ECO 300 – MICROECONOMIC THEORY
Fall Term 2005
SAMPLE FINAL EXAMINATION ANSWER KEY

QUESTION 1: (10 points, 1 each)

1. d (P-R p. 113)
2. a (P-R p. 71, Handout Sep. 22 p. 7)
3. b (P-R pp. 77, 200, Handouts Sep. 27 p. 5, Oct. 13 p. 5)
4. d (P-R p. 262)
5. a (Handout Dec. 6 p. 4)
6. a (P-R p. 438)
7. b (P-R p. 315, Handout Nov. 8 p. 4)
8. d (P-R. p. 482, Precepts Week 11)
9. d (P-R p. 620, Handout Dec. 1 p. 4)
10. c (P-R p. 642, Handout Jan. 10 p. 1)

QUESTION 2: (15 points)

(a) (5 points) P-R pp. 159-60: Expected utility is the sum of utilities associated with all possible outcomes, weighted by the probability that each outcome will occur. OR (Class handout Oct. 6 p. 3: If a consumer can have different outcomes (of wealth, income, consumption etc. depending on the specific context) x_1 , x_2 , … x_n , with respective probabilities) p_1 , p_2 , … p_n , and his utility function over outcomes is U, then his expected utility is

$$EU = p_1 U(x_1) + p_2 U(x_2) + \dots p_n U(x_n)$$

A perfect answer would give both the statement and the formula, but we give full credit for a full correct version of either one.

(b) (2 points) Risk-aversion corresponds to a concave utility function (MU = U'(x) decreasing, or U''(x) < 0).

(c) (3 points) An example: U(x) = ln(x).

(d) (5 points) P-R p. 162: Risk premium is the maximum amount of money the consumer is willing to pay to avoid the risk. Formal statement paralleling the answer to (a) above: Let $E[x] = p_1 x_1 + p_2 x_2 + \dots p_n x_n$ denote the average outcome in money or quantity terms. Then the risk premium R is the sure reduction in money or quantity below this level that would make the consumer indifferent between the reduced sure amount and the risky prospect, that is, the solution to the equation

$$U(E[x] - R) = p_1 U(x_1) + p_2 U(x_2) + \dots p_n U(x_n)$$

(e) (2 points) This was discussed in precepts week 4, and Martin gave a great example of various temperature scales as the "affine" transformations that were permitted while preserving the ability of the utility function to represent the same preferences.

Example: $V(x) = 3 + 7 \ln(x)$ represents the same preferences as $U(x) = \ln(x)$. (Note: $V(x) = \sqrt{x} = x^{1/2}$ does NOT represent the same preferences as $U(x) = \ln(x)$. The two correspond to different degrees of risk aversion. Using the coefficient of relative risk aversion concept from the class handout of Oct. 6 p. 5, you see that the square root function has $\rho = ½$ and the log function has $\rho = 1$.)

(f) (8 points) Criticism: Any section in Pindyck-Rubinfeld pp. 179-82 on behavioral economics, or the Allais paradox (class handout Oct. 11 p. 2) or Ellsberg paradox (precept week 4). Alternative: Prospect theory or Regret theory (class handout Oct. 11 p. 3). Your grade will depend on how complete, correct, and clear your answer is.

QUESTION 3: (15 points)

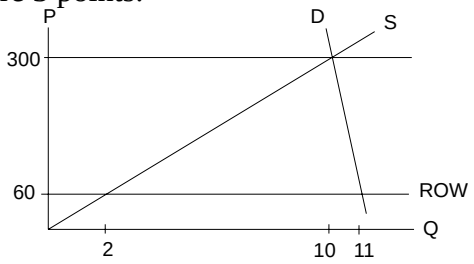
In the short run, the total avoidable cost is $TAC = 2 + ½ Q^2$. So the average avoidable cost is $AAC = 2/Q + ½ Q$. Marginal cost is $MC = Q$.
AAC is minimized where $– 2 / Q^2 – ½ = 0$, or $Q^2 = 4$ or $Q = 2$ (alternatively, where AAC = MC so $2/Q + ½ Q = Q$ etc.) And the minimized AAC is $2/2 + ½ * 2 = 2$.
Therefore the short run supply curve is given by $P = MC$ or $P = Q$ or $Q = P$ when $P > 2$, and $Q = 0$ when $P < 2$. At $P = 2$, the firm is indifferent between producing $Q = 2$ and not producing ($Q = 0$). (6 points)

In the long run, the total (avoidable) cost is $TC = 8 + ½ Q^2$. So the average (avoidable) cost is $AC = 8/Q + ½ Q$. Marginal cost is $MC = Q$.
AC is minimized where $– 8 / Q^2 – ½ = 0$, or $Q^2 = 16$ or $Q = 4$ (alternatively, where AC = MC so $8/Q + ½ Q = Q$ etc.) And the minimized AC is $8/4 + ½ * 4 = 4$.
Therefore the firm's long run supply curve is given by $P = MC$ or $P = Q$ or $Q = P$ when $P > 4$, and $Q = 0$ when $P < 4$. At $P = 4$, the firm is indifferent between producing $Q = 4$ and not producing ($Q = 0$). (6 points)

