MA Comprehensive Examination in Microeconomics

Saturday 16th August, 2008

Instructions

There are 6 pages in total, including this one. There are 10 short questions and 4 long questions spread across the remaining 5 pages. The total points on this exam is 100.

- Do not commence the exam until instructed to do so.
- Do not turn this page over until instructed to do so.
- You will have 3 hours to complete the exam.
- Answer the questions on the separate paper provided.
- Attempt 7 out of 10 short questions (70 points) and 2 out of 4 long questions (30 points). If you attempt more, be sure to indicate which you want us to grade or we will only grade the first ones that we come across.
- Be sure to show your workings.
- If part of a question builds on a previous part that you cannot answer, you may still get credit for describing how you would proceed were you to have the answer.
- This exam is meant to be quite difficult.
- You may be docked points for including irrelevant waffle in your answers.

Good luck!

Short Questions (10 points each): Attempt 7 only.

1. The following game has 2 pure-strategy Nash equilibria. Find them. [10 points]

P1\P2	L	M	R
T	9,-4	6,3	2,2
M	5,5	0,0	3,-1
B	2,0	1,2	4,5

Player 1's strategies are in the first column. Player 1's payoff is the first number in each pair.

2. A firm combines labor l and capital k to produce output y via the production function $y = f(k, l)$. Define:

    i. Decreasing returns-to-scale. [5 points]
    ii. Increasing returns-to-scale. [5 points]

3. Consider a symmetric 2-player infinitely repeated prisoner's dilemma game with a discount factor δ that satisfies $0 < \delta < 1$. For player 1, consider the following strategy: always defect, no matter what (that is, (D,D,D, ….)). Is this a dominant strategy? Does your answer depend on δ? [10 points]

4. Think of the following familiar games as formal two-person zero-sum games. For each, indicate whether it is a game of perfect information (explaining why), and comment on whether you think it has at least one pure-strategy Nash equilibrium:

    a. Rock-paper-scissors. [5 points]

    b. Chess with a simple rule change; if nobody has won by 50 moves, the game is declared a draw. [5 points]

5. Consider a binding minimum wage of $7. Assume that we know the exact market demand and supply schedules. Using conventional demand and supply analysis:

    a. Given the demand and supply schedule, why is it that we cannot identify geometrically exactly what the deadweight loss is? [4 points]

    b. Suppose that within the model of the binding minimum wage the quantity of labor transacted is 500 units. Given the demand and supply schedules:

        i. What would have to have occurred to make the deadweight loss the *lowest* it could possibly be within the model? [3 points]
        ii. What about the *highest* it could possibly be? [3 points]

6. The Coase theorem:

    a. State the Coase theorem. [2 points]

    b. Why is it implausible to think that the Coase theorem applies to a problem like air pollution in the Los Angeles basin? [4 points]

    c. Explain how a negative externality such as air pollution can be interpreted as a transaction cost problem. [4 points]

7. Assume that every firm in an industry has the following production function: $y = k^2 + l^2$, where y is output, k is capital input and l is labor input. What can we predict about the size and number of firms in this industry? [10 points]

8. Assume that it costs $3 to carry an umbrella around for the day, that it costs $10 to be stuck in the rain without an umbrella, and that you are risk neutral.

    a. If the probability of rain is 1/5, should you carry an umbrella? [2 points]

    b. Rain can be predicted by observing air pressure, which can be done by meteorologists only. High air pressure occurs with probability 4/5, and it implies a 1/8 probability of rain. Low air pressure occurs with probability 1/5, and it implies a 1/2 probability of rain. Purchasing a weather report from a meteorologist informs you of the air pressure and hence the probability of rain. What is the most that you are willing to pay for a report? [8 points]

9. Tom, Joe and Abe (men) and Pam and Sue (women) are considering 3 activities: they could stay home, go out to a club, or go to a new action movie. By staying at home the benefit to each is $0. By going to the club Tom, Joe, and Abe benefit $14, Pam benefits $26, and Sue benefits $40. By going to the movie Tom benefits $60, Joe and Abe benefit $20, Pam benefits $10 and Sue benefits $0. The movie charges $14 per person, and the club has a $20 cover charge, but only to men. Staying home is free.

    a. What is the most efficient activity for this group? [3 points]

    b. In a pair-wise vote between two activities, each person votes on which of the two activities he/she prefers. What activities does the efficient one beat in pair-wise votes? [3 points]

    c. Find a set of transfers so that each person benefits from the efficient activity relative to staying home. [4 points]

10. Baby-sitting: In the following, assume a supply schedule for Sam and a demand schedule for Mrs. Henderson. Sam's MC of supplying baby-sitting is increasing.

    a. Sam's marginal cost of producing a 7th hour of baby-sitting is $4.58. State exactly what that means. [2 points]

    b. At a price of $4.75, Sam would supply 7 hours of baby-sitting.

        i. What do we know about Sam's marginal cost of the 8th hour? [2 points]
        ii. What do we know about Sam's marginal cost of the 6th hour? [2 points]

    c. Mrs. Henderson's marginal benefit for the 7th hour of baby-sitting is $7.23.

        i. State exactly what that means. [2 points]
        ii. Assume that transaction costs between Sam and Mrs. Henderson are zero. What would be the social surplus from the transacting of the 7th hour of baby-sitting? [2 points]

Long questions (15 points each): Attempt 2 only.

