KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2015/2016

THIRD SEMESTER EXAMINATION FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN ECONOMICS

EET 904: COMPREHENSIVE MICROECONOMICS

DATE: MONDAY, 25TH JULY 2016 **TIME: 9.00 A.M. - 12.00 P.M.**

INSTRUCTIONS:

Answer a total of FOUR QUESTIONS: ONE question from Section A, ONE question from Section B and TWO Questions from Section C

SECTION A (15%). Answer ONE Question

Question One

(a) One of the communities in your country has retained you to manage a toll bridge that is essentially cost free. The demand for bridge crossings Q is given by $Q = 6 - \frac{1}{2}P$.

What is the loss of consumer surplus that would be associated with the charge of a bridge toll of US$. 6? 5 marks

(b) Suppose the income elasticity of demand for food is 0.5 and the price elasticity of demand is -1.0. Suppose also that a household spends $10,000 per year on food and that the price of food is $2, and that the household's income is $25,000. If a $2 sales tax on food were to cause the price of food to double, by how much would the household's consumption of food change? 5 marks

(c) Given the demand for beans: $Q_b = 4850 - 5P_b + 1.5P_p + 0.1Y$

$Income Y = 10{,}000$

$\Pr ice of beans P_b = 200$

$\Pr ice of peas P_p = 100$

(i) Find the income elasticity of demand 3 marks

(ii) Find the cross elasticity of demand 2 marks

Question Two

(a) A consumer chooses the quantities of two goods X_1 and X_2 so as to maximize utility given as:

$U = (0.5X_1^{-2} + 0.5X_2^{-2})^{-0.5}$ subject to the budget $810 = 48X_1 + 6X_2$

(i) Find the optimal quantities of X_1 and X_2 5 marks

(ii) Comment on the sufficient condition for utility maximization 5 marks

(i) A firm operating in a competitive market environment has a cost function given by $c(w, y) = w_1^{\alpha} w_2^{\beta} y^{\lambda}$. What is the firm's production function? 5 marks

SECTION B (25%). Answer ONE Question

Question Three

(a) A community in one of the rural areas of Kenya consumes two goods, rice (r) and milk (x). Assume that the price of rice is given by p with milk being the numeraire good with a price of 1. The community's utility function is given as:
$u(r, x) = x + \log r$

(i) What is the slope of the community's indifference curves for general values of u, x and r? 3 marks

(ii) Find the community's demand for rice $r(p, y)$ and for milk $x(p, y)$, where y denotes income 10 marks

(iii) Find the expenditure function and the Hicksian compensated demand functions for rice and for milk. 6 marks

(b) You are provided with the following production function:
$Q = x^a$, where Q is the output and x is an input.

(i) For what value of a is the production function legitimate? 2 marks

(ii) Letting p be the price of output and w be the price of the input, derive the corresponding profit function. 4 marks

Question Four

Given that a consumer has an inter temporal utility function given as: $U = U(CF) = C^{\alpha} F^{1-\alpha}$, where C is current consumption and F is future consumption. The consumer has an earning endowment of $\beta + \mu$ in the current period and $\nu - \phi$ in the future period. The rate of interest is r

i. Determine the expression for the equilibrium values of C and F 10 marks

ii. What is the effect of an increase in the interest rate on the consumer's utility? 6 marks

iii. Suppose that $\alpha = 0.1$; and the consumer has an earning endowment of 50 in the current period and 75 in the future period. The rate of interest is 12.5%. Determine the equilibrium values of C and F 5 marks

iv. Find the marginal utility of current and future earnings 4 marks

SECTION C (60%). Answer TWO Questions

Question Five

Consider a Cournot duopoly with unit costs of $c > 0$ and inverse demand function given as $p(q) = a - bq$ where $a > c$ and $b > 0$

(a) Assume the game is played once, and firms choose their quantities as follows: first, firm 1 chooses q_1 and then firm 2 chooses q_2 after observing q_1. What is the sub-game perfect equilibrium outcome? 5 marks

(b) Suppose the two firms choose quantity simultaneously and the game is infinitely repeated. Under what conditions can the symmetric joint monopoly outputs $(q_1, q_2) = (\frac{q^m}{2}, \frac{q^m}{2})$ be sustained with strategies that call for $(\frac{q^m}{2}, \frac{q^m}{2})$ to be played if no one has yet deviated and for the single-period Cournot (Nash) equilibrium to be played otherwise? 5 marks

