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Economics 437

The Maxwell School
Syracuse University

Exam 1

Spring 2012

VERSION M

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 small coastal city is concerned about damage from hurricanes. Currently, there is a 5% chance each year that a hurricane strong enough to cause damage will strike the city. When one does, it causes $50 million of damage. Two proposals have been made to address the problem. Plan A would spend $10 million in year 0 to build a protective seawall. With the seawall in place, the chance of damage would be reduced to 3% per year forever starting in year 1. However, if damage occurs, it will still be $50 million. Plan B would spend $1 million in year 0 to buy up shoreline property and convert it to a nature preserve. Maintaining the preserve would cost $100,000 per year forever starting in year 1. The preserve would not change the chance of damage, which would remain 5% per year. However, when a storm hits, it would absorb some of the storm water and lessen the amount of damage to the city to $35 million.

Please compute (a) the expected present value cost with neither plan in place, and then (b), (c) the expected present value cost of each plan. Then (d) explain briefly which what plan is best. 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 negative externality. The market willingness to pay for the good is W2P = 1200 – 3*Q and the marginal cost of producing it is MC = 2*Q. The external marginal costs are given by MCext = 1*Q.

Please compute: (a), (b) the price and quantity at the market equilibrium, (c), (d) the efficient price and quantity, and (e) the net welfare gain from moving from the market equilibrium to efficiency.

Question 3 (15 points)

A pollutant is emitted by 20 type-H firms and 50 type-L firms. Type-H firms each initially emit 200 tons of pollution and have a steep marginal cost of abatement curve: for type-H firm *i*, the curve is given by MCA*i* =(1/2)*Q*i* where Q*i* is the amount of abatement done by type-H firm *i*. Type-L firms each initially emit 500 tons of pollution but have a flatter MCA: for type-L firm *j*, the curve is given by MCA*j* = (1/10)*Q*j* where Q*j* is the amount of abatement done by type-L firm *j*. The marginal benefit of abatement is MBA=40 – (1/200)*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 = 3*Q1, MCA2 = 4*Q2 and MCA3=6*Q3. The marginal benefit of abatement is given by MBA = 210 – 1*Qt, where Qt is total abatement.

Design a tradable permit system that will achieve the efficient amount of abatement while shifting the total compliance cost so that source 3 pays 100% of the cost and sources 1 and 2 have net payments of zero. 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 positive externality. The market demand for the good is given by the willingness to pay equation W2P=A – B*Q, where A is a parameter and Q is the total amount consumed. Although A and B are initially unknown, data is available from the recent past: in 2010, P was $110 and Q was 38, and in 2011, P was $100 and Q was 40. (You may assume that the values of A and B have remained constant.) The marginal cost of the good in 2012 is MC=$80 and the industry is competitive. The external benefit is given by MBext = $1*Q.

Please calculate: (a), (b) the values of A and B, (c) the efficient quantity in 2012, (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.