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Economics 410

The Maxwell School
Syracuse University

Exam 1

Spring 2011

VERSION S

Instructions

1. Write your **SUID NUMBER** on your bluebook and DO NOT write your name.
2. Write the **EXAM VERSION** from the box above on your bluebook.
3. Do not open the exam until you are told to do so.
4. Please turn off the ringer on your phone right now – before the exam begins.
5. If you are wearing a baseball cap, please remove it or turn it backward.
6. SHOW ALL YOUR WORK. Numerical answers without supporting work will receive little or no credit.
7. 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.
8. Collaboration of any kind on the exam is not allowed. *Use of phones or other wireless devices at any time during the exam 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.
9. Calculators *may not* be shared.
10. Some handy formulas:

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

Areas: Triangle $= \frac{bh}{2}$ $\qquad$ Trapezoid $= \left(\frac{b_1 + b_2}{2}\right)h$

Question 1 (15 points)

Suppose a city is considering two alternative plans for a site containing hazardous waste. Under Plan 1, the city would spend $1000 in period 0 to bury the waste in a lined and sealed pit. The pit would keep the waste isolated for 50 years (years 1-50). However, beginning in year 51, there would be a 1/500 chance every year that some of the waste would leak out of the pit. In any year a leak occurs, it will have an 80% chance of causing $100,000 of damage and a 20% chance of causing $10 million of damage. Under Plan 2, the city would spend $2500 in each of years 1, 2 and 3 to incinerate the waste. Once the waste is incinerated, it has no chance of causing future damage. You may also assume that the waste causes no damage while it is waiting to being incinerated.

Please compute (a), (b) the expected net present value of each plan. Then (c) explain briefly which plan is better. You may assume the city uses an interest rate of 5% in present value calculations.

Question 2 (15 points)

Production of a good creates 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 = 2*Q. The external marginal benefits are given by MBext = 1*Q.

Please compute: (a), (b) the price and quantity at the market equilibrium, (c) the efficient quantity, (d) the price buyers would have to be charged to reach the efficient Q, (e) the subsidy rate that would be needed, and (f) the total cost of the subsidy to the government.

Question 3 (15 points)

An air pollutant is emitted by two types of firms: A and B. There are 200 type-A firms and each initially emits 100 tons of pollution. The marginal abatement cost for a type-A firm is given by MCAi = (1/10)*Q*i* where Q*i* is the amount of abatement done by type-A firm *i*. There are 50 type-B firms and each initially emits 800 tons. The MCA curve for a type-B firm is given by MCA*j* = (1/100)*Q*j* where Q*j* is the amount of abatement done by type-B firm *j*. The marginal benefit of abatement is MBA=48 – (1/1000)*Qt, where Qt is total abatement. The government wishes to use a tax to control the externality.

Please calculate: (a) the efficient total amount of abatement, (b) the efficient tax rate on emissions, (c), (d) the amount of abatement done by an *individual* firm of each type, (e), (f) the abatement cost for a firm of each type, and (g), (h) the tax payment by each type of firm.

Exam continues on the next page …

Question 4 (15 points)

Three sources each emit 60 tons of a pollutant (180 tons total). Their marginal abatement costs are given by: MCA1 = 1*Q1, MCA2 = 2*Q2 and MCA3=4*Q3. The marginal benefit of abatement is given by MBA = 180 – 2*Qt, where Qt is total abatement.

Design a tradable permit system that will achieve the efficient amount of abatement while splitting the total compliance cost so that sources 1 and 2 each pay 50% of the total and source 3 pays nothing. Please determine: (a) the equilibrium price of a permit, and (b), (c) and (d) the number of permits that should be distributed to each source.

Question 5 (15 points)

Suppose that consumption of a particular product creates a negative externality. The market demand for the good is good is given by the willingness to pay equation W2P=1300 – B*Q, where B is a parameter and Q is the total amount consumed. The good is produced by 10 identical firms, each of which has a marginal cost curve given by MC*i* = C*Q*i* where C is a parameter and Q*i* is the amount produced by firm *i*. Although B and C are initially unknown, the equilibrium price and quantity in the market have been observed to be P=50 and Q=250. The external cost is given by MCext = $260.

Please calculate: (a), (b) the values of B and C, (c), (d) the efficient price and quantity and (e) the deadweight loss at the market equilibrium.