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# KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY
## UNIVERSITY EXAMINATION, 2024/2025 ACADEMIC YEAR
## SECOND YEAR, SECOND SEMESTER EXAMINATION
## FOR THE BACHELOR OF ECONOMICS AND FINANCE

Date:  10<sup>th</sup> December, 2024

Date:  10th December, 2024

Time: 8.30am –10.30am

## KFI 2200: MICROCONOMIC THEORY II

**INSTRUCTIONS TO CANDIDATES**

ANSWER **QUESTION ONE (COMPULSORY)** AND **ANY OTHER TWO** QUESTIONS

**QUESTION ONE (30 MARKS)**
**Agrico Ltd. – Balancing Consumer Demand and Production in Kenya's Agricultural Market**
Agrico Ltd., a mid-sized agricultural firm in Kenya, has been operating for over two decades, primarily producing maize, beans, and horticultural crops. The company's objective is to maximize profits while responding to the changing needs of consumers and dealing with shifts in the local agricultural market.

In recent years, Kenyan consumers have shown a rising preference for organic produce due to health concerns and increased awareness of sustainable farming practices. This has led to increased demand for organic maize and beans. However, the prices of organic products are typically higher than those of non-organic products, which restricts some consumers with lower incomes from purchasing them. Agrico Ltd. has observed that a segment of its consumers is highly price-sensitive, while another segment is willing to pay a premium for organic produce. To cater to both groups, the company has begun diversifying its production. They produce both conventional and organic crops, allowing consumers to choose based on their preferences and income levels.

Agrico Ltd. faces increasing production costs due to climate variability, which affects crop yields, requiring additional investments in irrigation and clean energy solutions. To address rising costs, the firm is considering adopting solar-powered irrigation systems, which require a high initial investment but promise long-term savings. From the firm's perspective, the decision revolves around the trade-off between short-term costs and long-term gains. Agrico Ltd. must also decide how to price its organic produce to maintain profitability while staying competitive in the market.

The agricultural sector in Kenya is highly competitive, with several small and mid-sized farms producing similar crops. Agrico Ltd. competes with other local firms as well as imported agricultural products, especially from neighboring countries. Given the relatively competitive nature of the market, Agrico cannot significantly increase prices without losing customers to competitors. Additionally, the government recently introduced a subsidy for farmers who adopt sustainable farming methods. This policy aims to encourage firms like Agrico to adopt clean energy and organic farming practices. Agrico is considering applying for this subsidy to reduce its production costs and align with consumer demand for organic products.

Required: Use the case study to answer the questions that follow

a) Suppose the customers of the Agrico Ltd derive utility from maize and beans consumption given by $U = M^{0.5} B^{0.5}$. If the prices of maize and beans are Kshs. 6 and Kshs. 8 respectively and the consumer's income level is Kshs. 400. Determine the quantity of maize and beans that maximizes consumer utility **(8 Marks)**

b) Mathematically show that at the point of equilibrium of the consumer, the ratio of marginal utility of the two goods equals to the ratio of their prices **(4 Marks)**

c) The firm faces a cost function given as C= 6K+4L to produce output level given as $Q = 50K^{0.25}L^{0.75}$. determine the quantity of K and L that minimizes the firm's cost **(6 Marks)**

d) Does the production exhibit increasing, decreasing or constant return to scale? Prove your response mathematically **(2 Marks)**

e) Agrico Ltd company operates in a perfectly competitive market and faces a demand function Q= 40-4P and a cost equation: $C = 5 - 2Q + 0.5Q^2$. Determine profit maximising quantity for the firm and advice the management of the firm moving forward **(6 Marks)**

f) Discuss two interventions government can put place to protect the firm from stiff competition in the market for agricultural products **(4 Marks)**


## QUESTION TWO (20 MARKS)

a) A community in Tangulbei area of Kenya derives utility from consumption of two good: Good A and Good B. It has a budget of £200 to spend on the two goods. The community's utility function for the two goods is presented as; $U(X_A X_B) = 6X_A^{\frac{1}{3}} X_B^{\frac{2}{3}}$ where $X_A$ and $X_B$ are the units of good A and good B demanded respectively. Given that prices of good A and good B are £2 and £5 respectively, find;

i) The community's demand functions for the two commodities. **(7 Marks)**

ii) The Marshallian demands for good A and good B **(4 Marks)**


b) Consider the production function $Q = 25 L^{1/2} K$

i) Show whether the production function exhibit increasing, decreasing, or constant returns to scale? **(3 Marks)**

ii) If the price of labor is 80 shillings and the price of capital is 40 shillings, what capital-labor ratio will the firm choose to minimize its production costs? **(6 Marks)**

## QUESTION THREE (20 MARKS)

a) Suppose a firm operates in a monopoly market where the firm sells a product in two markets separates markets with the following demands functions: $P_1 = 12 - Q_1$ and $P_2 = 20 - Q_2$. Given that the total cost function: $TC = 3 + 2Q$. Advice the management the price to charge and quantity to supply in each market to maximize profit hence the maximum profit realized by the firm   **(8 Marks)**

b) Given two consumers with the following utility functions. Show that the two consumers have the same preferences; (*Hint: U₁-first consumer utility and U₂ – second consumer utility*)

$U_1(x, y) = X^2 Y^2$

$U_2(x, y) = X^4 Y^4$

**(6 Marks)**

c) A firm has the following total revenue and total cost functions. $TR = 320Q - 2Q^2$ and $TC = 1800 + 5Q + 3Q^2$. Determine the output level that maximises profit for the firm hence show whether this level of output maximises total revenue   **(6 Marks)**

## QUESTION FOUR (20 MARKS)

a) Suppose that a consumer has a demand function for good X of the form

$$Z = 15 + \frac{M}{12P}$$

Where M is the income level and P is the price level of Z. The original income of this consumer is ksh. 150 per day while the price of good Z is ksh. 5 per unit. If the price of good Z falls to ksh. 3, and assuming Z is a normal good.
   i)   Determine the substitution effect of this price change.          **(4 Marks)**
   ii)  Determine the income effect of price change                      **(3 Marks)**
   iii) Calculate the total effect of price change                       **(3 Marks)**

b) Using a well labelled diagram, show various technologies a firm can adopt to produce a given level of output                                                                              **(5 Marks)**

c) A monopolist is believed to cause inefficiencies leading to loss to both the consumer and the producer. Using a well labelled diagram show the deadweight loss in market due to existence of a monopoly market structure                                               **(5 Marks)**

## QUESTION FIVE (20 MARKS)

a) Show mathematically that the slope of the isoquant is equal to the ratio of the marginal products of the two inputs                                                                           **(4 Marks)**

b) A firm has a production function of Cobb-Douglas form as follows: $Q = 100L^{0.5}K^{0.5}$. Given that K=100 units, price of output is Kshs. 2, wage rate is Kshs. 50 and rental cost of capital is Kshs. 40 per machine hour. Determine the quantity of labour the firm should hire to optimize profit hence profit level                                                                               **(8 Marks)**

c) A consumer has a utility function of Cobb-Douglas form: $U = \sqrt{X_1 X_2}$. Suppose the income of the consumer is Kshs. 500 and price for X1 and X2 are Kshs. 5 and Kshs. 2 respectively. Determine the quantity of X1 and X2 that maximizes utility for the consumer                      **(8 Marks)**