AFRICAN ECONOMIC RESEARCH CONSORTIUM

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

JOINT FACILITY FOR ELECTIVES (JFE) 2010

JUNE – OCTOBER

ENVIRONMENTAL ECONOMICS II

Second Semester: Final Examination

Duration: 3 Hours **Date: Tuesday, September 28, 2010**

INSTRUCTIONS:

1. This examination has four questions. You are required to answer **ANY THREE** questions.
2. All questions carry equal marks.
3. Write legibly and show all workings.

Question 1

Consider a 2-person (*A* and *B*), 2-commodity (*X* and *Y*) and 2-resource (*L*-labour and *K*-capital) model. Let *X* and *Y* be public and private goods respectively consumed by the individuals. Assume further that $Y = Y^A + Y^B$, $K = K^Y + K^X$ and $L = L^X + L^Y$ where, L^Y and L^X are the amounts of labour resources devoted to the production of goods *Y* and *X* respectively; K^Y and K^X are the amounts of capital resources devoted to the production of goods *Y* and *X* respectively and Y^A and Y^B are the amounts of good *Y* consumed by individual *A* and *B* respectively.

If the utility function of individual A and B are $U^A(X, Y^A)$ and $U^B(X, Y^B)$ respectively and well behaved.

(a) If the utility of one of the individual for example B is constrained (ie $U^B(X, Y^B) = Z$)

(i) State the problem from which the necessary condition for efficiency can be derived. **(2 mark)**

(ii) Show that the condition for production efficiency is the same in a standard case where the two goods are private (do not derive the standard production efficiency condition for private goods) **(3 marks)**

(iii) Show that the condition for product-mix efficiency is the same in a standard case where the two goods are private (do not derive the standard product- mix efficiency condition for private goods) **(3 marks)**

(iv) Show that consumption efficiency require that the sum of the marginal valuation be equal to the cost of the commodity at the margins and violates the standard conditions for consumption efficiency if the two goods are private (do not derive the standard consumption efficiency condition for private goods) **(4 marks)**

(b)

(i) Lindahl (1919) proposed a method of financing public goods that is close to the free market solution. Briefly elaborate on this method showing why it is close to the free market solution. **(4 marks)**

(ii) What are the major caveats of a Lindahl Equilibrium? **(4 marks)**

Question 2

The Kakum National Park in Ghana is one of the well known Parks in the world with its mammal and bird species and an incredible 'walkway' that permits visitors to have a feel of a pristine forest. Currently gate fee to the park is free. An investor is interested in undertaking mining in the area since the soil contains some mineral. As an Environmental Economist the government of Ghana has asked you to estimate the value of the park. Using the Zonal Travel Cost method your field work provided the following data:

ZONE	VISITS	POPULATION (IN 0000)	TRAVEL COST (from Zone to Kakum Park)
1	1600	300	15
2	4900	900	20
3	1250	350	25
4	4600	1600	30
5	3500	2366	35
6	2500	1550	40

(a) Using the information above estimate the linear Trip Generation Function (TGF) for Kakum National Park **(6 marks)**

(b) With the help of the TGF estimate the surrogate demand function if the gate fee increases from \$0 to \$15 in steps of \$5. **(6 marks)**

(c) Sketch the surrogate demand function **(2 mark)**

(d) Using the surrogate demand for Kakum National Park estimate the total consumer surplus for the year **(4 marks)**

(e) Assuming there is an improvement in the quality of the park (resulting from the provision of hotels, restaurants tour guides, etc.) and as a result the surrogate demand function move outwards. How will you value the change in the value of the park as a result of this improvement (use sketches to illustrate your answer) **(2 Marks)**

Question 3

(a) In an economy there are two firms each emitting 50 units of Carbon dioxide (CO_2) per week. The Total Abatement Cost (TAC) of the two firms are given as:

$$TAC_1 = Q_1^2 + 2Q_1 + 2$$

$$TAC_2 = 2Q_2^2 + 9Q_2 + 5$$

The government after a careful research established the effluent air quality standard to be 80 units per week.

(i) Suppose the government allocates the abatement responsibilities equally such that each polluter must abate 10 units per week. Critically assess the cost implications and comment on the government's policy decision. **(1 mark)**

(ii) If the government offers 5 tradable permits per week, each permitting the emission of 2 units of Carbon dioxide at a price of $42 per permit, which of the firms will go for the permit and why? **(1 mark)**

(iii) What will be the optimal allocation of pollution between the two companies in order to ensure cost effectiveness? **(1 mark)**

(iv) What is the minimum cost? **(1 mark)**

(v) In practice is it possible for government to achieve the actual cost effective allocation of abatement? Why or why not? **(1 mark)**

(b) Tradable permit systems should replace regulatory instruments in air pollution control in the future. Discuss **(15 marks)**

Question 4

(a) Consider a typical sub-Saharan African country that produces a mineral resource, for example, gold in which all the environmental effects are not internalised, and in which the country have no control on the external price of the commodity.

(i) On a *priori* basis discuss the potential environmental effects if it engages in trade with a developed country. Use graphs to illustrate your point. **(5 marks)**

(ii) On that basis is trade good for the environment of that sub-Saharan country? Why or why not? **(1 mark)**

(b) In a simple prisoners game involving two countries, it costs 6 to abate by each country but confers a benefit of 4 to all countries. Discuss the nature of the cooperative and non-cooperative solutions. **(2 marks)**

(c) Discuss the problem of ozone depletion and the efforts being made by the international community to resolve this problem. **(8 marks)**

(d) Compare the easy problem of eliminating chlorofluorocarbons with the diabolically hard problem of abating greenhouse gases **(4 marks)**

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JUNE – OCTOBER

ENVIRONMENTAL ECONOMICS I

First Semester: Final Examination

Duration: 3 Hours **Date: Tuesday, August 11, 2009**

INSTRUCTIONS:

Answer ANY FOUR (4) Questions. All Questions Carry Equal Marks.

Question 1

(a) Give an outline of the deficiencies in the Standard National Accounts (SNA) that natural and Environmental Resource accounting aims to address. **(5 marks)**

(b) Explain how any three environmental and natural resource accounting approaches can be applied to adjust the conventional Standard National Accounts. **(6 marks)**

(c) What problems might a country encounter in implementing environmental and natural resource accounting? **(4 marks)**

Question 2

(a) Consider a fishery where the fish production function is linear in fish stocks and effort, and fish growth takes a logistic form. The markets of fish and fishing inputs are perfectly competitive. Show that:

(i) The open access steady state equilibrium stock is less that of a sole owner with an objective to maximize profits. **(5 marks)**

(ii) The harvest level in a private profit maximizing fishery exceeds that applied in an open access fishery **(6 marks)**

(b) Explain the types of externalities that affect the fishery's production function. **(4 marks)**