Final exam - Industrial Organization

Winter semester 2011/2012
Prof. Dr. Georg Götz

<u>Date:</u>   28th February 2012   <u>Time:</u>   16:15-17:45

1. General information:

   a. Make sure that your final exam is complete. The final exam consists of 5 problems.

   b. Only use the provided sheet of paper. Write your matriculation number immediately and clearly on each page!

   c. Please do not remove the staples from the provided sheet of paper.

   d. Allowed items at your workplace: Student ID, writing utensils (no red pen, no ink eraser, no pencil case), ruler, set square, non programmable calculator, food and drinks.

   e. Use a permanent pen (no pencil).

   f. Mobile phones have to be turned off and removed from your place!

2. Hints about doing the exam:

   a. Read each task carefully and consider the distribution of points. The tasks could be extended over several pages.

   b. Please work on all tasks and <u>state each on a new page</u>. Please write your answers in a readable way.

   c. You may write your answers in English or in German.

   d. Label the axes of your illustrations.

   e. Each point equals approximately 1 minute of working time (rough guideline).

   f. The final exam lasts 90 minutes!

We wish you every success!

1 Price discrimination [25 Points]

Sitneva is the only producer for a new anti-allergy drug. There are two consumer groups with identical size. The demand functions of the representative consumers are

$$q_1 = 120 - p_1$$
$$q_2 = B - p_2$$

with prices p_1 and p_2 for one pill and $B \leq 120$ as the second group's maximum willingness to pay. The cost function for producing the drug is $c(q) = 20q$.

a) Given that Sitneva has to charge a uniform price, what is the value of B for which Sitneva will serve both consumer groups?

Now assume that $B = 70$ and Sitneva will serve both groups.

b) Determine the equilibrium price, the equilibrium quantities and Sitneva's total profit if price discrimination is not feasible.

c) What price per pill will be charged to members of each group if Sitneva is able to practice third-degree price discrimination? Calculate the equilibrium quantities and Sitneva's profit.

d) Assume that Sitneva is still able to discriminate between the two consumer groups but sells its pills in packages. What will be the price for and how many pills will be in the package for each of the two representative consumers? Calculate the equilibrium profit.

2 Product differentiation [15 Points]

Consider the market for notebooks in which two firms, Leppa and Hynos, compete for consumers. Both firms provide notebooks with the same quality but in different colors x. There are $N = 1.000.000$ consumers in the market with uniformly distributed preferences for colors on the interval $[0, 1]$. Each consumer buys one laptop if the price is below her maximum willingness to pay of $1000\,€$ minus the disutility $t(x' - x)^2$ if the color x differs from her preference x'.

a) Assume that there are substitutes such that both firms have to set their price equal p^* which satisfies $p^* + t \leq \nu$ and $p^* > c$. Which color $x_1 \leq x_2$ would you choose if you know that your competitor chooses a color $x_2 \geq 0.5$? Note that all consumers with a preference $x \leq x_1$ will buy your product. Give a short explanation of your result.

b) Determine the equilibrium outcome for the case that both firms choose their color simultaneously.

c) Discuss whether this equilibrium outcome would hold if there are no substitutes, i.e. if both firms are able to set their prices p above or below p^*.

3 Product differentiation [25 Points]

Leppa is also active in the market for tablet computers in which it does not face any competition. Leppa provides its new tablet computer with different storage capacities $s_1 = 16$ GB with marginal costs $c_1 = 300$ € and $s_2 = 12$ GB with marginal costs $c_2 = 180$ €. Depending on the storage capacity and on the price, the utility of a representative consumer is $U = \theta s_j - p_j$ with $j = 1, 2$ and θ equally distributed on $[0, 100]$.

a) Derive the demand functions for the tablet computers with quality s_1 and with quality s_2. Note that the market is not covered, i.e. that not every potential consumer buys a tablet.

b) Assume that Leppa provides both qualities. Derive the equilibrium prices, quantities, the indifferent consumers and Leppa's profit.

c) Is the market covered? What would you expect if θ is equally distributed on $[60, 100]$? Discuss and illustrate your answer. (No calculations necessary!)

4 Research & Development [10 Points]

Scrooge Inc. and Glomgold Enterprise compete in the market for (homogeneous) rubber ducks which is characterized by an inverse demand function $P = 150 - X$. The firms produce the rubber ducks with constant marginal costs $c_S = 12$ € and $c_G = 15$ € respectively without any fixed costs. Both firms compete in quantities and firm i's equilibrium profit reads

$$\pi_i = \frac{(150 - 2c_i + c_j)^2}{9}$$

with $i, j = S, G$ and $i \neq j$. Gyro Gearloose, the famous inventor, develops a new production technology which allows the production with marginal costs of $c_{new} = 9$ €.

a) What is Scrooge Inc.'s willingness to pay for this innovation if Gearloose offers the innovation exclusively to the firm?

b) What is each firms' willingness to pay for this innovation if Gearloose sells the innovation to the highest bidder?

c) How do the results from (a) and (b) change if both firms compete in prices?

5 Discussion [10 Points]

Answer <u>one</u> of the following two questions:

a) Discuss the relevance of capacities and capacity constraints on competition and entry decisions.

b) Often firms provide bundles of their products. Explain the following illustration for the case with two products and and discuss this strategy in general.