Stockholm University
Department of Economics
Course name: Microeconomics
Course code: EC7110
Examiner: Ann-Sofie Kolm
Number of credits: 7,5 credits
Date of exam: December 16, 2017
Examination time: 3 hours

Write your identification number on each paper and cover sheet (the number stated in the upper right hand corner on your exam cover). Do not write answers to more than one question in the same cover sheet. Explain notations/concepts and symbols. Only legible exams will be marked. No aids are allowed.

The exam consists of 5 questions. One can get 100 points in total. For the grade E 40 points are required, for D 50 points, C 60 points, B 75 points and A 90 points.

Question 1 is a credit question. If you have received 12 credit points on your assignments, then you should not answer question 1. If you have received 8 credit points on your assignments, then you should answer question 1i but not question 1ii and 1iii. If you have received 4 credit points on your assignments, then you should answer question 1i and 1ii but not question 1iii. If you have received no credit points on your assignments, then you should answer all questions.

Credit	**Solve these questions**
0 points	1i, 1ii, 1iii
4 points	1i, 1ii
8 points	1i
12 points	- (don't solve question 1)

If you think that a question is vaguely formulated: specify the conditions used for solving it.

Results will be posted January 5, at the latest

Good luck!

Problem 1 (credit question, see above) (12 points) Carefully define the following terms and show formally how they can be derived from a cost minimizing firm facing a twice continuously differentiable and strictly quasi-concave production function, $y = f(K, L)$, where K and L denote capital and labour input.

i Conditional demand function.

ii Expenditure function.

iii Expansion path.

Problem 1 Assume a representative individual with preferences given by the following twice continuously differentiable and strictly quasi-concave utility function: $u(x_1, x_2) = x_1^{\frac{1}{3}} x_2^{\frac{2}{3}}$. The individual income is denoted M, and the individual can buy the goods at the given prices p_1 and p_2.

i (4 points) Use the Lagrange method and derive the Marshallian demand for the two goods.

ii (4 points) How will the demand of x_1 change when p_1 increases? Motivate your answer in terms of substitution and income effects.

iii (4 points) Show that the first order conditions implies that the solution should be such that we have a tangency point between the indifference curve and the budget line.

iv (4 points) Use the first order conditions in i) and derive the Lagrange multiplier as a function of p_1, p_2 and M.

v (4 points) Show that the Lagrange multiplier can be interpreted as the marginal utility of income.

vi (4 points) Show that the indifference curve is convex towards the origin.

Problem 3

Consider an individual with the following twice continuously differentiable and strictly quasi-concave utility function: $U(C, z) = C(T - z)$ where C denotes consumption and z denotes labour supply. T is the exogenously given total time available to the individual. In addition to labour income including an employment subsidy paid to workers, $w(1+s)z$, where w is the wage and s is the employment subsidy rate, the individual has access to an exogenously determined non-labour income denoted M. The price on the consumption good is normalized to unity.

i (5 points) Derive the individual labour supply.

ii (5 points) Show how the labour supply is affected by an increase in the employment subsidy rate, s? What can we say about the size of the income and the substitution effect?

iii (5 points) Show that the first order conditions implies that there is a tangency point between the budget line and the indifference curve. Illustrate in a figure with C on the y-axis and z on the x-axis.

Problem 4 Assume a profit maximizing firm producing a good, y, with the use of K and L, taking the input and output prices as given. The production function, $y = f(K, L)$, is twice continuously differentiable and strictly concave. Let P, r, w denote the product price and the input prices on capital and labour, respectively. Assume that the capital stock is fixed in th short run, i.e., $K = \bar{K}$.

i (4 points) Derive the short run labour demand function.

ii (4 points) Derive the short run profit function.

iii (4 points) Show how the firm's highest profit, defined by the profit function in *ii*), is affected by an increase in $\bar{K}$. Explain why.

iv (4 points) Show how the firm's highest profit, defined by the profit function in *ii*), is affected by an increase in w. Explain why.

v (4 points) Show formally that the short run profit function is convex in w.

vi (4 points) Show that the short run profit function is homogenous of degree one in input and output prices.

vii (4 points) Now relax the assumption of a fixed capital stock, and derive the long run demand for labour and capital.

Problem 5 Consider an economy with n agents and two goods. The n individuals' preferences are captured by $u^i\left(x_1^i, x_2^i\right) = \left(x_1^i\right)^{\varphi_i}\left(x_2^i\right)^{1-\varphi_i}$, $i = 1, ..., n$. The utility functions are twice continuously differentiable and strictly quasi-concave, and the preferences over the two goods differ across individuals as captured by the parameter $\varphi_i \in (0,1)$. The initial endowments are equal across individuals and given by $\bar{x}_1^i = \bar{x}_2^i = 1, i = 1, ..., n$. The price on good 1 is denoted p_1 and the price on good 2 is denoted p_2.

i (7 points) Derive the Walrasian equilibrium relative price, $\frac{p_2}{p_1}$.

ii (7 points) Consider a social planer with an objective of chosing an allocation of the goods so to maximize the aggregate welfare of the economy. Use the Lagrange method and set up the problem facing the social planner. Also derive the first order conditions.

iii (7) Will a derived allocation in ii) be Pareto efficient? Motivate.