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Economics 359M

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The University of Texas at Austin

Final Exam

Spring 2001

DO NOT OPEN THIS EXAM UNTIL YOU ARE TOLD TO DO SO.

Instructions

Write your STUDENT NUMBER in the upper right corner of this exam. Do NOT write your name.

SHOW ALL YOUR WORK. Answers without supporting work will receive little or no credit.

Do all your work on this exam. If you need extra space, write on the backs of the pages. However, if you do write an answer on the back of a page, *be sure you've noted that near the question*.

There are 80 points possible on the exam and you'll have 3 hours to complete it.

Question 1 (1 parts, 8 points)

People who are not economists often take it for granted that oil and other exhaustible resources are being used up much too quickly because people alive today do not take future generations into account. Is this true? Discuss in detail.

Question 2 (1 part, 8 points)

How would you determine the value of preserving the Arctic National Wildlife Refuge? Discuss your approach in detail and explain any strengths or weaknesses.

Question 3 (2 parts, 16 points)

Suppose the government is considering allowing a new pesticide to enter the market. The pesticide lowers the cost of growing crops. However, small quantities of it remain on the food and there is evidence that it is carcinogenic. No epidemiological studies have been done but in a clinical study a dose of 1000 units of the chemical were shown to cause 10 fatal cases of cancer in a population of 200 rats.

(a) Suppose that one year's of use of the pesticide by farmers would expose a typical consumer to 1 unit of the chemical and would lower the consumer's food expenses by $5. Under the usual assumptions used in risk assessment, should the government allow the pesticide to be used? Discuss how your decision would be affected by the population's willingness to pay per life saved and give an indication of the real world range of WTP for a life.

Question 3, continued

(b) Now suppose that a new clinical trial has been done and which finds that the true dose response function has the form: $R = (D^{0.5})/632$, where D is the dose (the number of units of the pesticide to which a person has been exposed) and R is the increase in the risk of developing cancer. Does this change your answer to part (a)? Discuss.

Question 4 (3 parts, 24 points total)

Suppose a particular pollutant is emitted by three sources and is initially uncontrolled. Source 1 emits 400 tons and can abate its emissions at a marginal cost given by $MC1=Q1$, where $Q1$ is the amount of abatement. Source 2 emits 800 tons and can abate at a cost given by $MC2=2*Q2$. Source 3 also emits 800 tons but its marginal cost of abatement is constant at $300. The damages caused by the pollutant depend on how much is being emitted. When the level of pollution is 1500 tons or less, the damage caused by an additional unit of pollution is $100; when emissions are greater than 1500 tons, the marginal damage is much higher: $1000.

(a) Determine the efficient level of abatement. How much should each source clean up? What will each source end up spending on abatement? What will the total amount spent on abatement be?

Question 4, continued

(b) Suppose the government decides to use a command and control policy to reduce the problem. It calculates the percentage reduction in overall emissions from part (a) and then requires each firm to reduce its emissions by that fraction. For example, if you showed in part (a) that overall emissions should be reduced by 20% then the command and control policy would require that each source eliminate 20% of its emissions. How much will each source end up paying for pollution abatement? Discuss how this compares to the results from part (a). Is it better or worse? Why?

Question 4, continued

(c) Suppose the government wanted to use a tradable permit policy instead. Design a policy that would achieve the efficient amount of abatement while spreading the overall cost between the firms according to their shares in the initial emissions. (For example, firm 2 accounts for 40% of initial emissions so it should pay 40% of the cleanup costs.) How many permits would you distribute to each firm? What would the price of a permit be in equilibrium?

Question 5 (1 part, 8 points)

Consider a resource that is to be used during two periods. In the first period, demand for the good is given by $P1=100-Q1$ and in the second period it is given by $P2=140-Q2$. There are 150 units of the good to be divided and it is available at zero cost. You may assume that the interest rate is 100%. Find the efficient allocation. What is the price and quantity in each period? Now calculate how the situation would change if a backstop were available at a cost of $30.

Question 6 (2 parts, 16 points total)

Suppose that a particular good can be produced from either raw materials or scrap. The marginal cost of raw production depends on the total amount extracted to date and is given by the equation: $MEC = Q_T$, where Q_T is the total amount produced to date. Producing the good by recycling scrap has a marginal cost of \$180. The good is to be produced for 4 periods, each of which has a willingness to pay given by: $Pi = 200 - Qi$, where Pi and Qi are the price and quantity of the good in period i. The interest rate is zero.

(a) Find the market equilibrium production and use of this good. Solve for the price, quantity, marginal extraction cost and royalty in each period. How much is produced from raw materials? How much by recycling? Discuss.

Question 5, continued

(b) Now suppose that each unit of raw production creates an externality of \$75. What is the efficient amount of raw production? What is the efficient amount of recycling? Discuss how your results from this section compare to those from part (a).