

Examination in the Bachelor of Science
Course title: Markets, Incentives and Ethical Management
Part: Markets and Incentives
Semester: 2
Lecturers: Prof. Dr. Heiko Karle, Prof. Dr. Markus Reisinger; Dr. Roe Sarel
Group: 172
Examination date: 26th April 2018

Aids: pocket calculator Casio FX-82 solar

Please enter your student ID (matriculation number) and your group!

Student ID	Group
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Please note:

The exam consists of 4 questions of which you will have to answer **all** questions. You have **90** minutes to complete the examination. The maximum of points to be reached is **90**. Please use the enclosed answer sheet to answer your questions and add your student ID on its cover.

We wish you all the best for your examination!

Internal use only!

Question	1	2	3	4	Total
Possible points:	31	20	25	14	90
Points achieved:					

Signature of corrector

Question 1 – General Equilibrium

(31 points)

Suppose that there are two consumers A and B and two products x and y . The initial endowment ω is such that consumer A is endowed with $(\omega_{X_A}, \omega_{Y_A}) = (10, 2)$ and consumer B is endowed with $(\omega_{X_B}, \omega_{Y_B}) = (6, 1)$. Both consumers have standard preferences and their utility functions are

$$U_A(X_A, Y_A) = X_A Y_A \quad \text{and} \quad U_B(x_B, y_B) = X_B Y_B.$$

- (a) In the Edgeworth box, draw the consumers' indifference curves passing through the initial endowment. Indicate the set of allocations that are Pareto improvements compared to the initial endowment and briefly explain it. (6 points)
- (b) Determine the Pareto-efficiency condition and briefly explain it. (4 points)
- (c) Determine the equation of the contract curve and draw it in the Edgeworth box. (5 points)
- (d) State the definition of competitive equilibrium. (4 points)
- (e) State the definition of the First Welfare Theorem. (2 points)
- (f) Indicate where in the Edgeworth box the competitive equilibrium must lie according to the first welfare theorem and your answer in (a). (2 points)

The next questions are about distributional issues regarding the two individuals and the welfare with different social welfare functions.

- (g) Determine the utilities of consumers A and B at their respective initial endowment. (1 point)
- (h) Determine consumer A and B's utility when consumer A gives 1 unit of good Y to consumer B. (1 point)
- (i) State whether the allocation in g) or in h) is preferred by a Rawlsian welfare function? Explain your answer. (3 point)
- (j) State whether the allocation in g) or h) is preferred by a Utilitarian welfare function? Explain your answer. (3 point)

Question 2 – Oligopoly

(20 points)

Consider two firms, firm 1 and firm 2, which produce a homogenous product. The inverse demand function is $P = 10 - Q$. Production cost functions are $C_1(q_1) = 2q_1$ for firm 1 and $C_2(q_2) = 4q_2$ for firm 2.

- (a) Suppose that both firms compete in prices (Bertrand Competition). Determine the equilibrium prices and the equilibrium profit of each firm. (4 points)
- (b) Suppose now that firms compete in quantities (Cournot competition). Determine the equilibrium quantities and the equilibrium profit of each firm. (7 points)
- (c) Is **firm 2** (i.e., the less efficient firm) better with price competition or with quantity competition? Provide an explanation to your answer. (3 points)
- (d) Is **firm 1** (i.e., the more efficient firm) better with price competition or with quantity competition? What is the explanation for your result. (3 points)
- (e) Would firm 2 (i.e., the less efficient firm) be better off if the competition was sequential and it was setting its price before firm 1 does (that is, firm 2 chooses its price first, firm 1 observes this price, and sets its own price). Provide an explanation to your answer. (3 points)

Question 3 – Oligopoly and Tacit Collusion

(25 points)

Consider a situation with two firms, firm 1 and firm 2, which produce a homogenous product. The inverse demand function is $P = 5 - Q$. Production cost functions are $2q_i$, $i=1,2$, for each firm, that is, $C_1(q_1) = 2q_1$ and $C_2(q_2) = 2q_2$.

- (a) Suppose that firm 1 is a monopolist (that is, firm 2 does not participate in the market). Determine the monopoly price and firm 1's profit. (4 points)
- (b) Instead of firm 1 being a monopolist, firm 1 now competes with firm 2. Competition occurs in prices (Bertrand competition). What are the equilibrium prices and equilibrium profits of this game? (3 points)
- (c) Suppose that instead of competing only for one period, the two firms compete in prices repeatedly for 100 periods. Explain why the Subgame Perfect Nash equilibrium in this repeated interaction is the same as in the one-shot (single period) competition. (4 points)

Suppose now that the two firms compete for an infinite number of periods. Both firms have a common discount factor δ , which is between 0 and 1. Each firm follows a grim-trigger strategy.

- (d) Formulate a reasonable grim-trigger strategy that allows the firms to sustain collusion if the discount factor δ is large enough. (5 points)
- (e) To determine the best deviation from a grim-trigger strategy, state the optimal one-period best-response of a firm, given that the competitor sets its price at the monopoly level. What is the resulting profit? (3 points).
- (f) Determine now the critical discount factor above which firms can sustain tacit collusion when following a grim trigger strategy. (6 points)

Question 4 – Asymmetric Information

(14 points)

Consider the following signaling situation:

There are two types of cars: one has high quality and is worth 50 to a buyer, and one has low quality and is worth 20 to a buyer. Both types are equally likely (that is, they each have a probability of 0.5).

The owner of each type of car can go to a car repair shop to implement “cosmetic” changes to the car, which do not affect the quality. However, implementing a level λ of cosmetic changes is less expensive for the owner of a high-quality car than for the owner of a low-quality car. Specifically, implementing one unit of cosmetic changes costs 2 for the owner of a high-quality car but 5 for the owner of a low-quality car.

- (a) Suppose that implementing cosmetic changes was not possible, what is the expected value of a car to a buyer? (2 points)

Consider the following constellation: Low-quality owners choose $\lambda=0$, high-quality owners choose $\lambda=\lambda^*>0$, and buyers pay 50 when seeing a level $\lambda=\lambda^*$ but only 20 when seeing a car with $\lambda=0$.

- (b) Determine for which values of λ^* neither the owner of low-quality car nor the owner of a high-quality car have an incentive to deviate. (5 points)
- (c) Out of these levels, which level of λ^* is the most-efficient one for social surplus? Give a short explanation. (3 points)
- (d) Explain verbally why signaling allows a buyer to disentangle the quality types although cosmetic changes do not improve the quality of a car. (4 points)