14.03 Final

Spring 1997

DO NOT OPEN THE EXAM UNTIL TIME IS ANNOUNCED!!!

Please box your answers when possible, so that they are easy to find. Use different bluebooks for the two parts.

You have three hours to complete this exam.

Points correspond approximately to minutes; there are 150 points on the exam, corresponding to 2 1/2 hours. This leaves you an extra 30 minutes to check your work, go back to difficult problems, etc.

Calculators are permitted.

Good luck!

Part I -- 64 pts.

True-False, and Why:

8 points each.

Instructions: YOU MUST defend your answer with two or three sentences, as well as a formula and or diagram. Diagrams should be labeled. However, your answers should be CONCISE!

1. An import tariff is good for a small country's consumers and producers as long as the tariff revenue can be redistributed to the consumers. [Your answer should use a *partial* equilibrium supply/demand approach to answer this question, and it must include a carefully labeled diagram.]
2. A risk-averse consumer is willing to pay more than her expected loss from a flood for an insurance policy which reimburses her for flood-related losses. [You answer must include a carefully labeled diagram illustrating the comparison between expected loss and willingness to pay for insurance.]
3. Government regulators should always crack down on price discrimination of any sort, since it (a) makes all consumers worse off and (b) gives the monopolist incentives to further distort production away from efficient levels. [Address each part separately].
4. If we apply the logic of Milgrom and Roberts, then we would expect that all else equal, falling prices of flexible manufacturing equipment will lead firms to decrease their inventories, maintain closer supplier relations, and increase their emphasis on information gathering about demand. [Be precise about the reasons these variables change or don't change in response to the price changes.]
5. Consider a price-taking firm with a U-shaped long-run average cost curve AC(q). For each fixed level of capital (K_0), the firm's short-run average cost curve SAC(q;K_0) intersects the long-run average cost curve AC(q) at the same quantity where SAC(q;K_0) intersects the short-run marginal cost curve SMC(q;K_0). [Hint: draw a picture, and think about the logical relationship between SAC and AC!]
6. If the government knows a price taking firm's total cost function $TC(q)$ and the social costs of output $SC(q)$, it can set a tax so that the firm internalizes any externalities it creates. [Your answer must either find a formula for the tax or explain why taxes don't work here.]
7. One of your classmates shows you his UROP project. His project looks at 30 cities of similar size in the U.S., and it compares the crime levels for those cities which established and implemented anti-gun regulations in the past five years (call this C_R), to crime levels in those cities without regulations (call this C_N). There were 15 cities of each type. He found that $C_R > C_N$, so that crime was *higher* in the cities which implemented the regulations.

   From these results, we can conclude that if we implemented anti-gun regulations in one of the 15 cities which doesn't already have regulations, crime in that city would increase. [Your answer should address whether this is a natural experiment, and building on that, whether the stated policy conclusion follows.]
8. If demand for a good is very elastic (relative to supply), then producers bear most of the burden of a tax. [Your answer should include a diagram.]

Part II - 86 pts.

Short Answer

1. [30 pts.] Suppose that there are two economists, Dr. BR and Dr. SR, are called to testify in front of Congress. They must support their testimony with formal economic arguments about the effects of different policies on efficiency. Dr. BR and Dr. SR disagree about which assumptions most accurately describe the world. *Except* on their points of disagreement, the two economists believe that the world operates according to our standard economic assumptions and in particular that markets function according to the assumptions of perfect competition.

   For each of the proposed policies (a)-(c) below, analyze the efficiency effects of the policy according to Dr. BR and according to Dr. SR. For each policy (a)-(c) *and* for each economist (i)-(ii), your answer should provide (1) a formal argument matched with a carefully labeled diagram, and (2) a statement of which constituencies in the economy will support the policy given the economist's assumption.

   (a) A price ceiling in the wadget market.

   (i) Dr. BR believes that firms are price takers, while (ii) Dr. SR disagrees.

   (b) An import tariff on automobiles. (Use a general equilibrium approach).

   (i) Dr. BR believes that the country is "small" and takes world prices as given, while (ii) Dr. SR disagrees.

   (c) A requirement that female nurses be paid for jobs according to their "comparable worth," such as the wages of electricians.

   (i) Dr. BR believes that there is no discrimination and that people choose their professions based on job characteristics, while (ii) Dr. SR believes that discrimination poses barriers to entry for women in the electrician profession.

