CHUKA UNIVERSITY

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF MASTER OF SCIENCE IN ECONOMICS

MSEC 831:MATHEMATICAL METHODS FOR ECONOMISTS

STREAMS: **TIME: 3 HOURS**

DAY/DATE: THURSDAY 15/07/2021 **2.30 P.M – 5.30 P.M**

INSTRUCTION

Answer Question ONE and any other two questions

QUESTION ONE

(a) The production function for a firm is given as Q = 200 - L^2- K^2

The corresponding cost function is given as C = 2L +3K

The firm wishes to maximize its output for a specified level of outlay of C = 30.

You are required to:

(i) Write a maximization problem for the firm. [2 marks]

(ii) Determine the level of K and L for which Q is maximized. [6 marks]

(iii) Determine whether the second order condition is satisfied . [2 marks]

(iv) Determine the maximum level of Q. [2 marks]

(b) Given the following production function Q =$CK^{\alpha}L^{1-\alpha}$

Required:

(i) Express MPL in terms of Q,α and L [2 marks]

(ii) Express MPK in terms of Q, α and K [2 marks]

(iii) Show that Q = K(MPK) + L(MPL) [4 marks]

(c) The ATC and the AR of the frim are given as

$2 - \frac{4}{Q} = Q - ATC$

$4Q = 2 - AR$

(i) Find the price elasticity of demand at P =4. [1 mark]

(ii) Show what level of Q is ATC at minimum. [1 mark]

(iii) Determine the point at which is ATC = MC. [2 marks]

(iv) Discuss your results in ii and iii above. [2 marks]

(v) Find the profit maximizing Q if a tax of 2 per unit is imposed. [3 marks]

(vi) Find the profit maximizing Q if a subsidy of per unit is imposed. [3 marks]

(d) A three sector input model is given by the following.

	1	2	3	D	X
1	X_{11}	X_{12}	X_{13}	D_1	X_1
2	X_{21}	X_{22}	X_{23}	D_2	X_2
3	X_{31}	X_{32}	X_{33}	D_3	X_3
V	V_1	V_2	V_3	GNP	
X	X_1	X_2	X_3		

Required:

(i) If the input –output coefficient are denoted by α_{ij} where (ij) = 1,2,3) write these inputs – output coefficients in terms of x_{ij} where (ij) = 1,2,3) [4 marks]

(ii) Find GNP by expenditure approach. [2 marks]

(iii) Find GNP by factor input approach. [2 marks]

QUESTION TWO

(a) Given the following market model,

$Q_d = \alpha_0 - \alpha_1 P$

$Q_s = \beta_0 + \beta_1 P$

(i) Find the total differential of the following function.

$Z = 2X_1^2 + 3X_1X_2 + 5X_2^2$ [4 marks]

QUESTION THREE

(a) Using well labelled diagrams. Shows the difference between consumer surplus and producers surplus. [10 marks]

(b) Given the following supply function, $Q^2+Q+2-P=0$

Find the producers' surplus when Q = 2 [5 marks]

(c) Given the following demand function: determine consumer' surplus

Q + P = 8 where P = 3 [5 marks]

QUESTION FOUR

A national income model is given by the following equations.

$Y = C + I_0 + G_0$

$C = \alpha_1 + \alpha_2 Y^d$

$Y^d = Y - T$

$T = \lambda Y$

(a) Find the equilibrium Y, C and T [8 marks]

(c)Determine the following multipliesr and interpret your results for each.

(i) Investment multiplier [2 marks]

(ii) Government expenditure multiplier [2 marks]

(iii)Autonomous consumption multiplier. [2 marks]
