Version: A

Examination in Microeconomics A
Spring Term 2013

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 7 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 4 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 or similar if you could answer the question with Yes (true) or No (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 in Figure 1:

Figure 1:

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. Assume infinitely divisible goods, unless explicitly stated otherwise.

3. Assume strictly positive and finite prices and income.

4. Assume that consumers maximize their utility and firms maximize profit.

5. If necessary, state your result rounded to the nearest integer.

Good luck!

1 True-/ False questions

1.1 There are two goods (1 and 2) of which arbitrary non-negative quantities may be consumed. Lisa weakly prefers a bundle (x_1, x_2) to a bundle (x_1', x_2') (that is, $(x_1, x_2) \succeq (x_1', x_2')$) if and only if $(x_1 + 1)(x_2 + 1) \geq (x_1' + 1)(x_2' + 1)$.

1. Is the preference relation $\succeq$ monotonic?
2. Does the utility function $u(x_1, x_2) = (x_1 + 1)^2(x_2 + 1)^2$ represent the preference relation $\succeq$?
3. Does the utility function $u(x_1, x_2) = x_1 x_2$ represent the preference relation $\succeq$?
4. Is the preference relation $\succeq$ convex?
5. Does the Marginal Rate of Substitution at any point (x_1, x_2) depend on the chosen utility representation of the preference relation $\succeq$?

1.2 There are two goods (1 and 2) of which arbitrary non-negative quantities may be consumed. Suppose Lisa's utility function is $u(x_1, x_2) = x_1 \cdot (x_2)^2$. Lisa has an income of $m > 0$ to spend on goods 1 and 2 having prices $p_1 > 0$ and $p_2 > 0$ respectively. All questions refer to Lisa's optimal consumption bundle (x_1^*, x_2^*).

1. Will Lisa spend $m/3$ on good 1?
2. Is it possible that $\frac{\partial u(x_1^*, x_2^*)/\partial x_1}{p_1} > \frac{\partial u(x_1^*, x_2^*)/\partial x_2}{p_2}$?
3. Is good 1 a normal good for Lisa?
4. Is good 2 a Giffen good for Lisa?
5. Suppose that Lisa gets her income m from the market value of her initial endowment (e_1, e_2), that is, $m = p_1 e_1 + p_2 e_2$. Is the cross price elasticity of the demand for good 1 with respect to the price of good 2 strictly negative?

1.3 Suppose that a firm produces an output good using two input goods with the technology described by the production function $f(x_1, x_2) = A x_1^c x_2^d$, where $c > 0$, $d > 0$, and $A > 0$. Input prices are given by $w_1 > 0$ and $w_2 > 0$. In the long run, the firm can choose any input quantities $x_1 \geq 0$ and $x_2 \geq 0$.

1. Are the firm's marginal products of the two input goods decreasing if $c < 1/2$ and $d < 1/2$?
2. Does the firm have a strictly positive fixed cost in the long run?
3. Does the firm's technology exhibit increasing returns to scale if $c + d < 1$?

4. Consider the isoquant of a strictly positive output quantity. Is it true that the Marginal Rate of Technical Substitution at (x_1, x_2) is independent of x_1?

5. Assume now that $c = 1/4$ and $d = 3/4$. Is the long run average cost curve ($LRAC(q)$) strictly increasing?

1.4 Consider a competitive market in which the aggregate demand quantity is $D(p) = 100 - p$ for all output prices $p \leq 100$ and is 0 for all $p > 100$. Suppose that there is an unbounded number of firms who may freely enter and exit this market. Each firm has the same long-run average cost function given by $LRAC(q) = (q-3)^2 + 1$ for all output quantities $q \geq 0$. Refer to the long-run equilibrium in your answers to the following questions.

1. Is the output price equal to 1?

2. Is the output quantity of each active firm equal to 3?

3. Does any firm obtain a strictly positive profit?

4. Do all active firms produce at the efficient scale?

5. Are there exactly 33 firms active in the market?

2 Text problems

2.1 Suppose you have an initial wealth that is worth 20 to you (all monetary amounts in this problem are measured in thousands of EUR). This wealth includes a car that is worth 10 to you. You anticipate that, with probability 1/13, the car will be stolen. You can buy K units of insurance, where you can choose any amount K with $0 \leq K \leq 20$. Buying K units of insurance means that you have to pay the amount gK to the insurance company, and in case your car is stolen you receive K from the company. You are an expected-utility maximizer with a Bernoulli utility function for money given by $U(Y) = Y^c$, where $0 < c < 1$ and $Y \geq 0$.

