AFRICAN ECONOMIC RESEARCH CONSORTIUM

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

JOINT FACILITY FOR ELECTIVES (JFE) 2009
JUNE – OCTOBER

ENVIRONMENTAL ECONOMICS II

First Semester: Final Examination

Duration: 3 Hours   **Date: Friday, October 2, 2009**

INSTRUCTIONS:

1. This Examination has Four Questions. Answer **ANY THREE** Questions.

2. All Questions Carry 20 Marks Each.

3. Write Clearly and Legibly.

Question 1

(a) Suppose that an environmental problem affecting Kenya and Tanzania can be modeled as a Chicken game. Each country must choose whether or not to act (*act* and *don't act*). Acting is assumed to be a public good so that acting by either country benefits both. Each unit of action comes at a cost of 7 to the actor, but confers benefit of 5 to both countries. If both countries act, they both experience benefits of 10 each. However, doing nothing exposes both countries to serious environmental damage. If neither country acts both suffer a damage of 4.

     (i)   Show the pay-off matrix to this game.

     (ii)   What is the non-cooperative solution to this one-shot simultaneous move game?

     (iii)   Suppose that it is known that Kenya is committed to acting on environmental problems, how does this affect the non-cooperative solution?

     (iv)   Suppose that the game is played sequentially with Tanzania moving first, what solution should we expect?

     (v)   What difference would it have made if Kenya was to move first?

     (vi)   Show that the cooperative solution of the one-shot simultaneous game is unstable.
[10 Marks]

(b) What is a transferable environmental externality? Formulate a simple two-agent model, where each agent selects a level of self protection, to illustrate the sub-optimal effects of a transferable externality. Show the cooperative and non-cooperative solutions on a graph as well. **[10 Marks]**

Question 2

(a) The Travel Cost Method has been used to estimate recreational benefits of a recreational site. Assume that you have already used a survey instrument and collected the following data in one of the national parks in your country.

Zone of Origin	Total Population in Zone I (000s)	Round Trip Distance (in km)	Total Number of Annual Visits from Zone i
I	1,000	10	40,000
II	2,000	20	60,000
III	3,000	30	60,000
IV	4,000	40	40,000

One of the things that you have discovered during your field visit in the site is that there is no charge to enter the park. Suppose that the travel cost per km is $1. Estimate a linear trip generating function. Using proposed gate fees of 0, 10, 20, 30, and 40 to generate a surrogate demand function and calculate the annual consumer surplus for the recreational experience. If you were the Park Manager, what would you set as the optimal gate fee? Be sure to state your assumptions and clearly show your workings.   **[10 Marks]**

(b) Define the concepts of non-essentiality and weak complementarity and discuss their significance in the context of Travel Cost Method. Also outline the major weaknesses of Travel Cost Method.   **[10 Marks]**

Question 3

(a) Suppose that you have conducted a contingent valuation survey among 600 respondents using a single bounded dichotomous choice elicitation format and found the following responses to different bids given to different groups of your sample.

Bid	Number of Respondents	Number of Yes
10	100	90
20	100	70
30	100	80
40	100	50
50	100	30
60	100	10

Compute the mean willingness to pay using the **Kaplan-Meier-Turnbull** and **Spearman-Karber** estimators. Be sure to state the assumptions behind each of the estimator. Assume that the upper limit for the Spearman-Karber estimator is $65.   **[10 Marks]**

(b) Following the 1989 Exxon Valdez incident of large oil spill in the coast of Alaska, the US National Oceanic and Atmospheric Administration (NOAA) formed a panel co-chaired by two Nobel laureates (Kenneth Arrow and Robert Solow) to review the use of CVM and come up with possible recommendations. Outline the major recommendations of the panel at various stages of CVM applications   **[10 Marks]**

Question 4

(a) The simplest version of Coase theorem is said to claim that a unique and efficient allocation of resources would follow from rational bargaining, irrespective of how property rights were initially allocated. Demonstrate (with the aid of graphs) that the distribution of net gains between parties will, in general, depend upon the initial distribution of property rights. Also outline the major limitations of Coase theorem.

[10 Marks]

(b) What does a cost-effectiveness criterion imply in the choice of policy instruments to control environmental damage? Describe the following policy instruments and characterize whether they are cost-effective (when and how?). You are welcome to give concrete examples to enhance clarity.

    (i) Non-transferable emission licenses

    (ii) Tradable emission permits

    (iii) Technology standards

[10 Marks]