Version: A

Examination in Microeconomics A
Spring Term 2012

Handling of the exam

- Please check carefully whether your exam sheets are complete and correct, objections after the exam cannot be considered:
  - There are 2 **versions** of this exam, which are denoted by A and C respectively. Please check carefully, whether the version on the question sheet corresponds to the one on the solution sheet.
  - The **question sheet** (including the pages with the general remarks) consists of 9 pages. In addition there is a **solution sheet**, which consists of 3 pages.
- The use of resources other than a non-programmable calculator and at most one dictionary is not allowed. The use of other resources (e.g. programmable calculators, your own concept paper) leads to the disqualification from the exam.
- You have 120 minutes to solve the exam.
- The **exam** consists of 5 True- / False questions, each consisting of 5 subquestions, and 3 Text Problems again each consisting of 5 subquestions.
- For the True- / False- questions you have to decide whether a statement is true or false. For *each* subquestion you have to mark on the solution sheet whether the statement is true (T) or false (F). You will be awarded points according to the following rule: If your answer is correct, you will obtain *3 points* per statement. If your answer is wrong or if both answers are marked, you will obtain *0 points*. If no answer is given, then you will get *1 point*. For the True- / False- questions you can therefore obtain at most obtain 75 points.
- The **Text Problems** have, on the one hand, Multiple-Choice-subquestions (MC) with 5 answers provided for each question, where *exactly one of these answers is correct*. On the other hand, there are numerical subquestions (N), where you have to fill in a number on the solution sheet in encoded form. For each subquestion you get 5 points if answered correctly and 0 otherwise. For the Text Problems you can therefore obtain at most obtain 75 points. Here is an example on how to encode integers in the numerical subquestions: Suppose the solution to the question is **503**. Then this number has to be filled in as follows:

Important: Mark the zero in the first column if the solution is a two-digit number. Similarly, mark the zero in the first and in the second column if the solution is a single-digit number.

- You will have passed the exam with certainty, if you obtain at least *70 points* or if you are among the 75% best participants of the exam.

Handling of the solution sheet:

- You **only** have to hand in the solution sheet at the end of the exam. Answers on concept sheets or on the question sheet will not be considered. We recommend that you fill in the solutions at the **end of the exam** in order to avoid corrections. Please start to fill in your answers **at least 5 minutes before the end of the exam**. The supervisors have orders to collect the solution sheets, even if you have not yet filled in your answers.
- *Please fill in the whole circle, do not mark answers with a cross!* Only *unambiguously legible* solutions can yield points. Please do not use TippEx to correct your answers!
- You must sign your solution sheet at the bottom, otherwise your exam is not **valid**.
- If you do not wish that we publish your registration number, your points and your expected mark on our homepage, you have to mark the respective field on the solution sheet. If you mark this field, you have to wait for your grade until it is announced by the "Studienbüro", which may take some time.

Concerning the content of the exam

1. Assume that the "Ceteris-Paribus" condition holds. This means that all variables that are not explicitly changed remain constant. If we ask for example about the effects of the change of one variable (e.g. p_1), you have to assume that the other variables (e.g. p_2) remain constant, unless explicitly stated otherwise.
2. If we say that a variable (e.g. p_1) is changed, we mean a marginal change that is strictly different from zero, unless explicitly stated otherwise.
3. Assume infinitely divisible goods, unless explicitly stated otherwise.
4. Assume strictly positive and finite prices and income.

5. Assume that consumers maximize their utility and firms maximize profit.
6. Market demand functions are always weakly decreasing, market supply functions are weakly increasing.

Good luck!

1 True-/False- questions

1.1 Consider the Cobb-Douglas production function $f(x_1, x_2) = x_1^a x_2^b$, where x_1 and x_2 are the quantities of inputs 1 and 2, and $a, b > 0$. The factor prices are $p_1 = 1$ and $p_2 = 1$. Which of the following statements are true?

a The marginal product of input factor 1 is increasing if $a + b > 1$.

b If $a + b = 1$, then the slope of the long run average cost curve is 0.

c If input factor 1 is fixed at $\bar{x}_1 = 1$ in the short run, then short run costs are equal to $C(q) = 1 + q^{\frac{1}{b}}$.

d The marginal rate of technical substitution is independent of the parameters a and b.

e If $a = b$, then in the long run, the firm uses the same amount of both inputs.

