Version: A

Repeat Examination in Microeconomics A
Summer Term 2007

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 three 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 4 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 at most obtain 100 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:

Zahl Frage	100er	10er	1er
1	○	○	○
2	○	○	○
3	○	○	●
4	○	○	○
5	●	○	○
6	○	○	○
7	○	○	○
8	○	○	○
9	○	○	○
0	○	●	○

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 *75 points*. The final passing threshold may be below but not above 75 points.

Handling of the solution sheet:

- You **only** have to submit 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 repercussions 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, which 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 A firm produces an output (quantity y) by using the quantity x of a single input. The production function is

$$f(x) = \begin{cases} x^2 & \text{if } x \leq 1 \\ x^{3/4} & \text{if } x > 1 \end{cases}$$

Which of the following statements are true?

a For $x > 0$, the production function has increasing returns to scale.

b The firm's average product is never (strictly) greater than 1.

c The firm's average cost function is decreasing for $x > 0$.

d The marginal cost curve intersects the average cost curve at its minimum.

e If the market price of the produced output is below the minimum of the average costs, then the firm does not produce.

1.2. An individual with wealth of 1000 plans to buy shares. According to her bank the value of shares may increase by 15% or decrease by 12%. The probability of an increase is 0.5. Alternatively, she can keep her money at zero interest rate. The individual maximizes her expected utility. Which of the following statements are true?

a Instead of buying these shares, the individual would always prefer to buy shares that increase in value for sure by 7%.

b If the individual is risk neutral, she would be indifferent between buying these shares and shares that increase in value for sure by 3%.

c If the individual is risk averse, then instead of buying these shares, she would always prefer to buy shares that increase in value for sure by 1.5 %.

For the rest of this problem assume that the money utility function of the individual is

$$u = \ln(A)$$

where A is wealth.

d The individual invests all her wealth in the shares recommended by her bank

e Assume that there is another investment opportunity that may increase in value by 25% or decrease by 12%. The probability of an increase is 0.5. The probabilities of a change in value of the shares recommended by the bank and the second investment opportunity are independent. The individual has to decide how much to invest in each investment opportunity. Statement: The maximization problem then is

$$\max_{x,y} 0.5 * \ln(1000 + 0.15x + 0.25y) + 0.5 * \ln(1000 - 0.12x - 0.12y)$$

where x and y are the amounts invested in the respective investment opportunities.

1.3. Consider an Edgeworth Box with two goods, in quantities x and y, and two consumers, A and B. The aggregate amount of the first good is $\overline{x}$, and the aggregate amount of the second $\overline{y}$. Which of the following statements are true?

a There may be Pareto-efficient allocations that are not on the contract curve.

b The allocation in which agent A gets $x_A = \overline{x}$ and $y_A = \overline{y}$ is always Pareto-efficient.

c The line $x_A = 0, 0 \leq y_A \leq \overline{y}$, can be the contract curve.

From now on assume assume that both individuals have Cobb Douglas utilities

$$\begin{aligned} u^A(x_A, y_A) &= x_A^\alpha y_A^{1-\alpha} \\ u^B(x_B, y_B) &= x_B^\beta y_B^{1-\beta} \end{aligned}$$

with $\alpha \neq \beta$.

d The contract curve is a straight line.

e Allocation $x_A = \overline{x}$ and $y_A = \overline{y}$ is Pareto-efficient.

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

a The demand for good i always depends on all prices.

b If the price of good i changes, then the demand for good i changes strictly.

c If the indifference curve at a point (x_1, x_2) with $x_i > 0$ for $i = 1, 2$ has positive slope, then the consumer wants to consume less of one good at this point.

d If the consumer's preferences are strictly convex, then at the optimum the absolute value of the marginal rate of substitution is equal to the price ratio.

e If the preferences are monotone, then the consumer prefers the bundle $(x_1^1, x_2^1) = (25, 7)$ to $(x_1^0, x_2^0) = (5, 8)$.

1.5 Consider an exchange economy with two consumers, A and B, and two goods, 1 and 2. Consumers have initial endowments and monotonic preferences depending only on their own consumption. Which of the following statements are true?

a An allocation that maximizes the sum of all utilities is Pareto efficient.

b If the two agents interact on a competitive market, taking the market price as given and maximizing individual utility, then in equilibrium nobody can be made better off without making the other worse off.

c If an allocation yields the same utility for both agents then the allocation is Pareto efficient.

d If the allocation $(x_1^A, x_2^A, x_1^B, x_2^B)$ is such that $(x_1^A, x_2^A) = (x_1^B, x_2^B)$, then it is Pareto efficient.

e Assume that the initial endowment does not lie on the contract curve. All points on the contract curve are Pareto superior to the initial endowments.

2 Text Problems

2.1 The market for gardening services in the Rhine-Neckar region has three types of suppliers. Type A produces with the cost function

$$C_A(q) = \begin{cases} 4q + 30 & \text{if } 0 < q \leq 10 \\ 0 & \text{if } q = 0 \end{cases}$$

type B with the cost function

$$C_B(q) = \begin{cases} q + 50 & \text{if } 0 < q \leq 10 \\ 0 & \text{if } q = 0 \end{cases}$$

and type C with the cost function

$$C_C(q) = \begin{cases} 5q + 40 & \text{if } 0 < q \leq 10 \\ 0 & \text{if } q = 0 \end{cases}$$

where q is the average number of hours worked per day. No producer can supply more than $q = 10$. (You may think of this as costs being infinite for $q > 10$). There are 20 producers of type A, 20 producers of type B, and 30 producers of type C. The market is competitive and the market price for an hour of gardening is $p > 0$.

