AFRICAN ECONOMIC RESEARCH CONSORTIUM

Collaborative MA Programme in Economics for Anglophone Africa (Except Nigeria)

JOINT FACILITY FOR ELECTIVES (JFE) JUNE – OCTOBER 2008

ENVIRONMENTAL ECONOMICS I

First Semester: Final Examination

Duration: 3 Hours Date: Wednesday, August 13, 2008

INSTRUCTION:

Answer ANY FOUR (4) Questions. All questions carry equal marks.

Question 1

(a) Discuss the different conceptualization of sustainability. (6 marks)

(b) To what extent are the ecologist's and the economist's concepts of sustainability mutually consistent? (4 marks)

(c) Make a distinction between renewable and non-renewable resources. Using this taxonomy discuss whether or not the current global use of fossil fuels sustainable? (5 marks)

Question 2

(i) Make a distinction between the strong and weak sustainability concepts. (4 marks)

(ii) Explain the concept of sustainability implied by the Hartwick rule. What problems will an economy encounter in applying the rule? (7 marks)

(iii) A number of studies that have tried to test the Hotelling's rule theory have come up with mixed results regarding the validity of the theory. Outline some of the factors that may have led to the failure of some of these studies to validate the theory. (4 marks)

Question 3

(a) Consider this problem of a forest owner. He plants trees in period *0* at a cost of equal to *C*, the tree maintenance costs are zero. The trees mature at time T, and the stand is harvested once. Determine the optimal time when the trees should be harvested. How will an increase in planting costs affect the decision on optimal harvesting time? **(7 marks)**

(b) Explain why determining the optimal use of forest resources may be a difficult task. **(8 marks)**

Question 4

An economy produces a single output Q using one non-renewable resource R, and one reproducible input K. The production function is: $Q_t = \theta K_t^{\alpha} R_t^{\beta}$. The extraction costs of the non-renewable resource depend on both the size of the stock and the rates of extraction. The problem facing this economy is to identify an optimal depletion path for the non-renewable resource. The inter-temporal social welfare function is utilitarian.

(a) Derive and explain the static and dynamic efficiency conditions necessary for solving the problem. **(9 marks)**

(b) What happens to consumption along the optimal path? **(4 marks)**

(c) What is the effect of an increase in the discount rate? **(2 marks)**

Question 5

(a) Consider the problem of identifying an optimal depletion path for a monopoly renewable resource owner. His extraction costs depend on both extraction rates and stocks.

(i) Derive and explain the conditions that must be fulfilled by the optimal depletion path. **(6 marks)**

(ii) How will a tax per unit of harvest affect the program in (i) above? **(4 marks)**

(b) "Monopoly resource owners may be considered to be resource conservationists. On the other hand they generate inefficient outcomes in resource utilization." Discuss this statement in relation to a concrete example of any international forest, energy or fishery company in your country. **(5 marks)**

Question 6

(a) Consider a simple fishery model in which resource growth is logistic is given by:

$$\dot{S} = G(S) = r\left(1 - \frac{S_t}{S_{max}}\right)S_t$$

The harvest function is given by: $H_t = \alpha E_t S_t$

Where H is fish harvests, S is the fish stocks, r is the intrinsic rate of growth of fish S_{max} is the carrying capacity of the ecosystem in which fish is found, and α is the fish catchability coefficient.

(i) Derive the sustainable yield function. (2 marks)

(ii) Find the expressions for the maximum sustainable yield and the corresponding level effort. (4 marks)

(b) Illustrate that when the welfare conservationists are taken into account the socially optimal steady stock of a renewable resource is larger. (4 marks)

(c) Give an outline of the factors contributing to the over-fishing in many African fisheries. (5 marks)

END