AFRICAN ECONOMIC RESEARCH CONSORTIUM

Collaborative PhD Programme in Economics for Sub-Saharan Africa

COMPREHENSIVE EXAMINATIONS IN CORE AND ELECTIVE FIELDS

FEBRUARY 10 – FEBRUARY 29, 2016

MICROECONOMICS

Time: 08:00 – 11:00 GMT **Date: Monday, February 15, 2016**

INSTRUCTIONS:

Answer a total of FOUR questions: ONE question from Section A, ONE question from Section B, and TWO questions from Section C. Please note that Question 5 in Section C is compulsory.

The sections are weighted as indicated on the paper.

SECTION A: (15%)

Answer only ONE Question from this Section

Question 1

(a) Using appropriate illustration, distinguish between income and substitution effects. **[10 Marks]**

(b) Illustrate whether the Giffen good paradox implies an inferior good. **[5 Marks]**

Question 2

What does 'free riding' mean? Give an example when free riding can be a problem and explain how it can be solved. **[15 Marks]**

SECTION B: (25%)

Answer only ONE Question from this Section

Question 3

(a) Show that the production function $Q = (K^\alpha + L^\alpha)^\beta$, where Q is output, K is capital input, L is labour input and $\alpha > 0$ and $\beta > 0$ exhibits diminishing returns when $\alpha < 1$ and increasing returns to scale when $\alpha\beta > 1$. **[15 Marks]**

(b) Specify a translog cost function for two inputs and show that the input shares depend on input prices. **[10 Marks]**

Question 4

A national newspaper is going through a recession and is seeking your advice on how to review its pricing strategy along the 2 different regions that make up the country. The two regional markets are market A and market B. The company's cost and inverse market demand functions are given as:

$C = 200 - 50\,(q_A + q_B)$

$P_A = 200 - 10q_A$; $\quad P_B = 400 - 50q_B$

(a) Calculate the profit maximizing price that must be charged in each market. **[7 Marks]**

(b) How many units must be sold in each market to maximize total profit? **[3 Marks]**

(c) Demonstrate that a higher price would be charged in the market with lower price elasticity of demand. **[15 Marks]**

SECTION C: (60%)

Answer TWO Questions from this Section,

One of which MUST be Question 5, which is COMPULSORY

Question 5 (Compulsory)

Define briefly the **underlined concepts** in any **4 of the following statements** and then **explain** whether the statements you have chosen are **true** or **false**?

(a) A **quasi-concave function** is always **monotonic**. **[7.5 Marks]**

(b) The **utility function** $u(x) = x^r$ where $1 > r > 0$ displays **constant relative risk aversion**. **[7.5 Marks]**

(c) When there is **information asymmetry**, a **risk neutral principal** should only offer a risk averse agent a fixed wage contract. **[7.5 Marks]**

(d) Every **Walrasian Equilibrium** allocation is **Pareto efficient.** **[7.5 Marks]**

(e) The **monotone likelihood ratio** demonstrates that wages should be an **increasing function** in effort. **[7.5 Marks]**

(f) In contrast to a **separating equilibrium**, in a **pooling equilibrium**, insurance companies can distinguish high risk customers from low risk customers. **[7.5 Marks]**

Question 6

Amina has a utility function over her net income, Y. Her utility function is $U(Y) = \sqrt{Y}$

(a) What are Amina's preferences towards risk? [Explain briefly your answer] **[4 Marks]**

(b) Amina drives to work every day and spends a lot of money on parking meters. Many days the thought of cheating and not paying for parking crosses her mind. However, she knows that there is a 0.25 probability of being caught in a given day if she cheats, and that will cost her a ticket worth $36. Her daily income is $100. What is the maximum amount of money she will be willing to pay for one day parking? **[12 Marks]**

(c) John also faces the same dilemma every day. His utility function is $U(Y) = Y$ and his daily income is $100. What are John's preferences towards risk? **[4 Marks]**

(d) If the price of one day parking is $9.25, will John cheat or pay the parking meter? **[5 Marks]**

(e) If the price of one day parking is $9.25, will Amina cheat or pay the parking meter under this price? **[5 Marks]**

Question 7

Consider the employer-employee relationship under conditions of asymmetric information. Assume there are high productivity/ability workers (given by β_H) and low productivity/ability workers, given by β_L, where $\beta_H > \beta_L > 0$. The probability that a worker is a high productivity worker is $\lambda \in [0,1]$.

Because productivity is unobservable, the employer may rely on education as a proxy for productivity or innate ability. Thus, while there is an incentive for workers to invest in education, there are costs associated with obtaining education, represented by $c(e, \beta)$.
In an education signalling game, Nature moves first to determine whether a worker is high or low ability. Each worker must then decide how much education to acquire before entering the labour market. The employer observes the education level of the worker, and for a given level of education, *e*, assumes with probability $\pi(e)$ that the worker is a high productivity worker.

(a) Write down an expression for each worker's utility function. **[1 mark]**

(b) Write down expressions for the wage that will be offered by the employer when he (i) can distinguish high ability from low ability workers and (ii) when he cannot distinguish high ability from low ability workers. **[2 marks]**

(c) Graphically represent the utility functions of the workers, explaining the economic intuition behind your graph. **[6 marks]**

(d) Suppose that the employer believes that any worker with less than 7 years of education is a low ability worker, and consequently offers a discontinuous wage schedule, where workers with less than 7 years of education all receive a wage, w_L, and workers with 7 years or more of education receive a wage of w_H. Graphically represent a separating equilibrium under these conditions, and explain the economic intuition behind it. Also verify that under this scenario, workers are maximizing their expected utility and the employer is maximizing profits. **[15 marks]**

(e) Are workers better off under this separating signalling equilibrium than if they had sent no signal at all? Explain. **[6 marks]**

Question 8

James Bond, a famous spy, has to choose one of two routes *a* and *d* (listed in order of speed in good conditions) to ski down a mountain. Fast routes are more likely to be struck by an avalanche. At the same time, Blofeld, a notorious rival spy has to choose whether to use (*y*) or not use (*x*) a valuable explosive device to cause an avalanche. The game is represented in normal form below:

		Blofeld	
		x (β)	y ($1-\beta$)
Bond	a (α)	12 , 0	0 , 6
	d ($1-\alpha$)	9 , 3	6 , 0

(a) State the fundamental theorem of mixed strategy Nash equilibrium. **[2 marks]**

(b) Find the mixed strategy Nash Equilibrium (NE) of this game. Assume that Bond plays *a* with probability α and Blofeld plays *x* with probability β as represented in the game table above. **[5 marks]**

(c) Now assume that Bond has four possible routes between which he can choose. Determine Bond's pure strategy best responses when $\beta = 2/3$, when $\beta < 2/3$, and when $\beta > 2/3$, by calculating Bond's expected payoffs from his pure strategies for the different values of β. The normal form for this game is presented below. **[12 marks]**

		Blofeld	
		x (β)	y ($1-\beta$)
Bond	a	12 , 0	0 , 6
	b	11 , 1	1 , 5
	c	10 , 2	4 , 2
	d	9 , 3	6 , 0

(d) If you were hired by Bond to analyse this strategic interaction, which route (i.e., strategy) would you suggest that Bond should **never** choose? **[2 marks]**

(e) Finally, find a mixed strategy NE of the new game (i.e., the one where Bond has 4 strategies) in which one player adopts a pure strategy s_i and the other player adopts a mixed strategy σ_j. Then find another mixed strategy NE in which this same pure strategy s_i is assigned zero probability. **[9 marks]**