# *UNIVERSITY OF OSLO*
# *DEPARTMENT OF ECONOMICS*

Postponed exam: **ECON3200/4200 – Microeconomics and Game Theory**

Date of exam: Monday, December 12, 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 subproblem counts equally)*

Assume that the production function $F$ is a two input CES (Constant Elasticity of Substitution). That is, given the inputs $z_1$ and $z_2$, the output $q$ that the firm can produce is given by:

$$q \leq F(z_1, z_2) = \left[z_1^{\beta} + z_2^{\beta}\right]^{\frac{1}{\beta}},$$

with $\beta \leq 1$.

(a) Show that the elasticity of substitution is $\frac{1}{1-\beta}$.

(b) For the case of $\beta \neq 0,1$ derive the conditional demands for inputs, i.e. $H_1(w_1, w_2, q)$ and $H_2(w_1, w_2, q)$.

(c) Check that $H_1(w_1, w_2, q)$ is decreasing with respect to the price of input 1 and homogeneous of degree zero with respect to $(w_1, w_2)$.

(d) What is the economic explanation for the conditional demand to satisfy homogeneity of degree zero with respect to $(w_1, w_2)$?

(e) Determine the profit function of the firm.

### *Problem 2 (20%, each subproblem counts equally)*

An individual has the following preferences defined on $\mathbb{R}_+^2$:

$$(x_1, x_2) \succcurlyeq (z_1, z_2) \iff x_1 + 2x_2 \geq z_1 + 2z_2.$$

(a) Represent these preferences graphically.
(b) Determine the cost (expenditure) function.
(c) What is the economic interpretation of these preferences?
(d) Assume these are preferences over a two-state lottery where good 1 is the monetary outcome in state 1 and good 2 is monetary outcome in state 2. What is the risk attitude of this individual? Justify your answer.

### *Problem 3 (20 %, each subproblem counts equally)*

True or false? For each of the statements, if true, try to explain why, and if false, provide a counterexample.

(a) The procedure of backward induction identifies a unique strategy profile in any finite extensive game of perfect information.

(b) In an ultimatum bargaining game, the proposer has all the bargaining weight.

(c) A strategy for a player in a static Bayesian game is a function that for each of the player's types specifies a feasible action.

(d) A dynamic Bayesian game models *signaling* if the informed player moves before the uninformed player.

### *Problem 4 (30 %, each subproblem counts equally)*

Consider a strategic situation between player 1 and player 2. Player 2 can choose either L or R. Player 1 can be of two types, C or P, and can choose either U or D if his type is C and choose either U′ or D′ if his type is P. The players' payoffs depending on their actions and player 1's type are shown below.

| | | L | R |
|---|---|---|---|
| C | U | 0, 0 | 8, 2 |
| | D | 2, 8 | 4, 4 |

| | | L | R |
|---|---|---|---|
| P | U′ | 2, 0 | 8, 2 |
| | D′ | 0, 8 | 4, 4 |

(a) Assume first that the type of player 1 is known by both players and that they make their choices simultaneously. For each type of player 1, determine the set of (pure) rationalizable strategies for each player, and the set of pure-strategy Nash equilibria.

(b) Assume next that only player 1 knows his own type, while player 2 thinks that the two types of player 1 are equally likely. Maintain the assumption that choices are made simultaneously. 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.