YLIOPISTOTENTTI - UNIVERSITY EXAM

Opiskelijan nimi / Student name:	Opiskelijanumero / Student number:

Opettaja täyttää / Lecturer fills in:

Opintojakson koodi and nimi / The code and the name of the course:

721345A

Intermediate Microeconomics

Tiedekunta / Faculty:	Oulu Business School

Tentin pvm / Date of exam: 1.11.2017	Tentin kesto tunteina / Exam in hours: 3 h

Tentaattori(t) / Examiner(s):	Opintopistemäärä / Credit units: 6
Mikko Vaaramo	Sisäinen postios. / Internal address:
	6 OyKKK

Sallitut apuvälineet / The devices allowed in the exam:

☒ Funktiolaskin / Scientific calculator   ☐ Ohjelmoitava laskin / Programmable calculator

☐ Muu materiaali, tarkennettu alla / Other material, specified below:

Tenttiin vastaaminen / Please answer the questions:
☒ Suomeksi / in Finnish   ☒ Englanniksi / in English

Suomenkielisessä tutkinto-ohjelmassa olevalla opiskelijalla on oikeus käyttää arvioitavassa opintosuorituksessa suomen kieltä, vaikka opintojakson opetuskieli olisi englanti. Tämä ei koske vieraan kielen opintoja. (Kts. Koulutuksen johtosääntö 18 §)

In a Finnish degree programme a student has a right to use Finnish language for their study attainment, even though the language of instruction is English, (excluding language studies) even when the language of instruction is other than Finnish. (See the Education Regulations 18 §)

Kysymyspaperi on palautettava / Paper with exam questions must be returned:
☒ Kyllä / Yes   ☐ Ei / No

Please answer all 5 questions (6 points each).

Question 1.

Consumer A has Cobb-Douglas preferences: $U(x_1, x_2) = x_1^2 x_2^2$,
where x_1 and x_2 are the amounts consumed goods 1 and 2.

a) What does the marginal utility (MU) measure?
   Calculate marginal utilities MU_1 and MU_2 for both goods.   *(2p)*

b) What does the marginal rate of substitution (*MRS*) measure?
   Calculate the marginal rate of substitution MRS_A for consumer A.   *(2p)*

The price of good 1 is $p_1 = 2$ and the price of good 2 is $p_2 = 10$. Consumer's income is $m = 20$.

c) Derive the utility-maximizing ordinary demands $x_1^*(p_1, p_2, m)$ and $x_2^*(p_1, p_2, m)$, given the prices of the goods and the consumer's income. *(2p)*

Question 2.

John works as a deliveryman, and his income depends how fast he is driving. If he follows the speed limits, John's daily income is 144€. If John speeds, his income is 196€, but if he is caught he gets fine of 160€. There is a probability π of being caught in a given day.

John has utility function $U(m) = \sqrt{m}$ over his income m.

a) What are John's preferences towards risk? Is he risk loving, risk averse or risk neutral? Explain your answer by studying the shape of the utility function analytically and/or graphically. *(2p)*
b) What is John's expected utility if he follows the speed limits? *(1p)*
c) Write down John's expected utility if he speeds. *(1p)*
d) Assume that John is an expected utility maximizer.
   Solve the probability of getting caught, π, that would make John <u>indifferent</u> between following speed limits and taking the risk of fine by exceeding the speed limit. *(2p)*

Question 3.

Firm uses labor L and capital K to produce output q with a production technology:
$q = f(L, K) = L^{1/2} K^{1/2}$.

a) Calculate the marginal product of labor MP_L.
   What does this marginal product of labor measure?
   Is the marginal product of labor constant, decreasing or increasing?
   Write down MP_L in a setting where capital K is fixed at level $\bar{K} = 16$. *(4p)*

b) What does returns-to-scale measure?
   Use scaling factor $k > 1$, and solve the returns-to-scale for the firm.
   Does the firm's technology exhibit constant, decreasing or increasing returns-to-scale? *(2p)*

Question 4.

Suppose the demand curve $D(p)$ and the supply curve $S(p)$ for the market are given by the following equations:

$D(p) = 100$
$S(p) = 2p - 10$

a) What is the market equilibrium (price and quantity) in this market? Calculate producer surplus. *(2p)*

b) Suppose that government imposes a quantity tax $t = 10$ on firms. Solve the new market equilibrium. What happens to the producer surplus? Draw a figure. *(2p)*

c) Calculate the tax revenue. Who ends up paying the tax? Does the consumer surplus change? If yes, how much? *(2p)*

Question 5.

The inverse market demand curve is $p(q) = 115 - q$. Cost function for any firm is $c(q) = 7q$. There is two firms operating in the market, and the output of firm 1 is denoted with q_1 and the output of firm 2 with q_2.

First, assume that the two firms play a <u>Cournot game</u> (quantity competition).

a) Calculate the reaction functions for both firms: $R_1(q_2)$ and $R_2(q_1)$. Draw a graph illustrating these functions, where output q_1 is on the horizontal axis and output q_2 is on the vertical axis. Solve the Cournot-Nash equilibrium (q_1^*, q_2^*), and plot it on your graph. How much will firm 1 produce? How much will firm 2 produce? What would be the market price? *(3p)*

Now, suppose the producers follow a <u>Stackelberg market model</u>. Firm 1 begins early, and acts as a Stackelberg leader. Firm 2 is a Stackelberg follower.

b) Write down firm 1's profit maximization problem. *(2p)*
Solve the leader's Stackelberg output q_1^S.
Solve the follower's Stackelberg output q_2^S.
What would be the market price?

Finally, suppose the producers operate as in a <u>Bertrand game</u> (price competition).

c) What is the Nash equilibrium price p^* in this framework? *(1p)*
Explain the adjustment process of price setting.