Information Economics, Fall 2014
Midterm Exam

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Note. This exam is in-class and open everything (including all kinds of electronic devices). However, an exam taker is not allowed to communicate with any person during the exam. Cheating will result in severe penalty. You do not need to return the problem sheet.

1. (40 points) Consider two firms producing and selling the same product to one market. While firm 2's unit production cost is $c_2 > 0$, firm 1 has a new technology and can produce at a lower unit production cost $c_1 \in (0, c_2)$. These two firms play the static Cournot game by choosing q_1 and q_2, respectively, as the production quantities at the same time. The market-clearing price is $p = a - q_1 - q_2$, where $a > c_2$ is an exogenous constant. Each firm acts to maximize its own profit.
   (a) (15 points) Find the equilibrium quantities chosen by the two firms.
   Hint. Under some conditions firm 2 may choose to produce nothing!
   (b) (10 points) How does the equilibrium outcome change when c_1 goes down? Provide both a mathematically proof and an economic intuition.
   (c) (15 points) Suppose that before the static game starts, firm 1 may choose to license the technology to firm 2 at a fixed payment t determined by firm 1. Once getting the technology, firm 2 will also produce at cost c_1. Suppose that firm 2 will purchase the new technology as long as her profit will become weakly higher. Apply economic reasoning to find a condition under which it is better for firm 1 not to sell the technology.
   Note. For Part (c), having any derivation in your answer will make you lose some points. Use economic reasoning only.

2. (30 points) Consider the two-type screening problem we introduced in lecture videos. For each of the following two extended cases, find the optimality condition for q_{H}^* and q_{L}^* (like the one on p. 29 of Week 6) and determine whether information asymmetry results in efficiency loss. Provide both a mathematically proof and an economic intuition.
   (a) (15 points) The production cost is not constant. More precisely, suppose the cost for producing q units is $c(q)$ rather cq, where $c(\cdot)$ is a strictly increasing and strictly convex function.
   (b) (15 points) The product is an information good and thus $c = 0$.

3. (30 points) Consider a car rental company and a renter who wants to rent a car for one day. The rental company is considering how to set the daily rent, car insurance fee, and insurance plan (e.g., covering up to a certain amount, the amount of deductible, etc.). For each of the following two scenarios, qualitatively propose a pricing and insurance plan that helps the rental company alleviate its informational disadvantage. Use as few mathematical symbols as possible. Provide economic reasoning to your proposed plan.
   (a) (15 points) Suppose that there are two types of renters, good drivers and bad drivers. If a good driver rents a car, with probability θ_{G} the car with be damaged. For a bad driver, the probability goes up to $\theta_{\mathrm{B}} > \theta_{\mathrm{G}}$. The renter's type is her/his hidden information.
   (b) (15 points) Suppose that the renter will decide her/his degree of carefulness $x \geq 0$ such that the probability to damage the car $p(x)$ decreases in x. The cost of being careful, $c(x)$, is increasing and convex in x. The degree of carefulness is the renter's hidden action.

   Note. As this exam is open everything, you may search online for existing plans and use them in answering this problem. The key component of your answer (that will help you earn the most points) is thus why the plan alleviates information asymmetry, not what the plan is.