NATIONAL UNIVERSITY OF LESOTHO

Faculty of Agriculture

Department of Agricultural Economics & ExtensionAEC 3303-12: Mathematical Economics-Final Examination

January 2024 **Marks: 100** **Time: 3 Hours**

Instruction: Answer all questions

QUESTION 1

a) The supplier will start to supply a good when the price greater than M5 per unit is available. He or she will then increase output by 2 units for every unit increase in price.

i) Write down the equation of the supply function. [05]

ii) Plot the supply function in the form $Q = f(P)$ [10]

b) The supply and demand functions for a particular market are given by the following equations:

$P_S = Q^2 + 6Q + 9$ and $P_d = Q^2 - 10Q + 25$

Find the equilibrium price and quantity algebraically. [05]

QUESTION 2

A consumer has a given income, M = *M*200, which is spent on two goods, X and Y. The prices of the goods are Px =M_4 and P_y = M5 respectively.

i) Deduce the equation of the budget constraint (4)

ii) Graph the budget constraint. (10)

iii) Explain each component of the budget constraint (6).

[20]

QUESTION 3

a) The output for a firm over time is given by the function,

$$Q = \frac{t^3}{30} - \frac{t^2}{5} + \frac{3t}{10} + 120$$

Determine the years in which output is at a maximum and a minimum. [10]

b) Given a short run classical production function, $Q = 3L^2 - 0.1L^3$

c) Find the values of Q for which MPL and APL are maximum. [06]

d) Show that MPL curve passes through the maximum point of the APL curve, that is, (MPL = APL) , when APL is at maximum). [04]

QUESTION 4

Given the demand function for a good, P = 50-2Q, while the total cost function is given by TC = 160 + 2Q.

a) Write down the equation for the total revenue (2), and for profit (3). [05]

b) Sketch the total cost (5) and total revenue functions (5) on the same diagram. [10]

c) Estimate in terms of Q the following, when the firm breaks even (4), and show profit and loss regions (6). [10]

d) Determine the value of Q where profit is maximum (5), the maximum profit (5) and sketch the profit function (5) [15]

END