1.2 Consider a risky situation in which either the income Y_1 or Y_2 (with $0 < Y_1 < Y_2$) is realized, each with equal probability. The agent has a von Neumann-Morgenstern utility function. Assume that the money utility function $U(Y)$, which is increasing in income Y, is either strictly concave everywhere, or strictly convex everywhere, or linear. Which of the following statements are true?

a Let $Y' = \frac{1}{2}Y_1 + \frac{1}{2}Y_2$. Statement: If the money utility of income Y' is strictly larger than expected utility in the risky situation, then the agent is risk-averse.

b Let Y'' be the income such that $U(Y'') = \frac{1}{2}U(Y_1) + \frac{1}{2}U(Y_2)$. Statement: If $Y'' < \frac{1}{2}Y_1 + \frac{1}{2}Y_2$, then the agent is risk-averse.

c A strictly concave money utility function implies weakly convex indifference curves.

d Independent of the agent's risk preference, his expected utility is larger the larger Y_2.

e Assume that a risk-loving agent has a non-risky alternative income. Statement: The agent's money utility of the non-risky income equals his expected utility of this non-risky income.

1.3 Consider a firm in a competitive market with market price p. (Note: The time horizon in this problem refers to the variability of inputs.) Which of the following statements are true?

a In the long run, it is optimal for the firm to produce the quantity q for which the difference between the marginal costs of producing q and the average costs of producing q is maximized.

b In its optimization problem, a profit-maximizing firm takes into account the effect of the quantity it produces on the price at which it can sell the corresponding quantity.

c The firm makes a positive profit by producing a quantity q, if the average variable costs of producing q are smaller than p.

d If the firm faces fixed costs, then the short-run average variable costs decrease in q for q sufficiently small.

e Consider a quantity q for which marginal costs equal the price. Statement: The firm maximizes its profit with this quantity.

1.4 Consider a situation with 2 goods, $i = 1, 2$. Which of the following statements are true?

a Assume exclusively in this sub-problem: The prices of both goods increase. After the increase of both prices, the demand of a consumer for good 1 increases. Statement: From this one can conclude that good 1 is a Giffen good for this consumer in the relevant range.

b Assume exclusively in this sub-problem: The price of good 1 increases. After the price increase, a consumer's demand for good 1 decreases. Statement: From this one can conclude that good 1 is a normal good for this consumer in the relevant range.

c Assume exclusively in this sub-problem: The income of the consumer decreases. After the decrease in income, a consumer's demand for good 1 decreases. Statement: From this one can conclude that in the relevant range, the consumer's demand for good 1 decreases if the price increases.

d If a good is normal, then the corresponding Engel curve is weakly increasing.

e If good 1 is normal, then good 2 is normal as well.

1.5 Which of the following statements are true?

a If market demand is perfectly elastic, then total consumer surplus is zero.

b If market supply is perfectly elastic, then total producer surplus equals the entire revenue of producers.

c If market supply is given by $S(p) = 2p$ for $p \geq 1$ and $S(p) = 0$ for $p < 1$, and the market price is $p = 2$, then total producer surplus is equal to 4.

d Consider the market for widgets in which there are 200 potential consumers who are willing to buy exactly one widget each. Half of them have a high willingness to pay of 10 euro, and the other half have a low willingness to pay of 6 euro. There are 100 producers, who each can produce one widget at a cost of 5 and additional widgets at a cost of 10 per unit. Consider an allocation in which each firm produces two units and the consumers with a high willingness to pay buy at a price of 10 and the others buy at a price of 5. Statement: By adjusting the production and allocation of widgets and the payments between the economic agents a Pareto improvement can be reached.

e Consider a competitive market that is currently in equilibrium. Assume the requirements for the first fundamental welfare theorem to hold are met. Then any intervention in this market that makes one consumer strictly better off necessarily makes someone else worse off.

2 Text Problems

Problem 2.1 Assume that there are two firms in a competitive market, $i = 1, 2$. Each of the two firms i has the supply function $S^i = \begin{cases} 100p - 100 & \text{if } p \geq 1 \\ 0 & \text{else} \end{cases}$.

The demand is given by $D = 1000 - 200p$.

2.1.1 (N) Determine the quantity that is traded in equilibrium. State the result rounded to the nearest integer.

2.1.2 (N) Determine the total producer surplus in equilibrium. State the result rounded to the nearest integer.

