Part I: Multiple-choice questions. Select exactly one alternative for each question. Each correct answer gives 5 points and each incorrect answer -1 point.

1. Four firms are active in a market. Their market shares are 40%, 40%, 10%, and 10%. What is the change in the *Herfindahl-Hirschman Index* (measured from 1 to 10,000) if the two largest firms merge?

   (a) A decrease of 4000.
   (b) A decrease of 1,600.
   (c) An increase of 3,200.
   (d) An increase of 3,600.
   (e) None of the above.

2. Which of the following statement regarding the appropriate modelling choice of competition is *false*? Price competition is abbreviated P and quantity competition is abbreviated Q.

   (a) P is more appropriate if capacity is unlimited.
   (b) P is more appropriate if prices are more difficult to adjust in the short run than quantities.
   (c) Q is more appropriate if capacity is limited.
   (d) Q is more appropriate if quantities are more difficult to adjust in the short run than prices.
   (e) None of the above.

3. Gela2 sells ice cream and coffee at a unit cost of 1 each. There are three types of clients, A, B, and C, and their reserve prices for one unit of the two goods are as indicated below (their reserve price is zero for additional units). The firm cannot observe the type of the client, but knows 40% of clients are of type A, 40% of type B, and 20% of type C. What is the profit-maximizing price, p, of a bundle of an ice-cream and a cup of coffee if the firm practices *pure bundling*?

	Ice cream	Cup of Coffee
A	7	1
B	5	4
C	4	2

   (a) $p = 9$.
   (b) $p = 8$.
   (c) $p = 7$.
   (d) $p = 6$.
   (e) None of the above.

4. Three firms compete in prices with homogeneous products. If they collude they share the monopoly profit 12 equally, otherwise they earn 0. Suppose the firms play a grim trigger strategy (start to collude but switch irreversibly to competition if there is a deviation). What is the minimum discount factor necessary to support collusion?

   (a) 1/3.
   (b) 1/2.
   (c) 2/3.
   (d) 3/4.
   (e) 5/6.

5. Which of the following alternatives is false?

   (a) Under Cournot competition, a firm has no incentive to license a drastic innovation to a competitor.
   (b) Under Bertrand competition, a firm has no incentive to license a drastic innovation to a competitor.
   (c) Under Cournot competition, a firm has no incentive to license a non-drastic innovation to a competitor.
   (d) Under Bertrand competition, a firm has no incentive to license a non-drastic innovation to a competitor.
   (e) None of the above.

6. Two firms, 1 and 2, can produce two incompatible versions of a network good, A and B. The matrix below illustrates the firms' payoffs depending if they choose to standardize or not.

Firm 2

Firm 1		A	B
	A	π_1^{AA}, π_2^{AA}	π_1^{AB}, π_2^{AB}
	B	π_1^{BA}, π_2^{BA}	π_1^{BB}, π_2^{BB}

Suppose, $\pi_1^{AB} > \pi_1^{BB}, \pi_2^{AB} > \pi_2^{AA}$ and either $\pi_1^{AA} > \pi_1^{BA}$ or $\pi_2^{BB} > \pi_2^{BA}$. Which of the following situation does this represent?

   (a) "Straightforward standardization".
   (b) "Battle of the sexes".
   (c) "Standards war".
   (d) "Pesky little brother".
   (e) None of the above.

Part II: Questions that require answers with calculations/motivation

7. (30 points) The monopoly firm Discro is selling a good to two types of customers, high income (H) and low income (L). The individual demand functions for each type of customer are given by $Q_H(p) = 11 - p$ and $Q_L(p) = 9 - p$ and Discro has a unit cost of 1.

    (a) (10 points) Suppose Discro practices *personalized pricing* using two-part tariffs. What are the profit-maximizing tariffs, $T_H(q) = F_H + qp_H$ and $T_L(q) = F_L + qp_L$ (where q is the quantity consumed)?

    (b) (10 points) Suppose Discro practices *group pricing*. What are the profit-maximizing prices, p_H and p_L?

    (c) (10 points) Suppose Discro practices *menu pricing* using non-linear pricing and that the two types have utility functions $U_H(q, T) = 11q - q^2/2 - T$ and $U_L(q, T) = 9q - q^2/2 - T$, with zero reservation utility. What is the profit-maximizing menu, $\{(T_H, q_H), (T_L, q_L)\}$, assuming the fraction of H-types is $1/2$? You may assume that the usual constraints bind.

8. (10 points) Alfa (A) and Beta (B) are competing in quantities in the market for truffel oil. The two firms face the inverse demand function $P(q_A, q_B) = 12 - q_A - q_B$. Alfa has a constant marginal costs of 1 and Beta a constant marginal cost of 2. What are the quantities observed in a subgame perfect equilibrium of the game where Alfa sets its quantity before Beta and Beta can observe Alfa's choice before deciding on its own production?

9. Consider an (irreversible) investment decision of an incumbent facing potential entry. The incumbent may either invest to deter entry or to accommodate entry.

    (a) (5 points) Explain what the direct effect and the strategic effect of the investment is.

    (b) (10 points) Explain whether the incumbent should "overinvest" or "underivest" to deter (D) entry and to accommodate (A) entry in the four scenarios given in the matrix below.

		Investment makes the incumbent	
		Tough	Soft
Mode of competition	Strategic substitutes	D: .... A:	D: .... A: ....
	Strategic complements	D: .... A:	D: .... A: ....

10. The market for widgets has the inverse demand function $P(q) = 20 - 2q$. An incumbent monopoly is initially producing widgets at a unit cost of 8 (all potential entrants have a marginal cost above 20). In case of entry firms compete in prices (Bertrand competition). Now, consider an innovation lowers the unit cost to 4.

    (a) (5 points) Suppose only the incumbent has access to the innovation. How much would it be willing to pay for the innovation?

    (b) (5 points) Suppose only an entrant has access to the innovation. How much is it willing to pay for the innovation? Is it more or less than the incumbent in (a)? Why?

    (c) (5 points) Suppose the innovation is first offered to the incumbent. If the incumbent declines, the innovation is sold to one of the entrants. How much is the incumbent willing to pay for the innovation in this case?