MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN EXAMINATION

UNIVERSITY EXAMINATIONS 2023/2024 ACADEMIC YEAR

FIRST YEAR FIRST SEMESTER EXAMINATIONS

FOR THE DEGREE BACHELOR OF SCIENCE IN ECONOMICS

COURSE CODE: ECO 113

COURSE TITLE: MATHEMATICS FOR ECONOMISTS 1

DATE: FRIDAY, 15-12-2023 **TIME:** 8:00 -10:00 AM

INSTRUCTIONS TO CANDIDATES

ATTEMPT: QUESTION ONE AND ANY OTHER TWO
TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 4 Printed Pages. Please Turn Over.

QUESTION ONE

a) Define the following terms as used in Mathematics for Economists. (10 Marks)

i. Endogenous variable

ii. Autonomous consumption

iii. Disjoint sets

iv. Functions

v. Symmetric matrix

b). What is a non-Singular Matrix? Briefly discuss the conditions for non- singularity of a matrix. (5 Marks)

c). What are the limitations of static (equilibrium) Analysis? (4 Marks)

d) Given the following equation;

$Y = C + I_0 + G_0$

$C = a + By$

Find Y* and C* using Cramer's rule. (5Marks)

e). Name and explain the three types of equations in Economic Models. (6 Marks)

QUESTION TWO

a). Consider the following production with labor (L) as the only input: $=49L^{2/7}$ .Compute marginal productivity of labor (MPL) and then use second order derivative to determine whether the function obeys the law of diminishing return. (4 Marks)

b). Highlight the properties of Determinants in Matrices (8 Marks)

b). Given a utility function U =U (X, Y) show that the slope of indifference curve is equal to negative Marginal Rates of Substitution (dy/dx = - MRSxy) (8 Marks)

QUESTION THREE

a). An electric utility company determines the monthly bill for a residential customer by adding an energy charge of 8.38 cents per kilo watt hour [kwh] to its base charge of $ 4.95 per month. Write an equation for the monthly charge (y)n in terms of the number of kwh [x] that are used.

(4 Marks)

b). Solve the following for x;

i). $\ln (e^{x2+3x}) = 3x + 4$ (2 Marks)

ii). $\text{Log}_b\, b^{x2+\,3x} = 8$ (2 Marks)

c). (c) Compute the following limits

(i) $lim\ x \rightarrow 2\ x\ 4\ x{+}2$ (2 marks)

(ii) $lim\ x \rightarrow 5\ x\ 2 + 5\ x - 2$ (2 marks)

d). If the demand and supply functions are given by $p = 600 - q$ and $p = 200 + 1/3q$ respectively, find the tax rate that will minimize the total tax revenue T. (8 Marks)

QUESTION FOUR

a). Consider the following system of three equations:

$x + y - 2z = 4$

$2x + 2y + 3z = 15$

$x + 3y + 2z = 12$

Using matrix inversion method, determine the values of x, y and z. (12 Marks)

b). Suppose the demand per commodity is 24 if the price is \$ 16, 20 if the price is \$ 18, 16 if the price is \$ 20 and 12 if the price is \$ 22. Assuming a linear relationship, derive the demand function.

(3Marks)

c) If the total cost function for a product is $C(x) = (x + 5)^3$, where x represents the number of hundreds of units produced. Producing how many units will minimize average cost? Find the minimum average cost. (5 Marks)

QUESTION FIVE

a). Consider the following utility function:

$U = 25X^{2/5}\ Y^{3/5}$

i). Find the MUx and MUy (8 Marks)

ii). From your results, find the MRCS between the two goods. (2 Marks)

iii.) By setting U =100, derive the corresponding indifference curve. (2 Marks)

iv). Find the MRCS when x = 2. (2 Marks)

v. Does the indifference curve obey the Law of diminishing MRCS? (2 Mark)

b). Find the MPC and MPS for the following function: $S = -150 + 0.25Y$. (4 Marks)