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Economics 410

The Maxwell School
Syracuse University

Exam 1

Spring 2008

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)

It is technically possible to capture carbon dioxide emissions from coal-fired power plants and store them in old oil reservoirs and other geologic formations. However, there is a chance that the CO2 might leak out catastrophically. If it does, any nearby residents would potentially be at risk.

Suppose that storing a ton of CO2 today (year 0) would provide $5 worth of benefits every year forever from reduced climate change (beginning in year 1). However, suppose that there is a 2% chance in any given year that some of the CO2 would leak out. If a leak occurs, it would probably dissipate before causing any harm but there is a 1 in 50,000 chance that it would kill someone (CO2 is non-toxic but in very large volume it could cause asphyxiation).

Using an interest rate of 5% and a VSL of $6 million, please calculate: (a) the net present value of storing a ton of CO2 in year 0. On the basis of your results, (b) explain briefly whether or not the project should be carried out. Be sure to show all your work.

Question 2 (15 points)

Consumption of a particular good has been found to create a positive externality. The market willingness to pay for the good is W2P = 1200 – 2*Q and the marginal cost of producing it is MC = 200 + 3*Q. However, each unit also creates $100 worth of external benefits.

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

Question 3 (15 points)

A pollutant is emitted by two different *types* of sources. There are 5 sources of type "A" and 100 sources of type "B". Each type-A source has a marginal abatement cost curve given by the equation MCA*i* = 1*Q*i* where Q*i* is the amount of abatement done by source *i* and *i* is a subscript running from 1 to 5. Each type-B source has an abatement cost curve given by MCA*j* = 20*Q*j* where *j* is a subscript running from 1 to 100. The marginal benefit of abatement is known to be: MBA = 400 – 0.1*Qt, where Qt is total abatement.

Please calculate: (a) the efficient total amount of abatement, (b) the efficient marginal cost of abatement, (c) the efficient amount of abatement done by an *individual* type-A source, and (d) the efficient amount of abatement done by an *individual* type-B source. Note that you only have to find the efficient pattern of abatement: you do not need to discuss a policy in this question.

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Question 4 (15 points)

Three sources emit a pollutant and each source initially emits 500 tons. The marginal abatement costs for the three sources are given by: MCA1 = 1*Q1, MCA2 = 1*Q2 (identical to source 1), and MCA3 = 2*Q3. The marginal benefit of abatement is given by MBA = 500 – (3/5)*Qt, where Qt is total abatement.

Design a tradable permit system that will achieve the efficient amount of abatement while causing source 3 to bear *all* of the overall compliance cost. 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 source was emitting 100 tons of the pollutant (200 tons total). The MBA for the pollutant is $200 per ton for levels of abatement up to 80 tons; above 80 tons of abatement the MBA drops to $50 per ton. At the time of regulation, the sources were believed to be able to abate at the following costs: MCA1 = 2*Q1, MCA2 = 2*Q2. An emissions tax policy was established and the tax set at $80 per ton However, the projected MCA for source 1 turned out to be wrong. The true curve was MCA1 = 4*Q1.

Please calculate: (a), (b) the amount of abatement that would have been done by each firm if the original MCA1 had been correct; (c), (d) the amount of abatement that would be efficient for each firm given the true MCA1; (e), (f) the actual amount of abatement done by each firm; and (g) the deadweight loss due to the policy.