2. [26 points] This problem concerns the multi-task model analyzed in class, and it uses exactly the same set of assumptions. In particular, consider a firm which produces widgets using machines. The firm employs workers who can use their time for two different activities: using the machine to make widgets (with effort spent e_1) and oiling the machine (with effort spent e_2). The firm's expected benefit for effort is $v_1e_1 + v_2e_2$. Workers' preferences are $U(w) = -e^{-rw}$. Their cost of effort (in certainty-equivalent units) is quadratic in the number of hours worked in each activity, that is, $c(e_1,e_2) = \frac{1}{2}e_1^2 + \frac{1}{2}e_2^2 + \gamma e_1e_2$, where we further assume that $\gamma \geq 0$.

   The firm measures effort imperfectly, according to $x_1=e_1 + \eta_1$ and $x_2=e_2 + \eta_2$, where η_i is normally distributed with variance σ_i^2.

   Workers come to work if their total certainty-equivalent wealth is greater than 0 (that is, their outside option is to stay at home with wealth 0). Their salary has two components, a fixed component α plus the commission payments $\beta_1 \cdot x_1$ and $\beta_2 \cdot x_2$.

   (a) For this first part, suppose that the firm has a self-oiling machine, so that $v_2=0$ (thus the firm sets $\beta_2=0$ and the worker chooses $e_2=0$). This is just the standard single-effort model. What formula will the firm use to set β_1? [*You do not have to derive this formula*]. How do incentives vary with σ_1^2 and r? Interpret.

   For the rest of this question, suppose that the firm values both oiling and widget-making. *You do not have to show the derivation of the principal's optimal choices of commissions, but you should state the principal's objective function and discuss its relevant properties in your answer.*

   (b) Consider two firms with this technology, Firm A and Firm B. The firms are exactly the same, except that Firm B institutes random monitoring of oiling, so that it improves the precision of its observation about effort on oiling, lowering σ_2^2 relative to Firm A. Qualitatively, compare Firm A and Firm B with respect to their choices of β_2.

   (c) Compare the two firms with regard to their choices of β_1, the commission on effort for widget production: do the firms make the same choices? Recall σ_1^2 is the same in both firms. Describe precisely the logic behind your answer.

3. [30 pts.] Suppose that there are two types of internet subscribers in the population, internet-junkies (IJ's) and email-checkers (EC's). The individual demand curve of an IJ is $7-.2q$, while EC's individual demand curve is given by $6-.25q$. There are 2000 IJ's and 1000 EC's in the MIT dorms. MIT (which incurs zero marginal cost) announces that due to cutbacks in defense funding, it needs to raise revenue, and so it will begin charging students for their use of internet time. Assume MIT maximizes profits.

Suppose first that MIT can distinguish between the students, so that it can prevent IJ's from taking deals intended for EC's and vice versa.

(a) If MIT can offer "bundles" of internet time for fixed prices to each type of student (i.e. 20 hours for \$60), what price-quantity bundle should it offer the IJ's and what price-quantity bundle should it offer the EC's? How do the quantities compare to the socially optimal quantities?

(b) In part (a), are the students better or worse off (in terms of consumer surplus) than if MIT offered *linear* prices to each group of students (i.e., MIT can choose linear prices of p_{IJ} per hour for IJ's and p_{EC} per hour for EC's), with no preset quantity limits? Is MIT better or worse off? [Hint: use a graph to compare the linear pricing solution to the "bundling" solution.]

Now suppose that MIT cannot distinguish between the students, so that students choose their most preferred bundles. Specifically, students can choose either the "Super" package, which gives Q^H hours of internet time at a price P^H, or they can choose the "Standard" package which gives Q^L hours of premium viewing at a price of P^L.

(c) Suppose that MIT announces the following bundles: (30,\$100) and (20,\$60). What will revenue be?

(d) Suppose that MIT instead offers (30,\$70) and (20,\$60). What will revenue be now? Will MIT be better or worse off with (c) than (d)?

(e) Could MIT increase revenue above what is earned in part (d) by offering the *same* quantities as in part (d), but by changing the prices? If so, what are the best prices for MIT to charge given these quantities? What is revenue now? [Hint: You may assume that it is optimal to try to target the high quantity to the IJ's and the low bundle to the EC's, but as usual, the students pick the best bundle for them. Thus, since the quantities are given here, you *don't* need to solve MIT's optimization problem for the choice of quantities.]

(f) Now suppose that MIT chooses to offer any two bundles it wants. State and interpret the condition which determines the profit-maximizing quantities (partial credit for explaining the tradeoff using a graph). You do *not* need to solve for these quantities.