With many firms like this, the long run industry supply curve will be a horizontal line at $P = 4$ (or the set of points $P = 4$ and $Q = 0, 4, 8, 12, 16, \ldots$ if you want to be pedantic.) (3 points)

QUESTION 4: (15 points)

a. Figure 3 points:



b. (6 points) The elasticity of supply is $(P/Q)\, dQ/dP = 1$, so $dQ/dP = Q/P = 10/300 = 1/30$. So when price P drops from 300 to 60, the quantity supplied by Japanese farmers

will decrease by (300-60)/30 = 8, so this quantity will be 10 – 8 = 2, and the domestic quantity demanded is 11. So imports = 11 – 2 = 9.

c. Consumer surplus increase = ½ (10+11) (300–60) = 21 * 120 = 2520 (million yen)
Producer surplus loss = ½ (10+2) (300–60) = 12 * 120 = 1440 (million yen)
(3 points each for these calculations)

QUESTION 5: (15 points)

a. (4 points) The monopoly level of output is found where marginal revenue equals marginal cost.
Here total revenue TR = (1200 – Q) Q = 1200 Q – Q^2 , so MR = 1,200 - 2Q. Setting MR equal to MC (which is zero here) yields: 1,200 - 2Q = 0, Q = 600, P = 1,200 - 600 = 600

b. (8 points) First we find the best response functions (reaction curves). With zero costs, profit equals revenue. For firm 1,
$R_1 = P\ Q_1 = (1{,}200 - Q)\ Q_1 = 1200\ Q_1 - (Q_1 + Q_2)\ Q_1 = 1200\ Q_1 – Q_2\ Q_1 – (Q_1)^2$
To maximize this with respect to Q_1 holding Q_2 constant, we set
$\partial\ R_1/\partial Q_1 = 1200 – Q_2 – 2\ Q_1 = 0$, or $Q_2 + 2\ Q_1 = 1200$
Repeating the same calculation for firm 2 yields $2\ Q_2 + Q_1 = 1200$
These have the obvious solution $Q_2 = Q_1 = 400$, and then P = 1200 – 800 = 400

c. (3 points) Perfect competition will lead to price = marginal cost = 0, so total quantity 1200. The split of this between the two firms is indeterminate.

QUESTION 6: (15 points)

(2 points) A pure public good is non-exclusive (non-payers cannot be prevented from consuming it) and non-rival (one person's consumption does not detract at all from another's consumption of the same good).

(10 points) Samuelson condition – Lecture Overhead handout of January 12, p. 2 or Pindyck-Rubinfeld pp. 666-667. The figure and associated analysis needed here.

(3 points) The problem with using this method in practice is private information. People do not have the incentive to declare their willingness to pay truthfully when they can become free riders instead. More elaborate schemes such as the Vickrey-Clarke-Groves method are needed.

QUESTION 7: (15 points)

To implement the principle, the government needs to know each individual's ability and need; both of these are largely private information. This creates problems of adverse selection and moral hazard. People will pretend to have little ability and great need (adverse selection). And if what the government gives to each person depends on need and not effort, people will have little incentive to make any effort. Of course the

government can (to some extent and at a cost) detect ability and need, and monitor effort. But the cost may be excessive, and also the detection / monitoring raises further agency problems – people can collude with the detectors or monitors, resulting in corruption.

Mitigation of the adverse selection requires some "screening devices". People can be allowed to select from a menu of payment options – a straight salary or one with a performance-based component – so the less able will choose the salary and the more able will choose the performance-based scheme. The latter can take several forms – bonuses, profit-shares, promotions, … Sometimes rewards that are cheap for the government to provide may acquire prestige and get the desired response – medals for "Hero of the Soviet Union, Second Class", or the like. All these devices are actually intended to serve the principle of getting work out of people according to their ability, but the resulting payment structures may run counter to the principle of giving out fruits of the economy according to need.

On the side of needs, payment in kind may have a useful role. This contradicts the elementary economics intuition that it is best to pay people in cash and let them use it to suit their own best preferences optimally. If people with limited mobility were given cash to buy wheelchairs or the like, many might pretend to have the disability, collect the cash, and spend it on something else. But if they were given wheelchairs, the incentive to pretend disability to get this inconvenient contraption is much reduced. (Giving cash and requiring credible proof of purchase of a wheelchair is tantamount to giving a wheelchair.) But if there is a good secondary market in wheelchairs, recipients can convert the good into cash, so the mimicking problem reappears. Governments have consciously or subconsciously used humiliation as a screening device – welfare offices are drab, waiting times are long, the clerks are surly, paying at supermarket counters with food stamps is degrading, and so on. The idea is that only the truly needy would put up with this. Of course the ethics of such devices are questionable.

Coping with moral hazard again needs some incentive pay structure. This creates inequality, which may (but need not always) run counter to the principle of payment according to need.

Of course this is a huge subject, and in the 25 minutes available to answer such a question on an exam you could only touch on the major points. But this is something that can help you organize your thinking about the subject of asymmetric information, and you can take the lessons beyond the exam and the course into real policy applications.