



University of Fort Hare
Together in Excellence

FACULTY OF MANAGEMENT AND COMMERCE
DEPARTMENT OF ECONOMICS
ALICE/EAST LONDON CAMPUS

ECO212/E
END OF MODULE ASSESSMENT (EMA)
JUNE 2023
QUESTION PAPER

Time: 3 hours

Module: Economics 2 – Mathematical Economics

Marks: 50

This memorandum consists of 3 pages, including the cover page.

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INSTRUCTIONS:

- **Answer ALL questions, showing clearly all the calculations.**
 - **Use clearly drawn diagrams where necessary.**
 - **Calculators are allowed.**
- **Answers must be rounded off to two (2) decimal places.**

Question 1 [12 marks]

The demand for plastic containers is $Qd = 8000 - 4p$; the supply of plastic containers is $Qs = p - 1000$. Now suppose that the government wants to impose an excise (specific) tax of $T=100$ on the producers of plastic containers to help combat plastic pollution.

- (a) Find the equilibrium price and quantity before AND after the introduction of this specific tax on plastic containers. [8]
- (b) Graphically illustrate the impact of tax on quantity demanded and price of the plastic containers. [4]

Question 2 [24 marks]

2.1. Akimo Pty Ltd has a profit function (π) below for two farm produce beans (α) and maize (β).

$$\pi(\alpha; \beta) = 15\alpha + 7\beta - 0.04\alpha^2 + 0.01\alpha\beta + 0.01\beta^2 + 36$$

- (a) Determine the amount of beans and maize that optimise profit for this company. [6]

2.2. When analysing the cost functions of a firm in the short run, it is very important to note that the relationship between average costs (AC) and marginal costs (MC) is important.

$$\text{Given: } TC = 3q^2 - 5q = 48$$

- (a) Find marginal and average cost functions [4]
- (b) Show that AC is at its minimum when $q = 4$ and that $MC = AC$ at this output. [4]

2.3. Clean Energy Corp produces and sell wind turbines (1) and solar panels (2). The inverse demand for its wind turbines is $P_1 = 100 - 2q_1$; while the inverse demand for its solar panels is $P_2 = 76 - q_2$. Furthermore, the cost of producing these wind turbines and solar panels is.

$$C(x) = 3q_1^2 + 2q_1q_2 + 2q_2^2 + 55.$$

- (a) Find the levels of q_1 and q_2 that satisfy the first order and second-order conditions for the maximisation of clean energy's profit. [8]
- (b) At which prices must clean energy sell its wind turbines (p_1) and solar panels (p_2) to maximise its profits? [2]

Question 3 [14 marks]

3.1. Considering the following production function $q = 6(0.4K^{0.3} + 0.6L^{0.3})^3$.

- (a) Does this production function exhibit increasing, decreasing or constant returns to scale. Briefly explain. [3]
- (b) Write down an expression for the capital elasticity of production, e^k . [2]

3.2. Consider the following Cobb-Douglas production function.

$$Q = 15K^{5/8}L^{3/8}$$

Find.

- (a) MP_L [3]
- (b) MP_K [3]
- (c) Calculate MP_{KK} and comment on returns to capital [3]

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