences over coffee, denoted x_c, and sugar, denoted x_s. These preferences are represented by the utility function $U(x_c, x_s) = min\{x_c, 2x_s\}$. The price of coffee, denoted p_c, and the price of sugar, denoted p_s, are strictly positive.

(a) Draw the no-worse-than-z and no-better-than-z sets for $z = (2,2)$.

(b) Argue that if a bundle solves the cost minimization problem of Andrea, then $x_c = 2x_s$; that is, if $x_c > 2x_s$ or $x_c < 2x_s$, then the same utility level can be achieved at a lower cost.

(c) Using the result from (b), derive the Hicksian demands and the cost function for Andrea.

(d) What is the economic interpretation of Andrea's preferences?

Problem 3 (30 %, each sub-problem counts equally)

Consider a strategic situation between an *employer* (player 1) and a *worker* (player 2). Player 1 can either *accept* (A) or *reject* (R) player 2. Player 2 can either become *skilled* (S) through education, or remain *unskilled* (U). Player 2 can be of two types; either he is inherently *high ability* (H) or he is inherently *low ability* (L). The players' payoffs depending on their actions and player 2's type is shown below, where the first number is the payoffs of player 1 (the employer) and the second number is the payoff of player 2 (the worker).

H

	S	U
A	4, 6	-2, 4
R	0, 2	0, 0

L

	S'	U'
A	-2,-2	-6,-4
R	0, -6	0, 0

(a) For game H and for game L, determine the set of (pure) rationalizable strategies for each player, and the set of pure-strategy Nash equilibria.

(b) Assume next that only player 2 knows his own type, while player 1 thinks that the two types of player 2 are equally likely. Model this situation in an ex ante perspective by specifying the Bayesian normal form.

(c) For the Bayesian normal form found in part (b), determine the set of (pure) rationalizable strategies for each player, and the set of pure-strategy and/or mixed-strategy Nash equilibria.

Problem 4 (20 %, each sub-problem counts equally)

Consider again the strategic situation between an *employer* (player 1) and a *worker* (player 2) described in Problem 3. Assume (as in parts (b) and (c) of Problem 3) that only player 2 knows his own type, while player 1 thinks that the two types of player 2 are equally likely.

(a) (*Screening*) Assume now that player 1 acts before player 2, and that player 1's choice of A or R can be observed by player 2 before he makes his choice of S or U. Show that there is a unique subgame perfect Nash equilibrium.

(b) (*Signaling*) Assume now that player 2 acts before player 1, and that player 2's choice of S or U can be observed by player 1 before she makes her choice of A or R. Show that there is a unique perfect Bayesian equilibrium.