2.1.1 (N) Determine your optimal choice of K if $g = 1/13$ and $c = 1/2$.

2.1.2 (N) Determine your optimal choice of K if $g = 1/13$ and $c = 1/4$.

2.1.3 (N) Suppose that $g = 1/13$ and $c = 1/8$. Determine the absolute value of the slope of your indifference curve at the point at which K is chosen optimally. Assume for this computation a coordinate system in which your wealth with car not stolen is drawn on the horizontal axis, and your wealth with car stolen is drawn on the vertical axis.

2.1.4 (N) Determine your optimal choice of K if $g = 1/11$ and $c = 1/2$.

2.1.5 (MC) Which of the following statements is correct?

a. Buying full insurance means to choose $K = 20$.

b. You find it optimal to buy full insurance if $g = 1/11$ and $c = 1/2$.

c. If $c = 2$, then you are risk-loving.

d. If $c = 1$, then you are strictly risk-averse.

e. If it were true that $g = 1/14$, then the expected profit of the insurance company would be positive.

2.2 Consider a competitive market in which the aggregate demand quantity is $D(p) = 10 - p$ for all prices $p \leq 10$, and is 0 for all $p > 10$. Suppose the market supply quantity is $S(p) = p$ for all prices $p \geq 0$. The government introduces a quantity tax of $t = 2$ that the firms must pay for each unit sold. The equilibrium price in the market with the tax is described by the price paid by the consumers, p_D^* and the price received by the firms after having paid the tax, $p_S^* = p_D^* - t$. The equilibrium price in the market without the tax is denoted p^*.

2.2.1 (N) Determine p^*.

2.2.2 (N) Determine p_S^*.

2.2.3 (N) Determine the quantity traded in the equilibrium of the market without the tax.

2.2.4 (N) Determine the price elasticity of the market supply at the price p^*.

2.2.5 (MC) Which of the following statements is true?

a. The tax revenue equals 10.

b. At the price p^*, the market demand is strictly less price-elastic than the market supply (that is, the absolute value of the price elasticity of the demand is smaller than the price elasticity of the supply).

c. Consumers and firms bear equal shares of the tax burden, in the sense that $p_D^* - p^* = p^* - p_S^*$.

d. The firms bear the tax burden, in the sense that $p_D^* = p^*$.

e. Introducing the tax does not reduce the quantity traded in equilibrium.

2.3 Consider an exchange economy with two goods, 1 and 2, that may be consumed in arbitrary non-negative quantities. There are 10 consumers of type A and 10 consumers of type B. The preferences of each type-A consumer are represented by the utility function $u^A(x_1^A, x_2^A) = x_1^A + x_2^A$, where x_i^A denotes the quantity of good i she consumes. Each type-A consumer has the initial endowment $e^A = (6, 1)$. The preferences of each type-B consumer are represented by the utility function $u^B(x_1^B, x_2^B) = x_1^B x_2^B$, where x_i^B denotes the quantity of good i she consumes. Each type-B consumer has the initial endowment $e^B = (2, 3)$. A competitive equilibrium is described by the prices p_1^*, p_2^* of good 1 and good 2, respectively, the bundle consumed by each type-A consumer, (x_1^{A*}, x_2^{A*}), and the bundle consumed by each type-B consumer, (x_1^{B*}, x_2^{B*}).

2.3.1 (N) Calculate $10x_1^{A*}$.

2.3.2 (N) Calculate $10x_1^{B*}$.

2.3.3 (N) Determine p_2^* if $p_1^* = 3$.

2.3.4 (N) Determine p_1^* if $p_2^* = 4$.

2.3.5 (MC) Which of the following statements is true?

a. In equilibrium, prices are such that $p_1^* = p_2^*$. The equilibrium allocation is reached if the consumers are partitioned into pairs such that each pair consists of one type-A consumer and one type-B consumer, and in each pair the type-A consumer gives half a unit of good 1 to the type-B consumer, who gives half a unit of good 2 to the type-A consumer.

b. There is no equilibrium.

c. There is no equilibrium point in the interior of the Edgeworth box.

d. The allocation in which every consumer keeps her initial endowment is Pareto efficient.

e. We have $p_1^* < p_2^*$ because there are fewer units of good 2 than of good 1 in the economy.