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Economics 410

The Maxwell School
Syracuse University

Exam 1

Spring 2007

VERSION M

Instructions

1. Write your SU ID NUMBER and the exam version letter above on your blue book. Please do NOT write your name.

2. Do not open the exam until you are told to do so.

3. Please turn off the ringer on your phone right now – before the exam begins.

4. SHOW ALL YOUR WORK. Numerical answers without supporting work will receive little or no credit.

5. You have 80 minutes to work on the exam. There are 75 points possible; please budget your time accordingly. Also note that many of the questions have (a), (b), etc., inserted into the text to help you avoid overlooking part of the answer.

6. Collaboration of any kind on the exam is not allowed. *Use of phones or other wireless devices will be presumed to be collaboration – so don't do it.* Cheating of any kind will result in an F on the exam and referral of the case to the Dean's office for further sanctions.

7. Calculators *may not* be shared.

8. Some handy formulas:

$$PV = \frac{B}{(1+r)^t} \qquad PV = \frac{B}{r}$$

Question 1 (15 points)

A town is considering expanding its wastewater treatment plant. Without the expansion, the town has a 5% chance in every year of exceeding the system's capacity. When it does, raw sewage is released into a nearby lake causing $10 million of damage. Expanding the system would prevent the overflows but it would cost $6 million in construction costs (paid in year 0), plus it would cost $100,000 every year to maintain. You may assume that if the plant is built, it will begin operating in year 1 and will last forever. The interest rate is 5%.

Please calculate (a) the net present value of the expansion. On the basis of your results, (b) explain briefly whether or not the town should go ahead with the project. Be sure to show all your work.

Question 2 (15 points)

A town of 20,000 residents has a pollution problem arising from production of a single good. It is known that the residents have identical W2P curves for the good of the form: W2Pi = A – B*Q_i, where the subscript i indicates individual i. It is also known that when the price of the good is $6, a typical person buys 40 units, and when the price is $4, a typical person buys 60. The supply of the good is perfectly elastic at $3 (that is, the MC is $3) but each unit also creates $2 worth of pollution.

Please compute (a) the market equilibrium, (b) the efficient equilibrium and (c) the welfare gain from moving from the market equilibrium to efficiency. Please note that you only have to calculate the two equilibriums and the DWL: you do not have to propose or discuss any policies in this question.

Question 3 (15 points)

A pollutant is emitted by three sources. It is currently uncontrolled and each source emits 100 tons. The marginal benefit of abatement is known to be: MBA = 100 – 0.6*Qa. The marginal abatement cost curves for the three sources are the following: MAC1 = 2*Qa1, MAC2 = (1/3)*Qa2, and MAC3 = (2/3)*Qa3.

Please calculate (a) the efficient total amount of abatement and (b), (c) and (d) the amount of abatement that should be done by each source. Note that you only have to find the efficient pattern of abatement: you do not need to discuss a policy in this question.

Exam continues on the next page …

Question 4 (15 points)

Three sources emit a pollutant. Each is initially emitting 100 tons. The marginal benefit of abatement is known to be $240 per ton, and the sources have the marginal abatement costs shown: MAC1 = 4*Qa1, MAC2 = 6*Qa2, MAC3 = 3*Qa3.

Design a tradable permit system that will achieve the efficient amount of abatement while spreading the total compliance cost equally across the three sources. Please calculate (a), (b) and (c) the number of permits that should be distributed to each source.

Question 5 (15 points)

Two sources of a pollutant were recently regulated. Just before regulation each was emitting 1000 pounds of the pollutant (2000 pounds total). The MBA for the pollutant is $40 per pound. At the time of regulation, the sources are believed to be able to abate at the following costs: MCA1 = (1/20)*Qa1, MCA2 = (1/10)*Qa2. A permit system was established and each firm was given exactly the number of permits that the regulator expected it to need at the efficient pattern of abatement. (No tweaking to equalize costs.) However, the projected MAC for source 1 turned out to be wrong. The true curve was MCA1 = (1/10)*Qa2.

Please calculate: (a) and (b) the original number of permits given to each firm, (c) the expected price of a permit, (d) the amount of abatement that would be efficient given the true MCA1, (e) the actual price of a permit, (f) and (g), the actual amount of abatement done by each source, (h) the value of any permit sales between the firms, and (i) the deadweight loss due to the policy.