2.1.1 (MC) Exactly one of the following answers is correct.

a Producers of type C will never produce because their costs are higher than those of type A producers.

b Producers of type C will not produce at maximum capacity because their quasi-fixed costs are higher than those of type A producers.

c Producers of type C will not produce at maximum capacity if the price is sufficiently high.

d Producers of type C will produce at maximum capacity if type B producers do so, because they have lower quasifixed costs than type B producers.

e None of the above answers is correct.

2.1.2 (N) What is aggregate supply of gardening services at price $p = 8$? State the answer rounded to integer numbers.

2.1.3 (N) What is aggregate supply at price $p = 10$? State the answer rounded to integer numbers.

2.1.4 (N) Demand for gardening services in the region is given by the function $Q = 590 - 60p$. What quantity is sold in equilibrium? State the answer rounded to integer numbers.

2.1.5 (N) What is the profit earned by each producer of type C in the equilibrium of part 2.1.4? State the value rounded to integer numbers.

2.2 Consider an exchange economy with two agents, called A and B. There are two goods, 1 and 2. The preferences of the two agents are represented by the following utility functions:

$$u^A(x_1^A, x_2^A) = \ln x_1^A + \ln x_2^A \qquad \text{and} \qquad u^B(x_1^B, x_2^B) = x_1^B (x_2^B)^2$$

where u^j is agent j's utility and x_i^j is consumption of good i by agent j. The agents' initial endowments are:

$$\begin{aligned} e_1^A &= 40, \quad e_2^A = 160 \\ e_1^B &= 420, \quad e_2^B = 60 \end{aligned}$$

The two agents trade with each other in a perfectly competitive market, i.e. by taking prices p_1 and p_2 as given.

2.2.1 (MC) Exactly one of the following answers is correct. In equilibrium,

a agent A consumes $x_1^A = 0$.

b the price p_1 is strictly greater than p_2.

c the price p_1 is uniquely determined.

d at least one agent is strictly worse off than with his initial endowment.

e None of the above answers is correct.

2.2.2 (N) Determine the equilibrium consumption of good 1 by agent A and state it rounded to integer numbers.

2.2.3 (N) Determine the equilibrium consumption of good 1 by agent B and state it rounded to integer numbers.

2.2.4 (N) Determine the equilibrium price ratio p_2/p_1 and state it rounded to integer numbers.

2.2.5 (N) Determine the equilibrium supply of good 2 by agent A and state it rounded to integer numbers.

2.3 Ule's preferences over the consumption of two goods can be represented by the utility function $u(x_1, x_2) = x_1 x_2$. The prices of the goods are p_1 and p_2. Ule's income $Y = 100$.

2.3.1 (N) Determine Ule's demand for good 1 at prices $p_1 = 1/4$ and $p_2 = 1$ and state it rounded to integer numbers.

2.3.2 (N) By how much does Ule's consumer surplus from good 1 increase if the price of good 1 drops to $\widehat{p}_1 = 1/8$? State the result rounded to integer numbers. Hint: Do not calculate the consumer surplus for the two prices separately, only the difference of the two. Remember that $\int \frac{1}{x_1} dx_1 = \ln x_1$.

2.3.3 (N) By how much does one have to reduce Ule's income at prices $\widehat{p}_1 = 1/8$, $p_2 = 1$ for him to be as well off as at prices $p_1 = 1/4$, $p_2 = 1$ and income 100? State the result rounded to integer numbers.

2.3.4 (N) By how much does one have to increase Ule's income at prices $p_1 = 1/4$ and $p_2 = 1$ for him to be as well off as under prices $\widehat{p}_1 = 1/8$, $p_2 = 1$ and income 100? State your result rounded to integer numbers.

2.3.5 (N) By how much does one have to increase Ule's income at prices $p_1 = 1/4$ and $p_2 = 1$ for him to be just able to afford the bundle that is optimal at $\widehat{p}_1 = 1/8$, $p_2 = 1$ and $Y = 100$? State your result rounded to integer numbers.

2.4 The market for Schokowuppis has the following demand and supply functions

$$\begin{aligned} \text{Supply} &: \quad S(p) = p \\ \text{Demand} &: \quad D(p) = 18 - 2p \end{aligned}$$

2.4.1 (N) Determine the critical price p^* that satisfies: for all $p > p^*$ there is excess supply.

2.4.2 (N) Calculate the elasticity of supply in equilibrium and state it rounded to integer numbers.

2.4.3 (N) The government subsidizes demand with $t = 1$ per unit bought, if the quantity bought on the market is not larger than 6.5. Otherwise the government does not invene in the market. Determine the number of market equilibria.

2.4.4 (N) Now assume that the government taxes the supply with a unit tax of $t = 1$, if the quantity bought on the market is not less than 5.9. (The demand is not subsidized in this part.) Otherwise the government does not intervene in the market. Determine the number of market equilibria.

2.4.5 (MC) Exactly one of the following statements is correct:

a Consumer surplus in the equilibrium without taxes or subsidies is 8.

b The tax receipt of the government increases with t.

c If the government taxes producers with a unit tax of $t = 3$, then it gets tax receipts of 4.

d If the government taxes consumers with a unit tax of $t = 3$, it gets tax receipts of 4.

e None of the above answers is correct.