Name, First Name: _____

Immat. No.: _____

Instructions:

- Mark the version of your elective box on your answer sheet. Correct answers yield 2 points each, wrong answers -1 point each, no mark yields no point. The second part contains 4 free-form questions (Sections 2 to 5) yielding a maximum of 17 points each.

- You have 120 minutes to answer all questions. Please state for each question if the respective statement is correct ('true') or incorrect ('false'). Mark the respective box on your answer sheet. Correct answers yield 2 points each, wrong answers -1 point each, no mark yields no point. The second part contains 4 free-form questions (Sections 2 to 5) yielding a maximum of 17 points each.

- You have 120 minutes to answer all questions.

- Use only the answer sheet to answer the questions. Answers in other places than the answer sheets will not be considered.

- Use of non-programmable calculators is allowed.

- Please put your name on *all* sheets.

- Please hand in *all* exam materials.

Section 1. Various Questions

State whether the following statement are correct or not. Mark the respective box on the answer sheet.

1. In its minimum, the AVC curve is intersected by the AC curve.

2. An equilibrium is stationary but not necessarily stable.

3. The short form of the profit maximization–rule for a firm in a *competitive market* is 'marginal revenues = marginal costs'.

4. In terms of utility, a consumption tax on a single good is better than an income tax with the same revenue.

5. Monopolistic price discrimination of first degree generally means charging different prices for different units of the good, but the same prices from different people.

6. If a good is a normal good, then demand for it decreases when income decreases.

7. The competitive market equilibrium is unstable.

8. Monopolistic price discrimination of first degree leads to a Pareto-efficient allocation.

9. The reflexivity axiom for consumer preferences demands that consumers can state a preference relation between any two bundles of goods.

10. Given demand for good number 1 is $x_1 = 2\frac{m - p_1 + p_2}{2p_1}$, the two goods, good 1 and good 2, are substitutes.

11. The Hotelling model can be interpreted as a model of product quality.

12. Imagine a firm in a competitive market with a cost function $c(y) = \frac{2}{3}y^3 - 12y^2 + 36y$ with y giving the firm's output quantity.
At a market price of $p = 14$, the output quantity that maximizes the firm's profits, is $y^* = 11$.

13. For the firm from the previous question, the supply function is $y^* = y(p) = 6 \pm \sqrt{36 - 18 + \frac{p}{2}}$.

14. A Cournot equilibrium is a Nash equilibrium.

15. If the utility from two goods is given by $U(x_1, x_2) = 5x_1 + 2x_2$, then the two goods are perfect complements.

16. In an equilibrium, no single individual has reason to change his behavior.

Section 2. Monopoly

A monopolist faces two separate markets with the demand curves given as

$$D_1(p_1) = y_1 = 100 - p_1, \quad D_2(p_2) = y_2 = 100 - 2p_2$$

with $D_1 = y_1$ and $D_2 = y_2$ giving the quantities and p giving the price on the market. Let the monopolist's costs be given as

$$C(y) = 20y.$$

1. Write down the equations of the inverse demand curves $p_1(y_1)$ and $p_2(y_2)$.

2. Assume that the monopolist can price discriminate by charging a different price in each market.

   a) Write down the specific revenue functions $R_1(y_1)$ for the first and $R_2(y_2)$ for the second market.

   b) Write down the specific marginal revenue functions $MR_1(y_1)$ for the first and $MR_2(y_2)$ for the second market.

   c) What are the profit maximizing quantities and prices on the markets?

3. Assume the monopolist is unable to price discriminate. Thus, he faces the aggregate demand $y = D(p)$ of both markets.

   a) What is the function of aggregate demand $D(p)$? (Derive the explicit equation of aggregate demand for the given problem.)

   b) For the aggregate demand function $D(p) = y = 200 - 3p$, compute the function of inverse aggregate demand.

   c) What is the optimal quantity and price for the non–discriminating monopolist?

Section 3. Consumption

A household has the following utility function:

$$u(x_1, x_2) = x_1 (x_2 + 5),$$

with x_1 and x_2 giving the quantities of goods no. 1 and 2, respectively.

1. Derive the general demand functions for the goods.

2. Assume the general demand function for the second good is

$$x_2(m, p_1, p_2) = \frac{1}{2} \frac{m}{p_2}.$$

   Let the income be $m = 1000$ and the price for the second good $p_2 = 1$

   a) Compute the demanded quantity for the second good, $x_2(m, p_2)$.

   b) Assume the price for the good rises to $p_2' = 2$. What is the new (hypothetical) income m' that keeps the household's purchasing power constant at the new price p_2'?

   c) Compute the demanded quantity of the second good for the new price p_2' and the hypothetical income m', i.e. $x_2(m', p_2')$.

   d) Compute the demanded quantity for the original income m and the new price p_2', i.e. $x_2(m, p_2')$.

   e) Compute the substitution effect $\Delta_{x_2}^s$, the income effect $\Delta_{x_2}^n$ and the total effect Δ_{x_2} of the price change.

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Section 4. Cost Minimization

A firm produces the product y with the following production function

$$y = f(K,L) = 3K^{\frac{1}{3}}L^{\frac{2}{3}},$$

where K is the amount of capital and L is the amount of labour.

1. What is the degree of homogeneity of the production function?

2. Assume the costs for the input factors are given by $w_K = 4$ and $w_L = 8$.

   a) What are the costs of the firm depending on K and L?

   b) Derive the cost minimizing input combination depending on the output y.

   c) Derive the firm's cost function $c(y)$.

Section 5. Oligopoly

Assume that the market demand for a good y is given by

$$D(p) = 30 - \frac{1}{2}p.$$

Suppose that the industry has two firms, a Stackelberg leader (firm 1) and a Stackelberg follower (firm 2). Both firms have identical cost functions

$$c(y_i) = 20y_i,$$

where y_i denotes the output of firm i ($i = 1, 2$).

1. Derive the inverse demand function and the profit functions of both firms.

2. How many units will firm 2 supply?

3. How many units will firm 1 supply?

4. Compute the equilibrium price.

5. Compute the price elasticity of demand in the equilibrium.