ECO 300 – MICROECONOMIC THEORY
Fall Term 2004
PROBLEM SET 8
Due 12.30 p.m. on Thursday December 15

QUESTION 1: (Total 35 points)
Multiple choice, 5 points each

1. Perfect competition achieves a Pareto optimal allocation of two goods between two people because
a. both of them have the same preferences.
b. both of them face the same prices.
c. both of them consume the same quantity of both goods.
d. goods are homogeneous

2. In an economy which produces two goods X and Y, using two inputs L and K , efficient input use occurs when
a. $MRTS_{LK}^{X} = MRS_{LK}^{Y}$
b. $MRT_{XY} = MRS_{XY}$
c. $MRS_X/P_X = MRS_Y/P_Y$
d. $MRTS_{LK}^{X} = MRTS_{LK}^{Y}$

3. Assume that a particular state has decided to outlaw the sharing of individuals' credit histories as an illegal invasion of privacy. As a result of this action we would expect the
a. cost of borrowing money to rise.
b. number of loans to unworthy credit risks to rise.
c. problems of asymmetric information to become more severe.
d. All of the above.
e. None of the above.

Scenario 1: This applies to questions 4 and 5. Consider the information below:
For Group A the cost of attaining an educational level y (a continuous variable) is CA(y) = $6000 y . For Group B the cost of attaining level y is CB(y) = $10000 y. Employees will be offered $50,000 if they have y < y*, where y* is an education threshold determined by the employer, and offered $130,000 if they have y >y*.

4. Refer to Scenario 1. The highest level of y* that can be set and still have the high-productivity people choose to meet it is
a. 16.
b. 13 1/3.
c. 13.
d. 8.
e. 0.

5. Refer to Scenario 1. The lowest level of y* that can be set and still have only the high-productivity people meet it is

a. 16.
b. 13 1/3.
c. 13.
d. 8.
e. 0.

Scenario 2: This applies to questions 6 and 7. Consider the following information:

The probability of a fire in a factory without a fire prevention program is 0.01.
The probability of a fire in a factory with a fire protection program is 0.001.
If a fire occurred, the value of the loss would be $300,000. A fire prevention program would cost $80 to run.

6. Refer to Scenario 2. Moral hazard arises in this situation because, if the firm

a. pays the premium that is based on the 0.001 probability, it has no incentive to spend the additional $80 for the fire protection program, so the true probability of loss is no longer 0.001.
b. pays the premium that is based on the 0.01 probability, it has no incentive to spend the additional $80 for the fire protection program, so the true probability of loss is no longer 0.01.
c. puts the fire protection program in place, it has less incentive to spend $300 for a premium, leaving the firm underinsured.
d. puts the fire protection program in place, it has less incentive to spend $6,000 for a premium, leaving the firm underinsured.
e. puts the fire protection program in place, it will consider that a substitute for insurance and not be able to deal with the loss from a fire should it occur.

7. Refer to Scenario 2. Moral hazard would be eliminated in this situation if

a. the insurer would always charge $300.
b. the insurer would always charge $6000.
c. the insurer could costlessly monitor whether a fire prevention program has been implemented, and adjust the premium upward if it is not.
d. the insurer could costlessly monitor whether a fire prevention program has been implemented, and adjust the premium downward if it is not.
e. the fire did not occur.

QUESTION 2: (Total 25 points)

Consider the example of screening for skill using education, which was developed in the class handout of December 1, Asymmetric Information Part 2, pp. 4-5. Extend it by supposing that there is a third type B, whose productivity on a good job is 100, and whose cost of getting X units of education is 40 X. All the other magnitudes are as in the class handout. Regard X as a continuous variable (not necessarily restricted to be an integer).

You are asked to find a separating equilibrium with screening, where employers believe anyone with $E_A$ or more of education as type A, believe anyone with $E_B$ or more of education as type B, and these beliefs are correct in the light of the choices of education made by the various types.

(a) (12 points) Find the incentive compatibility conditions (inequalities like those on p. 5 of that handout but now involving both $E_A$ and $E_B$ ) that ensure [1] type A find it optimal to get education $E_A$ and not mimic the choices of types B and C, [2] type B find it optimal to get education $E_B$ and not mimic the choices of types A and C, and [3] type C find it optimal to get education 0 and not mimic the choices of types A and B.

(b) (8 points) You will find that some of these inequalities when taken together imply others, thereby making the others redundant. Reduce the set of inequalities to a minimal set, that is, those that are not redundant in this way. What kinds of mimicking are ruled out by the inequalities in this minimal set? What general principle can you infer?

(c) (5 points) The incentive compatibility conditions jointly require $E_A$ to be in a numerical interval. Find the lower and upper bounds of this interval. Compare them to the corresponding bounds, namely 2.6 and 5.2, that existed in the case considered in class, where there were only two types, A and C. What general principle can you infer?

QUESTION 3: (Total 25 points)

You are a turnaround artiste, specializing in identifying underperforming companies, buying them, improving their performance and stock price, and then selling. You have found such a prospect, Sicco. This company's marketing department is mediocre; you believe that if you take over the company you will increase its value by 75% of whatever it was before. But its accounting department is very good; they can conceal assets, liabilities, and transactions to a point where the company's true value is hard for outsiders to identify (but insiders know the truth perfectly). You think that the company's value in the hands of its current management is somewhere between $10 million and $110 million, uniformly distributed over this range. The current management will sell the company to you if, and only if, your bid exceeds the true value known to them.

(a) (5 points) If you bid $110 million for the company, your bid will surely succeed. Is your expected profit positive?

(b) (8 points) If you bid $50 million, for the company, what is the probability that your bid succeeds? What is your expected profit if you do succeed in buying the company? Therefore, at the point in time where you make your bid of $50 million, what is your expected profit? (Warning: In calculating this expectation, don't forget the probability of your getting the company.)

(c) (12 points) What should you bid if you want to maximize your expected profit? (Hint: Assume it is X million dollars. Carry out the same analysis as in part (b) above, and find an algebraic expression for your expected profit as seen from the point in time when you are making your bid. Then choose X to maximize this expression.)

QUESTION 4: (15 points)

Briefly (250 words or less) describe and analyze a game of signaling or screening in which you have been personally involved, either as the informed party or the uninformed party. State whether the signaling or screening achieved its purpose, and explain why or why not. Remember the incentive compatibility conditions that are needed for credibility of signals or success of screening devices to achieve separation; your answer should have a clear logical sense of such incentive compatibility, even if you do not need any algebra for the logical reasoning in your example.

You should expect about 12 points for a logically correct answer where the game does not have any special imagination or interest. The final 3 points are for such special qualities, as judged by Martin. You can get less than 12 points for logical errors about incentive compatibility or other aspects of the game.