CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

CHUKA & THARAKA

FIRST YEAR EXAMINATION FOR THE AWARD OF BACHELOR OF SCIENCE IN ECONOMICS AND STATISTICS, ECONOMICS AND SOCIOLOGY, ECONOMICS AND MATHEMATICS AND ECONOMICS AND HISTORY

ECON 131: INTRODUCTION TO MATHEMATICS FOR ECONOMISTS

STREAMS: BSC (ECON & STATS/ECON & SOCI/ECON & MATHS/ECON & HIST (Y1S1) **TIME: 2 HOURS**

DAY/DATE: MONDAY 09/12/2019 **8.30 A.M. – 10.30 A.M.**

INSTRUCTIONS: Answer question ONE and any other TWO questions. Show your workings clearly

QUESTION ONE (30 MARKS)

(a) Differentiate between the following terms: [4 marks]

(i) Behavioural and technical functions

(ii) Endogenous and Exogenous variables

(b) A thousand people took part in a survey to reveal which newspaper A, B or C; they had read on a certain day. The responses showed that 420 had read A, 316 had read B, and 160 had read C. Of these responses, 116 had read both A and B, 100 had read A and C, 30 had read B and C and 16 had read all three papers

(i) How many had read A but not B? [1 mark]

(ii) How many had read both A and B and not C? [2 marks]

(iii) How many had read neither A, B and C [1 mark]

(c) Evaluate

(i) $4log_4\ 3 + 2log_3\left(\frac{1}{9}\right)$ [2 marks]

(ii) Simplify $(x^{-5})\ (x^8) \div x^3$ [1 mark]

(d) A national income model is given by

$Y = C + I + G$

Where C, I and G are consumption, investment and government expenditure components given by:

$C = a + by$

$I = 0.1Y$

$G = 250$

Required:

(i) Find equilibrium value of income (Y) [2 marks]

(ii) What is the corresponding equilibrium investment? [1 mark]

(e) Find the following [4 marks]

(i) $\int\left(x^3 + \sqrt{x} - x^{\frac{1}{2}}\right)\partial x$

(ii) $\int_2^5 (x+2)(x-1)\partial x$

(f) The average revenue and total cost for a firm are given by:

$AR = 3½ - ½Q$

$TC = \frac{1}{20}Q^3 - \frac{3}{10}Q^2 + 2Q + 1$

Find:

(i) The output and price levels that will maximize profits. [4 marks]

(ii) The output level that will maximize total revenue [2 marks]

(iii) The total output level that will minimize average variable cost (AVC) marginal cost (MC) [2 marks]

(iv) The minimum AVC and MC [1 mark]

(g) Expand $(9 + x)^{10}$ [3 marks]

QUESTION TWO (20 MARKS)

(a) Consider the following equations

$PQ = 10$

$Q = -2\sqrt{5} + 2P$

(i) Which of the two represents supply and which represents demand function? [2 marks]

(ii) Determine the equilibrium price and quantity [3 marks]

(iii) Graph your results [3 marks]

(b) Find the derivatives of [6 marks]

(i) $Y = (3x^2 + 2x + 1)^{-3/4}$

(ii) $Y = (x^2)\sqrt{(x^2 + 2x^2)}$

(iv) $Y = \frac{(x^2+1)(x+5)}{(x+6)(x^2+x)}$

(b) Consider the following demand functions for two firms

$P = 16 - 0.4Q$

$P = \frac{1}{3}Q^2 - 16\frac{1}{2}Q + 230 \qquad 0 < Q < 20$

In each case

(i) Write out the corresponding elasticity of demand [2 marks]

(ii) Determine price elasticity of demand at $P = 6$ and $Q = 20$ [2 marks]

(iii) Comment on the magnitude and sign of your results [2 marks]

QUESTION THREE (20 MARKS)

(a) (i) Find the points at which critical values for the following function occur and whether the function attains maximum or minimum value at such points [4 marks]

$Y = \frac{1}{3}x^3 + \frac{5}{2}x^2 + 6x + 23$

(ii) Consider the following demand and cost functions

$P = 25 - 3Q$

$TC = Q^2 + 6Q$

If a per unit tax t is imposed on the output, determine

(I) The maximum profit [2 marks]

(II) The change in price [1 mark]

(III) The tax rate t which will maximize total tax $T = tQ$ [1 mark]

(IV) The maximum tax T [1 mark]

(b) Some two commodities how the following demand and supply functions:

$Q_{d1} = 4 - 2P_1 + 2P_2$

$Qd_2 = 6 + 2P_1 - 2P_2$

$Qs_1 = -3 + P_1$

$Qs_2 = -2 + 2P_2$

Determine the equilibrium values of prices and quantities for the two commodities using Cramer's rule [6 marks]

(c) The inter industry transactions for a four sector economy are given by:

	1	2	3	4
1	120	0	200	180
2	80	40	0	36
3	61	158	0	240
4	100	36	37	0

(i) Which of the sectors has purchased inputs from all the other sectors except sector 1? [1 mark]

(ii) Which of the four sectors has purchased products from all the others except itself and sold its output to all the other except itself? [1 mark]

(iii) How much has sector 2 sold to itself? [1 mark]

(iv) If total output of sector 2 is 356; how much does the sector contributes to find demand? [1 mark]

(v) If total input purchased by sector 3 is 440, how much value added did this sector use in its production process [1 mark]

QUESTION FOUR

(a) The supply of cooking oil is given by the following function

$Q = -4 + \frac{1}{2}P$

Where Q is the supply of cooking oil and P is its price

(i) Graph the function [2 marks]

(ii) What is the quantity of cooking oil supplied at zero price? [1 mark]

(iii) What happens to the supply for cooking oil as its price rises? [1 mark]

(iv) 'The supply of cooking oil increases as its price falls' is this statement correct? Explain [1 mark]

(b) An economy is defined by:

$Y = C + I + G + X - M$

$C = C + C_o + C_1 Y$

$I = I_o + I_1 Y$

$M = M_o + M_1 Y$

$G = G_o$

$x = X_o$

(i) Name the endogenous and the exogenous variable in the model [2 marks]

(ii) What is the difference between C_o and M_o on one hand, and C_1 and M_1 on the other hand? [2 marks]

(iii) What is the balance of trade position in the economy when [3 marks]

(a) $X > M$

(b) $X < M$

(c) $X = M$

(iv) Find the value of Y in terms of C_o, C_1, I_o, I_1, M_o, M_1, X_o and G_o and denote the value by $\bar{Y}$ [3 marks]

(v) Find the value of C in terms of C_o, C_I, I_o, I_1, M_o, M_1, X_o and G_o and denote it by $\bar{C}$ [2 marks]

(c) Solve $4x^2 - 25 = 0$ [3 marks]
