



**UNIVERSITY EXAMINATIONS**  
**2021/2022 ACADEMIC YEAR**  
**FIRST YEAR SECOND SEMESTER**  
**SPECIAL/SUPPLEMENTARY EXAMINATION**  
**FOR THE DEGREE OF BACHELOR OF EDUCATION.**  
**COURSE CODE: ECO 103**  
**COURSE TITLE: MATHEMATICS FOR ECONOMISTS**

**DATE: 29<sup>TH</sup> JULY, 2022**

**TIME: 11.00AM – 1.00PM**

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**INSTRUCTIONS TO CANDIDATES**

Answer Question One in Section A and Any other TWO (2) Questions in Section B

TIME: 2 Hours

**KIBU observes ZERO tolerance to examination cheating**

This Paper Consists of 2 Printed Pages. Please Turn Over. 

### QUESTION ONE (COMPULSORY)

a) Evaluate the limit of the following function.

i)  $\lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n$  when  $n = 3$  (5 marks)

ii) Given  $A = \begin{pmatrix} 10 & 4 \\ 8 & 5 \end{pmatrix}$  determine its determinant (3 marks)

iii) Explain four factors that makes a product perfectly elastic ( $e = 1$  unitary elastic). (4 marks)

b). Express

i)  $\log_3 3 + \log_4 4 - \log_6 6$  as a single logarithm (3 marks)

ii)  $\log_x 3 = 3 \log_a 2 + \log_a 20 - \log_a 1.6$  (3 marks)

c. The output,  $Q$ , of any production process depends on a variety of inputs, known as factors of production. These include land, capital, labour, and enterprise.

If  $Q(K, L) = 100K^{1/3} L^{1/2}$ ,  $K = 27$  and  $L = 100$  Determine output  $Q$ . (5 marks)

d) Evaluate

i)  $f(x) = (2x^3 + 1)(x^2 - 3x)$  (3 marks)

f) Determine the value of the following without using a calculator

i)  $27 \left(\frac{27}{125}\right)$  ii)  $81^{-3/4}$  (4 marks)

### SECTION B

### QUESTION TWO

i) Solve the system of equations:

$$\begin{aligned} 3x + 2y &= 1 \\ -2x + y &= 2. \end{aligned} \quad (5 \text{ marks})$$

ii) Given the profit  $\pi = 13x + y$ , you are required to determine the maximizing output  $Q$  subject to the budget constraint  $2x + y = 6$  (5 marks)

iii) Determine the slope and intercept of the straight line  $9x + 3y = 4$ . (5 marks)

- iv) The demand and supply equations of a good are given by the following equations.

$$4P = -Q_d + 240,$$

$$5P = Q_s + 30.$$

(5 marks)

Determine quantity at equilibrium

### QUESTION THREE

- i) A car manufacturing firm is faced with the following demand and supply functions.

$$Q_d = Q_s$$

$$Q_d = 4 - p^2$$

$$Q_s = 4p - 1$$

Using a graph determine the optimal output (Q) that will satisfy the firm's equilibrium condition. (5 marks)

- ii) Find the integral

$$\int_0^2 (8x^3 - 3x^2 + 2) dx$$

(5 marks)

- iii) Discuss the role of mathematics in studying economics

(10 marks)

### QUESTION FOUR

- a) Find each logarithm

i)  $\log_9 1/3$

ii)  $\log_3 27$

iii)  $\log \log_2 1/8$  (6 marks)

- b) It costs a car company sh.50000 to produce each car, and fixed costs are sh.200000 per week. The company's price function is  $p = 19000 - 70x$ , where p is the price at which exactly x cars will be sold.

- i) How many cars should be produced each week? (2 marks)

- ii) For what price should they be sold? (2 mark)

- iii) What is the company's maximum profit? (3 marks)

- iv) Find the absolute extreme values  $f(x) = x^3 - 9x^2 + 15x$  on (0,5) (7 marks)

### QUESTION FIVE

- a) Discuss the limitation of the mathematical approach in studying economics. (4marks)

- b) Find the second order derivatives with respect to X of the following functions.

i)  $f(x) = (2X^2 - 3)^4$

ii)  $f(x) = (4zx + 4)^5$  (6 marks)

- c) Find the slope of the line through the pair of points given and draw the graph line. (4 marks).

(1, 3); (2, 5)



c) Simplify  $\frac{[(x^2)x^3]^{14}}{x^5 \cdot x^7}$

( 6 marks)