Question 1

Suppose my utility function over strawberries (s) and cream (c) is $u(s,c) = \alpha s + \beta c$ where (α, β) are strictly positive constants. The price of strawberries is p_s, the price of cream is p_c and my income is m.

a. Show that neither commodity can be inferior. [4 points]

b. Draw a graph where the x-axis is price of strawberries and the y-axis is price-elasticity of demand for strawberries. Clearly label all features of interest. [3 points]

c. Henceforth ignore the preferences described above. Non-satiation means that I always prefer more to less of each commodity. If we assume non-satiation in a world with only strawberries and cream, can both goods simultaneously be Giffen? [3 points]

d. Suppose that an economist wants to test the plausibility of the standard model of consumer behavior as a description of actual behavior. Explain how knowledge of whether a good is normal, inferior, Giffen or non-Giffen (ordinary) can help an economist do this. [5 points]

Question 2

N identical people are deciding how much to contribute to a charity. They each start with $\$e$. For every dollar that i donates to the charity, EVERYBODY gets $\$\beta < 1$ of utility. Let $0 \leq x_i \leq e$ denote the donation by person i. Then the utility of person i is: $u_i = e - x_i + \beta\left(\sum_{j=1}^{N} x_j\right)$.

a. What is the Nash equilibrium of this game? [2 points]

b. Why does $N\beta > 1$ imply that the Nash equilibrium is Pareto inefficient? [2 points]

c. The head of the charity offers x lottery tickets to the contributor for each $\$x$ that that individual contributes to the charity, e.g., if you contribute $3, you get 3 lottery tickets. The lottery prize is $\$R > 0$. The lottery is only open to the N people. Assuming that lottery tickets are perfectly divisible (i.e., you can buy 0.25 lottery tickets etc), show that the new symmetric Nash equilibrium is $x_i = \frac{(N-1)R}{N^2(1-\beta)}\ \forall\ i$. You can assume that the first-order condition is sufficient for solving this. [4 points]

d. The head of the charity is a bit of a miser and says that the lottery has to be financed by the charitable contributions. This means that the component of utility that people derive from the charity is now $\beta\left(\sum_{j=1}^{N} x_j - R\right)$. Show that when $N\beta > 1$, the provision of the public good will still exceed that implied by part (a). [3 points]

e. By referring to externalities, in words describe how a self-financing lottery has solved this charitable contributions dilemma. [4 points]

Question 3

Two individuals are involved in a mutually advantageous relationship. Each person contributes an effort level e_i, which is a non-negative number. Individual i's preferences (for $i \in \{1,2\}$) are represented by the payoff function $u_i(e_1, e_2) = \alpha e_i\left(e_j - e_i\right) + e_j$, where $\alpha > 0$.

a. Find the Nash equilibrium. [2 points]

b. Consider the infinitely repeated version of this game, where $0 < \delta < 1$. Payoffs are: $\sum_{t=1}^{\infty} \delta^t u_i(e_1^t, e_2^t)$. How can the players sustain an effort of $k > 0$ by both players for each period? What is the smallest δ necessary to sustain such an equilibrium? [7 points] [PARTS (c) AND (d) ON NEXT PAGE]

c. Given a utilitarian social planner who values the utility of both players equally, what is the symmetric Pareto efficient solution to the planner problem? [2 points]

d. "This model of how repetition can sustain higher effort is of no practical consequence since there is no such thing as an infinitely repeated game." Explain **two** reasons for disagreeing with this statement. [4 points]

Question 4

Studios need scripts to make movies, and people who write scripts like to be able to brag that their script was taken by a movie. Assume (contrary to all reason) that movie scripts and studios are all of the same quality. Each studio wants to buy at most one script. Given a price of purchasing scripts $-\infty < p < \infty$, the demand for scripts by studios is:

$$D = \max\left\{0, \left(91 - \frac{1}{100}p\right)\right\}$$

Each scriptwriter wants at most one studio to take his/her script. Given a price of purchasing the right to have a studio take your script of $-\infty < q < \infty$, the demand for studios by scriptwriters is

$$D = \max\{0, (1000 - q)\}$$

[Note: if $y = \max\{0, f(x)\}$ then $y = f(x)$ if $f(x) \geq 0$ and $y = 0$ otherwise]

a. In a free market, how many scripts will be traded, and which side will pay what other side how much? How much total welfare will be produced from this? [5 points]

b. If each script trade is taxed $5000, how many scripts will be traded? Who in effect pays more of this tax, studios or script-writers? What is the welfare loss from this tax? [5 points]

c. Ignore the tax. Imagine that a law prohibits trading scripts for cash, and that scripts and studios are allocated at random to all who want them. How many scripts will be exchanged, and what is the welfare loss from this law? [5 points]

[END OF EXAM]