**CHUKA**  **UNIVERSITY**



# UNIVERSITY EXAMINATIONS

## EXAMINATION FOR THE AWARD OF DEGREE OF DOCTOR OF PHILOSOPHY IN AGRICULTURAL ECONOMICS

**AGEC 934: QUANTITATIVE ANALYSIS**

**STREAMS: PHD (AGEC)** **TIME: 3 HOURS**

**DAY/DATE: WEDNESDAY 22/04/2020** **11.30 AM – 2.30 PM**

**INSTRUCTIONS:**

**Answer ALL Questions in Section A and any other Three in Section B**

**Question One**

(a) Define the term agricultural policy? [2 marks]

(b) Distinguish between Efficiency and Equity as used in agricultural policy analysis. [5 marks]

(c) Explain the role of Quantitative policy analysis in an economy. [8 marks]

**Question Two**

The State has a role to play in a market economy, discuss this statement in relation to agricultural policy analysis. [10 marks]

**SECTION B**

**Question Three**

(a) With the help of the "Edgeworth box" discuss the neoclassical view of market economies in relation to the analysis of public policies. [10 marks]

(b) Using clear examples, discuss the difference between private profitability and social profitability as used in the Policy Analysis Matrix. [5 marks]

**Question Four**

Suppose the total cost (TC) of a monopolistic firm is a liner function of output q expressed as $TC = 10q$. the market demand facing the firm is $p = 100 - 2q$

(a) Determine the monopolistic firm's profit maximizing output and price. [3 marks]

(b) Determine the pareto-optimal level of output and price, where the sum of consumer and producer surplus is maximum. [4 marks]

(c) Compute the consumer surplus, producer surplus and dead-weight loss in the case of a monopoly. [4 marks]

(d) Compute the loss of consumer surplus and gain in producer surplus caused by a monopoly. [4 marks]

**Question Five**

(a) Define the term Trade Policy [3 marks]

(b) Using clearly labelled diagrams, describe

(i) The effect of a tariff or equivalent quota on agricultural imports of a small importing country. [6 marks]

(ii) The effect of a subsidy on small exporting country. [6 marks]

**Question Six**

Suppose a chemical company discharges its by-products to an adjacent river to its factory. An agri-processing company also located downstream along the river uses the river water to irrigate its crops. Assuming that each firm needs only one variable input to produce its product. The two firm's production functions are given by

$$Q^A = f(x,z) = 200 + 10x - 0.5x^2 - z^2$$
$$Q^c = g(y) = 100 + 20y - 0.5y^2$$

Where $Q^A$ is the output of apples and $Q^C$ is the ouput of chemicals, x is agri-good's use of its major input water, and y is the chemical company's major factor input, chemical compounds. The term z is the effluent from the chemical company and an increase in effluent z reduces the output of apples. We assume that 1 unit of the input y used by the chemical company generates 1 unit of the effluent, z, that is z = y. The price of water $w^x = 0$, the price of chemical compound $w^y = KES\ 8$, the price of apples $P^A = KES\ 1$ and the price of chemical output, $P^c = KES\ 1$. Answer the following questions

(a) Suppose that the chemical and agri-good's company are two independent profit maximizing entities and that no regulation controls the amount of effluent discharged by the effluent company. Further, the two companies have not negotiated to solve the effluent problem. Determine the amount of effluent that will be discharged into the river. Determine the pareto optimal amount of effluent. [3 marks]

(b) Suppose that the 2 firms are still independent profit maximizing entities. Assume that the chemical company has the right to pollute, but the agri-goods company is allowed to pay the chemical company to reduce the effluent to a desirable level. With zero transaction costs, it is possible to reach an agreement of effluent reduction between the two profit maximizing firms? If your answer is yes, present a payment arrangement that will result in the pareto optimal level of effluent. [4 marks]

(c) Maintaining the assumption that the two firms are independent profit maximizing agents. If agri-goods has the property rights to pollution, but creative chemical is allowed to pay agri-goods in order to discharge a desirable amount of effluent. With zero transaction costs, it is possible to reach an agreement between the two profit maximizing firms. If your answer is yes, present a payment arrangement that will result in the pareto optimal level of effluent. [4 marks]

(d) Suppose that the chemical and the agri-goods company are owned by 1 profit-maximization firm. Ag-chem group. Determine the amount of effluent that will be discharged into the lake? [4 marks]

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