Stockholm University

Department of Economics

Course name:	**Intermediate Microeconomics**
Course code:	**EC2101**
Semester:	**Spring 2016**
Type of exam:	**Main**
Examiner:	**Adam Jacobsson**
Number of credits:	**7,5 credits (hp)**
Date of exam:	**Sunday 13 March 2016**
Examination time:	**5 hours (09:00-14:00)**

Write your identification number on each paper and cover sheet (the number stated in the upper right hand corner on your exam cover).

Use one cover sheet per question. Explain notions/concepts and symbols. If you think that a question is vaguely formulated, specify the conditions used for solving it. Only legible exams will be marked. **No aids are allowed.**

You may answer in English or in Swedish.

The exam consists of 5 questions. Questions 1-3 are worth 25 points each, question 4 is worth 15 points and question 5 is worth 10 points. The maximum score on the exam is 100 points in total. For the grade E 45 points are required, for D 50 points, C 60 points, B 75 points and A 90 points.
If you have the course credit you do not have to answer question 5.

Your results will be made available on your "My Studies" account **(**www.mitt.su.se) on 31 March at the latest.
The exam review will be held on 1 April at 10-12 in lecture hall D8.

Good luck!

Question 1

Ellinor can consume two goods, x_1 and x_2, at prices p_1 and p_2, respectively. Ellinor's preferences are well behaved and are represented by the following utility function: $u(x_1, x_2) = (x_1)^3 x_2$. Ellinor has an income of m.

a) What, exactly, do we mean by well behaved preferences? (4 points)
b) Derive Ellinor's Marshallian demand functions for the two goods. (10 points)
c) What is the share of income that Ellinor spends on good 1? (Hint: use the derived demand function from b.) (4 points)
d) Is good 2 an ordinary good? Motivate your answer.(Hint: use the derived demand function from b.) (4 points)
e) Provide one example of a positive and monotone transformation of the utility function. Would a positive and monotone transformation of the utility function change any of your answers to a)-d)? Explain your answer intuitively. (3 points)

Question 2

Consider the firm ACME which uses capital, *K*, and labour, *L*, to produce widgets according to the following production function: $f(K, L) = K^{\frac{2}{3}} L^{\frac{1}{3}}$. Let *r* and *w* be the prices of capital and labour respectively. *P* is the price of widgets. The markets for widgets, capital and labour are all perfectly competitive.

a) What is the technical rate of substitution between capital and labour for ACME? (5 points)

In the short run, the level of capital is fixed at $K = \bar{K}$.

b) Set up the short run profit maximization problem. Calculate the short run optimal level of labour. (5 points)

In the long run, ACME can vary both *K* and *L*.

c) Set up ACME's long run cost minimization problem by using the Lagrange method. (Hint: fix output at the level $\bar{y}$.) What are the cost minimizing levels of *K* and *L* in the long run? (10 points)

d) Derive ACME's long run cost function (hint: use your answer form c). (5 points)

Question 3

Consider a market for a homogenous good with the following inverse demand function: $p(y) = 20 - y$ where *y* is total sold quantity of the good on the market and *p* is the price for which it sells for. There are only two firms on this market, Alpha and Beta, who both produce this homogenous good. Alpha's cost function is $c_A(y_A) = 2y_A$ and Beta's cost function is $c_B(y_B) = 2y_B$. The two firms set their production quantities simultaneously without knowing the choice of their opponent.

a) Derive both firms' best response functions and draw these in a diagram. (10 points)

b) What quantities will each firm produce in the equilibrium? Illustrate these quantities in the diagram from a). What is total quantity produced and what is the equilibrium price? (5 points)

Now assume that firm Alpha sets its quantity before Beta.

c) What quantities will the firms produce in the new equilibrium? How have the profits of Alpha and Beta changed compared to your answer in b)? Give an intuitive explanation for this change (if there is a change). (10 points)

Question 4

In a village there is a common grazing land for cows. The cost of purchasing a cow is a and if c cows graze on the common, they will provide $f(c) = 4\sqrt{c}$ liters of milk. Let p be the price of milk.

a) If the village council could decide how many cows the village should have in order to maximize profits, how many cows would graze on the common? (5 points)

b) If the farmers would decide individually, how many cows would then graze the common? (5 points)

c) Compare the two results in a) and b) and explain intuitively why the results differ (if they do), especially concerning efficiency. (5 points)

Question 5

If you have the course credit, do not answer this question.

Assume that there are two types of workers in a perfectly competitive labour market, able workers with marginal product a_2 and unable workers with marginal product $a_1 < a_2$. The number of able workers is L_2 and the number of unable workers is L_1. A firm in a perfectly competitive market produces a good (selling at *p=1*) where the production function is linear: $Q = a_1 L_1 + a_2 L_2$. Under complete information and perfect competition we would have; $w_1 = a_1$ and $w_2 = a_2$, where w_1 and w_2 are the wages of respective type of worker. However, the firm does not know the types of the workers when it hires. On the other hand, the firm knows the proportions of the two types of workers. Assume that the workers do not have any better alternative than what is offered by the firms in this market.

a) What is the wage that will be offered to the workers in this setting? (2 points)

Now assume that the workers can spend e years at university. Assume that this education does not change the workers' productivity. The cost per year of university education is c_1 for the unable workers and c_2 for the able workers where $c_1 > c_2$. Assume also that w_1 & w_2 correspond to lifetime wages (and Q is the corresponding level of production for the same lifetime).

b) The workers can now choose to educate themselves or not (that is, they can pick a level of e) and then show the education certificate to the employer. The employer can now offer different contracts to the workers, where each contract specifies how many years of education, e^*, a worker needs in order to get a certain wage. Explain intuitively the conditions that must apply for the existence of a separating Nash equilibrium in this market (that is, the contracts that the able workers sign are different from the contracts that the unable workers sign). (3 points)

c) Derive mathematically the condition that has to hold for a separating Nash equilibrium. (5 points)