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Economics 410

The Maxwell School
Syracuse University

Exam 2

Spring 2007

VERSION P

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 120 minutes to work on the exam. There are 90 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)

The government is considering whether or not to regulate the use of an industrial chemical. Nationwide, there are 100,000 workers in the industry that uses the chemical. A typical worker is exposed to a dose of 100 milligrams (0.1 gram). No epidemiological study has been done on the chemical but a clinical study is available. In the study, 400 mice were exposed to a dose that would be equivalent to 100 grams in a human, and there were 60 more cases of cancer than normal. The dose-response function is believed to be linear.

The government is considering two options: Policy A would cost $150 million and would ban the chemical completely; Policy B would cost $50 million and would restrict, but not ban, the chemical. Under Policy B, only 20,000 people would be exposed but those people would still receive the 0.1 gram dose.

Please calculate: (a) the number of expected cases of cancer in workers as a result of exposure to the chemical before regulation, (b) the net benefits of Policy A, and (c) the net benefits of Policy B. Then (d) explain which policy would be preferred and why. You may assume that the government uses $6 million as its estimate of the population's willingness to pay to save a statistical life.

Question 2 (15 points)

A state government would like to determine the value of a small park that is open only on weekends. No admission fee is currently charged and 490 people visit the park in a typical weekend. A researcher has interviewed a sample of the visitors and determined that they come from 5 geographic zones. The cost of a round trip to the park from each zone is shown in the table below, along with each zone's population and the number of people who visit the park from the zone.

Zone	Travel Cost	Population	Visitors
A	$5	250	100
B	$10	600	180
C	$15	500	100
D	$20	1100	110
E	$25	2000	0

It is also known that the number of visits to the park (including people from all zones) is given by an equation of the form: P=A-B*Q, where P is the admission fee, Q is the number of visitors, and A and B are constants. The park is open 52 weekends a year and the government uses a 5% interest rate in PV calculations.

Please compute: (a) the number of people who would visit the park each weekend if a $5 admission fee were charged, (b) the amount of consumer surplus currently produced by the park each weekend, (c) amount of surplus produced over a year, and (d) the present value of keeping the land as a park forever. For simplicity, you can treat each year's annual surplus as arriving all at once: you do NOT need to worry about the fact that the weekends are scattered throughout the year.

Question 3 (15 points)

A city is deciding what to do with a parcel of vacant land. The city is concerned about two periods, now (period 0) and a generation in the future (period 1). The interest rate between the two periods is 100%. The land is providing zero benefits now but the city believes that it might be valuable as a park in period 1. In particular, it believes that there is a 25% chance the land would produce $70 million of benefits as a park in period 1; otherwise, however, it would produce zero benefits. A developer would be willing to buy the land for $10 million in either period. Development of the land is irreversible.

Please: (a) calculate the net present value of leaving the park vacant in period 0, and (b) explain whether or not the city should sell the land to the developer in period 0 and why.

Question 4 (15 points)

A river carrying 1000 units of water is used for three purposes: agriculture, drinking water, and recreation. The demand for agricultural water is given by W2Pa = 1000 – Qa, and the demand for drinking water is given by W2Pd = 4000 – 10*Qd. Both uses take water out of the river, and it does not return. Recreational benefits come from water left in the river. There are 200 recreational users of the river and each has a marginal benefit given by MBi = 10 – (1/20)*Qr, where Qr is the amount of water left in the river. Recreational use is non-rival.

Please calculate: (a), (b) and (c) the efficient quantities of water to allocate to the three uses. If the government wanted to allocate the water by charging agricultural and drinking water users for water, (d) what price should it charge? Recreational users would not have to pay.

Question 5 (15 points)

Consider the allocation of an exhaustible resource across three generations. Demand is the same in each of the periods but mining technology is improving and MEC is falling over time. The following information is available:

- Demand in each period: W2Pi = 1200 – Qi
- MEC in period 1: $300
- MEC in period 2: $200
- MEC in period 3: $100
- Resource available: 1600 units
- Interest rate: 100%

Please calculate: (a) the equilibrium royalty, extraction cost, price and quantity that would occur in each period, and summarize your results in a table. Then suppose that a backstop is available at a marginal cost of $700. Please calculate: (b) the new equilibrium royalty, extraction cost, price and quantity in each period, summarizing your results in a second table. Finally, calculate (c) the total amount of the resource produced via the backstop.

Question 6 (15 points)

Suppose that a supply of oil is to be allocated across two identical periods. In each period, the demand for oil is given by W2Pi = 1000 – (1/2)*Qi, and the marginal extraction cost is zero (MECi = 0). Initially, there are 2200 barrels available. However, it is possible to find additional barrels via exploration. The cost of drilling an exploratory well is $200. Seventy-nine percent (79%) of the time, no oil will be found, 20% of the time 1 barrel will be found, and 1% of the time 30 barrels will be found. The interest rate is 100%.

Please calculate: (a) the minimum oil price that will induce exploration; (b) the market equilibrium price and quantity in each period taking exploration into account, summarizing your results in a table; (c) the equilibrium amount of oil that will be found via exploration; and (d) and the expected number of wells that will be drilled.