(c) Derive the minimal level of the discount factor δ such that output levels $(q_1, q_2) = (q, q)$ with $q \in [\frac{a-c}{2b}, \frac{a-c}{4b}]$ are sustainable through Nash reversion strategies 10 marks

(d) Prove that the level of the discount factor δ, $\delta(q)$ is an increasing, differentiable function of q. 10 marks

Question Six

Two male deer compete with the right to mate with a female deer. Each male deer is strong (S) or weak (W) with an equal probability. Each male deer knows its own type, but not its rival's. The two male deer make a simultaneous decision whether or not to fight with each other. If they don't fight, then the female deer will not mate with any of them; if they do fight, then the female deer will mate with the winner. Suppose that a strong deer always wins a fight against a weak deer, and that if both deer are the same type, then each wins with a probability of ½ . Finally suppose that fighting costs a deer 2, and, on top of that, a deer gets 0 if it doesn't mate, and 10 if it does, regardless of whether it fought or not.

(a) Describe the set of pure strategies available to a male deer 5 marks
(b) Is the situation in which a strong deer fight and weak deer doesn't a Bayesian-Nash Equilibrium? (Show your workings clearly) 5 marks
(c) Identify all the pure strategy Bayesian-Nash equilibria in the game (show your workings clearly) 15 marks
(d) Are all the Bayesian-Nash equilibria identified in part (c) above equally plausible? If yes, why if No why not? 5 marks

Question Seven

A worker is equally likely to be either a "Low" or a "High" type worker. Neither the worker nor the market can observe the worker's type. There are two periods: $t = 1$ and $t = 2$. In every period the worker exerts effort $e \in [0,1]$. The worker's choice of effort is unobservable by anyone else. The utility cost of the effort in every period is $\frac{1}{2}e^2$ for both types of the worker. There are two possible output levels in every period: 1 and 0. In each period, the output of the "Low" type worker is equal to 1 with a probability e, and is equal to 0 with a probability $1-e$, where e is the effort exerted by the worker in that period. The output of the "High" type worker is always equal to 1 regardless of the effort exerted.

Suppose that in every period the worker is paid a market wage before the worker exerts effort. Assume further that the wage that the worker is paid in each period $t \in [1,2]$ is equal to the probability that the worker's output in period $t = 1$ given the available information. Both the worker and the market can observe the output produced by the worker in the first period. The worker is a risk-neutral expected utility maximizer with the same utility function $u(w,e) = w - \frac{1}{2}e^2$ where w denotes wage in both periods. There is no discounting between periods. Let $\hat{e}_1$ denote what the market believes is the effort of the low type worker in the

first period. Let w_{21} and w_{20} denote the wages paid to the worker in the second period when its output in the first period is equal to 1 and 0, respectively.

(a) Will the worker exert any effort in the second period? Explain 2 marks

(b) Find the wage $w_1(\hat{e}_1)$ that the market pays to the worker in the first period as a function of its belief $\hat{e}_1$. 4 marks

(c) Find the wage $w_{21}(\hat{e}_1)$ that the market pays to the worker in the second period if the output in the first period was equal to 1 and the worker is believed to have exerted the effort $\hat{e}_1$ in the first period. 6 marks

(d) Find the wage $w_{20}(\hat{e}_1)$ that the market pays to the worker in the second period if the output in the first period was equal to 0 and the worker is believed to have exerted the effort $\hat{e}_1$ in the first period. 6 marks

(e) Find the worker's optimal first period effort $e_1(w_{21}, w_{20})$ as a function of the wages paid in the second period w_{21} and w_{20}. Assume the worker takes the wages as given. 6 marks

(f) Find the equilibrium first period effort e_1, and the second period wages w_{21} and w_{20}. 6 marks

Question Eight

Two countries in Africa are engaged in international trade. Country A is the only producer of wheat and faces a production function given by $W = 3L^{\frac{1}{3}}$, where W is the output of wheat produced and L is the labour input. Country B purchases wheat from A and uses it to manufacture a nutritional supplement (S) that boosts immunity. The country's production function is given as $S = W^{\frac{1}{2}}$. Assume that the prices are given as P_W, P_S and P_L for wheat, nutritional supplement and labour, respectively. Assume further that though countries A and B are monopolist and monopsonist, respectively, they agree to remain competitive. Find W, S and P_W if the wage rate and the price of the nutritional supplement are known. 30 marks

END