



OFFICE OF THE DEPUTY PRINCIPAL
ACADEMICS, STUDENT AFFAIRS AND RESEARCH

UNIVERSITY EXAMINATIONS

2020 /2021 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER SUPPLEMENTARY
EXAMINATION

**FOR THE DEGREE OF BACHELOR OF
ECONOMICS**

COURSE CODE: ECO 312

COURSE TITLE: MATHEMATICS FOR ECONOMISTS

DATE: MARCH, 2021

TIME:

INSTRUCTION TO CANDIDATES

- SEE INSIDE

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REGULAR – SUPPLEMENTARY EXAM
ECO 312: MATHEMATICS FOR ECONOMICS

STREAM: BA ECONOMICS

DURATION: 3 Hours

INSTRUCTIONS TO CANDIDATES

- i. Answer Question **ONE** and any other **TWO** questions.
- ii. Maps and diagrams should be used whenever they serve to illustrate the answer.
- iii. Do not write on the question paper.

Question One

a) Evaluate the partial derivatives of the following functions:

i) $y = (2x_1 + 3)(x_2 - 2)$ (4 marks)

ii) $y = \frac{2x_1 - 3x_2}{x_1 + x_2}$ (4 marks)

iii) $(x_1 + 2)^2(x_2 + 3)^3$ (4 marks)

b) Find the degree of homogeneity and nature of returns to scale for the following function

$Q = 10 K^{1/4} L^{3/4}$ (5 marks)

c) A total cost function is given by $C = Q_1^3 + Q_1Q_2 - 6Q_2^3 + 40$

Find: MC_1 , MC_2 and if function displays increasing or decreasing MC with respect to each of the goods. (13 marks)

Question Two

A firm produces jam from two raw materials, strawberries and black berries. The production function for the jam is given as: $Q = 20x^{0.2}y^{0.8}$ where x is strawberries and y is blackberries. If each unit of straw berries cost 20 shillings and each unit of blackberries cost 2 shillings, and the firm has only 1450 shillings at its disposal:

- i) Use the langragian method to determine the optimal values of strawberries and blackberries to be bought and the maximum amount of jam to be produced. (14 marks)
- ii) Show that $\frac{MP_x}{MP_y} = \frac{P_x}{P_y}$ at the maximum output (6 marks)

Question Three

i. Get the first order, second order and cross partial derivatives of the following functions.

i) $Y = 8X_1 + 15X_1^2 X_2 + 3X_2^3$ (6marks)

ii) $Y = 2X^2 + 3XW + 7W^3$ (6 marks)

ii. A utility function is given as: $U = Q^{1/2} Q^{4/3}$

a. Determine the marginal utility of good 1 and 2 (4 marks)

b. Determine the nature of marginal utility for each of the goods (4 marks)

Question Four

a. The marginal revenue function for a firm is given as: $MR = 20 - 5Q$. Determine the total revenue function for the firm. (5 marks)

b. For XYZ manufacturing company, the total fixed costs are sh.1200 and the variable costs are sh. 2 per unit. The demand equation is given as $P = 100/\sqrt{q}$

i. At what level of output is profit maximized (6 marks)

ii. What is the price at the profit maximization (4 marks)

c. solve the following simultaneous equations using Cramer's rule:

$$5x + 3y = 30$$

$$6x - 2y = 8$$

(5 marks)

Question Five

a) Find the derivative of the function

$$f(x) = \left(\frac{x^2 - x - 3}{x^2 + 1} \right) (x^2 + x + 1)$$
 (8 marks)

b) Evaluate the following

$$\int (x^3 + 2x^2 + 6x)(3x^2 + 4x + 6) dx$$
 (8 marks)

c) Proof Young's theorem for the following function:

$$Y = 2X_1 X_2^3 + 4X_1^2 + 5X_2$$
 (4 marks)