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THE UNIVERSITY of York

Degree Examination 2004

ENVIRONMENT DEPARTMENT

BSc in Environment, Economics and Ecology, Part 1b

ECONOMICS OF ECOLOGICAL RESOURCES

Time allowed: **one and a half hours**

Answer **ONE question from SECTION A** and **ONE question from SECTION B**

University calculators and graph paper will be provided

Pay adequate attention to spelling, punctuation and grammar, so that your answers can be readily understood

SECTION A

Question 1 (50 marks)

Discuss the following statement: "A dynamically efficient allocation of a scarce non-renewable resource with a constant marginal cost of extraction involves rising marginal user cost and falling quantities consumed."

Question 2 (50 marks)

Illustrate the problem of pollution control under the (static) efficiency, the safety and the sustainability standard by discussing the assumptions/limits of each standard.

SECTION B

Question 3

Consider the case of a non-renewable resource extraction (e.g. oil) over two periods: period 1 (t=1) and period 2 (t=2). The inverse demand curve has the form

$$p_t=20-0.8q_t$$

where p_t is the price (£) of the resource at time t and q_t is the quantity (e.g. barrels) of resource extracted at time t. The marginal cost of extraction (£) is constant and equal to 4.

a) If the resource were abundant (non-scarce):

- how much would be extracted in period 1 and in period 2?
- What would the price be in the two periods?
- What would the marginal user cost (MUC) be in the two periods?

(10 marks)

b) Given that the total amount of non-renewable resource available (Q) is 30, find the dynamic efficient allocation of the non-renewable resource in period 1 and period 2 if the discount rate (r) is equal to zero. What would be the efficient price and the marginal user cost in the two periods?

(15 marks)

c) If you were to apply a discount rate of 10%:

- would the dynamic efficient allocation of the scarce non-renewable resource in period 1 and period 2 be affected?
- If so, how much resource would you extract in period 1 and in period 2?
- What would the efficient prices and marginal user costs be in the two periods?

(25 marks)

/turn over

Question 4

We assume that a fish population (in tons) grows at rate

$$g=rF(1- F/K)$$

where r is the intrinsic growth rate, F is the size of the fish population and K is the carrying capacity of the habitat.
The catch level (in tons) and the population size (in tons) in terms of the level of effort (E) are, respectively,

$$H=qEK[1-(qE)/r]$$

and

$$F=K[1-(qE)/r]$$

where q is the (constant) "catchability coefficient".
Given a constant marginal cost of effort (c) and a price per unit of catch (p):

a) calculate the level of effort under open access regime (E_o), the level of effort under private property regime (E_e) and the level of effort at the Maximum Sustainable Yield (MSY) level (E_{MSY}).

(30 marks)

b) Knowing that r=0.3, q=0.1, K=30, c=2, p=5 demonstrate that

$$E_o > E_{MSY} > E_e$$

(5 marks)

c) For the same parameter values calculate the catch level and the fish population under open access regime (H_o and F_o), under private property regime (H_e and F_e) and at the MSY level (H_{MSY} and F_{MSY}). Comment on your results.

(15 marks)