2.1.3 (MC) Consider the (price-) elasticity of market supply. Exactly one of the following answers is correct, which one?

a For $p = 2$ this elasticity is equal to $\frac{1}{3}$.

b For $p = 2$ this elasticity is equal to $\frac{4}{3}$.

c For $p = 2$ this elasticity is equal to $\frac{6}{5}$.

c For $p = 2$ this elasticity is equal to 2.

e None of the above four statements is true.

2.1.4 (N) Assume that the government imposes a quantity tax t on the firms. Compute the smallest t such that the tax revenue of the government is zero and $t > 0$. State the result rounded to the nearest integer.

2.1.5 (N) Also in this sub-problem the government imposes a quantity tax on the firms. In this sub-problem, this quantity tax t is equal to the solution of sub-problem 2.1.4. Compute the loss in consumer surplus that results from the introduction of this tax compared to the situation without taxes. State the result rounded to the nearest integer.

Problem 2.2 Consider a consumer who plans his consumption in this period, c_0,

and his consumption next period, c_1. He can lend and borrow at the interest rate r. His utility function is $u(c_0, c_1) = \ln c_0 + \frac{1}{2} \ln c_1$. His income is 96 in period 0 and 72 in period 1.

2.2.1 (N) What is the optimal value of c_1 at an interest rate $r = 100\%$? State the result rounded to the nearest integer.

2.2.2 (N) What is the optimal value of c_0 at an interest rate $r = 100\%$? State the result rounded to the nearest integer.

2.2.3 (N) At which interest rate (expressed in percent) would the consumer neither save nor borrow? State the result rounded to the nearest integer.

2.2.4 (MC) Now let the interest rate be $r = 12,5\%$. Exactly one of the following statements is true, which one?

a At the optimum, the consumer chooses $c_0 = 88$ and $c_1 = 80$.

b At this interest rate, the consumer is a saver.

c The consumer prefers the income 80 in period 0 and 104 in period 1 to his income of 96 in period 0 and 72 in period 1.

d The consumer prefers an interest rate of 15% to the interest rate of 12,5%.

e None of the above four statements is true.

2.2.5 (N) Assume now that the consumer can lend at the interest rate $r = 40\%$ and borrow at $r = 60\%$. What is the optimal c_0? State the result rounded to the nearest integer.

Problem 2.3 Assume that the typical utility function of a hairdresser is $U(C, F) = \sqrt{C} + 2\sqrt{F}$, where C denotes the monthly quantity of consumption of goods and services and F the monthly amount of leisure consumed (in hours). The price of consumption (C) is $p = 1$, the price of leisure (relative to all other consumption) is given by the market wage rate w for hairdressers. The typical monthly total time budget of a hairdresser is T=450 hours, which individuals can freely allocate to leisure and work.

2.3.1 (MC) This question refers to the usual $C - F$ coordinate system with F on the vertical axis. Exactly one of the following answers is correct, which one?

a If $w = 15$, the hairdresser's budget line intersects the F-axis at $F = 30$.

b The hairdresser's indifference curves intersect the C-axis at a positive angle (i.e. with slope different from 0).

c If the wage rate w increases, the budget line becomes flatter and shifts downwards.

d The hairdresser's marginal rate of substitution between leisure and consumption (dF/dC) strictly increases if F and C increase by the same factor (i.e. from (C, F) to (tC, tF) with $t > 1$).

e None of the above answers is correct.

2.3.2 (N) Assume that in X-Stadt there are 20 trained hairdressers. If the wage is $w = 2$, what is the elasticity of the aggregate supply of hairdressers' labor? State the answer rounded to integer numbers.

2.3.3 (N) The demand for labor in the market for hairdressers in X-Stadt is given by $L^D(w) = 9000/(w + 4)$. In equilibrium, how many hours do the hairdressers in X-Stadt work per capita? State the answer rounded to integer numbers.

2.3.4 (N) Because of the desperate situation in X-Stadt, 10 hairdressers leave the town. What is the number of hours worked per capita by the remaining hairdressers in equilibrium? State the value rounded to integer numbers.

2.3.5 (N) Because the situation of the remaining 10 hairdressers is still unsatisfactory, the town council imposes a minimum wage of $w = 5$. What is the new monthly income of each hairdresser in this new situation? State the answer rounded to integer numbers.