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Economics 410

The Maxwell School
Syracuse University

Exam 2

Spring 2008

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)

A local government would like to determine the value of a section of public beach. No admission fee is charged and 15,000 people visit the beach in a typical year. A researcher interviewed a sample of the visitors and found they come from five geographic zones. The cost of a round trip to the beach from each zone is shown in the table below, along with each zone's population and the number of people who visit from the zone.

Zone	Travel Cost	Population	Visitors
A	$10	30,000	6,000
B	$20	20,000	3,000
C	$30	50,000	5,000
D	$40	20,000	1,000
E	$50	50,000	0

It is also known that the number of visits (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 government uses a 5% interest rate in PV calculations.

Please compute: (a) the number of people who would visit the beach if a $10 admission fee were charged, (b) the amount of consumer surplus currently produced by the beach each year, and (c) the present value of keeping the land as a public beach forever.

Question 2 (15 points)

A state government has been approached by a company that would like to build a new hydroelectric dam. However, the dam would flood an unusually beautiful area that is heavily used for recreation. In evaluating the proposal, the state 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%. If left in its natural state, the area will provide recreational benefits worth $20 million in period 0. The benefits in period 1 are uncertain: there is a 60% chance they would also be $20 million but a 40% chance they would be much higher: $200 million. If it is allowed to build the dam in period 0, the company will pay the state $72 million. However, if it is not allowed to build until period 1, it is only willing to pay $60 million. In either case, the payment would arrive in the year of construction (period 0 or period 1, respectively). Construction of the dam is irreversible.

Please: (a) calculate the net present value of leaving the area in its natural condition in period 0, and (b) explain whether or not the state should allow the dam to be constructed in period 0 and why.

Question 3 (15 points)

Suppose the government of Brazil is considering whether to allow part of a 1000 square mile area of undisturbed rainforest to be converted to soybean plantations (to be used for biofuels). The market demand for plantation land is given by W2P = 18,000 – 10*Q, where Q is measured in square miles. However, if the land is left in its natural state, it maintains the region's biodiversity, which provides two valuable benefits: (1) on *each* square mile plot, there is a 1 in 200,000 chance that someone will discover a medical treatment worth $1 billion; and (2) there are 1 million people in Brazil who are *each* willing to pay $0.01 per square mile to preserve the forest just to know that it is still in its natural condition (independent of the medical benefit).

Please calculate: (a) the value *per square mile* of leaving the forest in its natural state; and (b) the amount of land that should be converted to soybean plantations.

Question 4 (15 points)

A river is used for three purposes: drinking water, recreation and hydroelectric power. The demand for drinking water is given by W2Pd = 5000 – Qd. Water used for drinking is taken out of the river and does not return. Power generation and recreation do not take water out of the river, and both occur downstream from the point where the drinking water is removed. The demand for water for hydro power is given by W2P = 500 (constant at $500). There are 1000 recreational users of the river and each has a marginal benefit given by MBi = 1 – (1/4000)*Qs, where Qs is the amount of water left in the river. Recreational use is non-rival and does not conflict with power generation (the power plant is downstream from the recreational area). The amount of water originally in the river is 6000 units.

Please calculate: (a), (b) the efficient quantities of water to allocate to allocate to drinking and to leave in the stream. Next, determine (c), (d) the allocation of water that would occur under the doctrine of prior appropriation. Finally, calculate (e) the deadweight loss that occurs in the second case.

Question 5 (15 points)

Consider the allocation of an exhaustible resource across three generations. The following information is available about demand and MEC in the three periods:

Period	Demand	MEC
1	$W2P_1 = 1000 - Q_1$	400
2	$W2P_2 = 1600 - 2Q_2$	400
3	$W2P_3 = 2800 - 4Q_3$	400

Initially, there are 900 units of the resource available. The interest rate between generations is 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 $1200. 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 natural gas is to be allocated across two identical periods. The demand for gas in each period is given by W2Pi = 1000 – Qi. Initially, 1100 units of gas are known to be available on land and those units can be extracted at MEC_L = $0 (zero) in either period. However, it is possible to find additional gas via exploration at sea. The cost of drilling an offshore exploratory well is $250. No gas will be found in 80% of the wells but in the other 20% of the wells, 5 units will be found per well. If found, offshore gas is more expensive to extract than gas on land: the cost is MEC_S = $100 for units found at sea. The interest rate is 100%.

Please calculate: (a) the minimum gas price that will induce offshore 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 gas that will be found via exploration; (d) the expected number of wells that will be drilled; and (e) the total amount spent on exploration.