AFRICAN ECONOMIC RESEARCH CONSORTIUM

Collaborative PhD Programme in Economics for Sub-Saharan Africa

COMPREHENSIVE EXAMINATIONS IN CORE AND ELECTIVE FIELDS

FEBRUARY 13 – MARCH 3, 2017

MICROECONOMICS

Time: 08:00 – 11:00 GMT **Date: Friday, February 17, 2017**

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

Explain why demand curves slope down to the right for all normal goods and some inferior goods. **[15 Marks]**

Question 2

(a) Using a graph, explain the relation between average and marginal cost curves. **[7 Marks]**

(b) In a competitive market in the short run, state and explain the condition under which a firm produces a positive output level. **[8 Marks]**

Section B: (25%)

Answer only ONE Question from this Section

Question 3

A production function for a perfectly competitive firm is given as:

$$q = Ax_1^{1/2}x_2^{1/2}$$

where q is the output (in tons) and x_i are amounts of inputs used in the production process. The cost of producing q is given by:

$$C = \sum_i w_i x_i , \quad i = 1, 2$$

where w_i are per unit input prices for input 1 and input 2.

(a) Derive the cost function in its general form and verify that it satisfies the homogeneity property and Shephard's Lemma. **[10 Marks]**

(b) When $w_1 = w_2 = 100$ and A=10, what is the minimum amount of each input required to produce 360 tons of output? **[5 Marks]**

(c) Compute the optimal profit for the firm when p = 20. **[2 Marks]**

(d) Compare and contrast the Cobb Douglas and constant elasticity of substitution (CES) production functions. **[8 Marks]**

Question 4

Consider an economy with two consumers A and B. Consumers A and B have utility functions $u(x_1^A, x_2^A) = (x_1^A)^{1/4}(x_2^A)^{1/2}$ and $u(x_1^B, x_2^B) = (x_1^B)^{1/4}(x_2^B)^{1/2}$, respectively. They face prices p_1 and p_2 for good 1 and good 2, respectively, and they have incomes I^A and I^B, respectively.

(a) Write formally the economic problem faced by consumer A and derive the Marshallian demand functions $x_1^{*A}(p_1, p_2, I^A)$ and $x_2^{*A}(p_1, p_2, I^A)$. **[5 Marks]**

(b) Explain Walras' Law. Why is this law important for the general equilibrium theory? **[8 Marks]**

(c) If the consumers have initial endowments $e^A = (3,3)$ and $e^B = (9,6)$, compute the Walrasian equilibrium relative price, and allocations. **[12 Marks]**

Section C: (60%)

Answer TWO Questions from this Section,

One of which MUST be Question 5, which is COMPULSORY

Question 5 (Compulsory)

For each of the following statements define the underlined terms then determine whether the statement is **True, False or Uncertain** with a brief explanation of your answer. Answer **any five** of the sub-questions in this question.

(a) The **Kuhn Tucker conditions** are valid only for solving **constrained optimization problems** with boundary conditions. **[6 Marks]**

(b) A **risk averse agent** will always prefer the **expected value** of a gamble for sure than the gamble itself. **[6 Marks]**

(c) **Hotelling's lemma** allows us to derive the **supply function** from the profit function **[6 Marks]**

(d) If a **natural monopoly** is to operate at the efficient output level by adopting **marginal cost pricing**, it will need a subsidy to stay in production. **[6 Marks]**

(e) In the **repeated prisoner's dilemma game** the **Folk theorem** provides the necessary condition for the Pareto efficient outcome to be sustainable. **[6 Marks]**

(f) **Equivalent variation** and **Compensating Variation** always give identical measurements of welfare changes. **[6 Marks]**

(g) In the presence of **negative externalities** a firm will produce more than the **socially optimal output.** **[6 Marks]**

(h) The **lemon market** of Akerlof illustrates **a moral hazard** problem**.** **[6 Marks]**

Question 6

Consider the following indirect utility function derived from a consumer's utility maximization:

$$v(p,y) = \alpha_1\left(\frac{y}{p_1}\right)^{\beta_1} + \alpha_2\left(\frac{y}{p_2}\right)^{\beta_2}$$

where y is income, p_i is price of commodity i, for i = 1, 2. and α_i and β_i are parameters.

(a) Determine the Lagrange multiplier of the underlying consumer's utility maximization problem. **[8 Marks]**

(b) Determine the Marshallian demand functions. **[12 Marks]**

(c) Explain the concept of duality in consumer theory. **[10 Marks]**

Question 7

Two friends, *Juma* and *Amina*, are considering a time out together and need to take decisions simultaneously on what activity to engage in. *Juma* loves visiting (*V*), *Amina* loves the theater (*T*). The payoff to each from choosing either of the two activities given the choice of the other is represented in the game matrix below

Amina / *Juma*	***V***	***T***
V	3, 1	0, 0
T	0, 0	2, 5

(a) Identify the pure strategy Nash equilibrium (equilibria) if any. **[3 Marks]**

(b) Is there any Nash equilibrium in mixed strategies? If yes derive the mixed strategy Nash equilibrium. **[5 Marks]**

(c) Draw the extensive form of the game and determine which of the pure strategy Nash equilibria is credible. **[7 Marks]**

(d) Game theory has become a major tool of analysis in economics. Provide a critique of this approach. **[15 Marks]**

Question 8

Consider the following principal-agent situation. We have a principal P and an agent A. P wants to hire A for a one time project. If A works for P, A can choose high effort, e_H, or low effort, e_L. Profits are either high, π_H, or low π_L, with $\pi_H > \pi_L$. If A chooses e_H then profits are π_H with probability ρ_H, and π_L with probability $1-\rho_H$. If A chooses e_L then profits are π_H with probability ρ_L and π_L with probability $1-\rho_L$. P maximizes expected profits from the project, less the expected wages paid to the agent, A maximizes expected utility as follows, given a wage, w, and effort choice, e: $U(w,e) = V(w) - e$ where $V'(w) > 0$ and $V''(w) < 0$. P designs a contract, A then accepts it or not, and if A accepts, A then chooses an effort level. Assume that A has a reservation utility level of U_0.

(a) Show how to implement e_L and e_H if effort is observable and verifiable and the agent is risk averse. **[10 Marks]**

(b) Answer part (a) above given that the agent is risk neutral. **[5 Marks]**

(c) If e is not observable, and the agent is risk-neutral, show that P can still obtain the same payoffs as in case (a). **[15 Marks]**