

**UNIVERSITY OF SWAZILAND
FACULTY OF SOCIAL SCIENCE
DEPARTMENT OF ECONOMICS
SUPPLEMENTARY EXAMINATION**

JULY 2014

TITLE OF PAPER: MATHEMATICS FOR ECONOMISTS

COURSE CODE: ECON 208

TIME ALLOWED: THREE (3) HOURS

- INSTRUCTIONS:**
- 1. ANSWER THREE (3) QUESTIONS:
QUESTION ONE(1) IS COMPULSORY AND
YOU CAN THEN CHOOSE ANY TWO (2)
QUESTIONS FROM THE REMAINING
FOUR (4) QUESTIONS PROVIDED.**
 - 2. QUESTION 1 CARRIES 50 MARKS AND
THE CHOSEN TWO QUESTIONS CARRY 25
MARKS EACH**
 - 3. ALWAYS ROUND YOUR ANSWER TO TWO
(2) DECIMAL PLACES.**

**THIS PAPER IS NOT SUPPOSED TO BE OPENED UNTIL PERMISSION
HAS BEEN GRANTED BY THE INVIGILATOR**

QUESTION 1 (COMPULSORY)

a) Given the input – coefficient matrix and the final demand vector:

$$A = \begin{bmatrix} 0.3 & 0.4 & 0.2 \\ 0.2 & 0 & 0.5 \\ 0.1 & 0.3 & 0.1 \end{bmatrix}$$

$$d = \begin{bmatrix} 100 \\ 40 \\ 50 \end{bmatrix}$$

- i) Find the “correct” output levels for the 3 industries. (15)
- ii) Calculate the amount of primary input required to produce the solution output levels. (3)
- iii) Define a homogenous equation system. (7)

b) A Company has two inter-acting branches, B1 and B2. Branch B1 consumes E0.5 of its own output and E0.2 of B2 output for every E1 it produces. Branch B2 consumes E0.6 of B1 output and E0.4 of its own output per E1 of output. The company wants to know how much each branch should produce per month in order to meet exactly a monthly external demand of E50,000 for B1 product and E40,000 for B2 product.

- i) Set up (without solving) a linear system whose solution will represent the required production schedule. (10)
- ii) Find a production schedule for the above external demand. (15)

QUESTION 2

The demand and supply functions and equilibrium condition for a good are given as:

$$P = Q_s + 40 \quad P = -2Q_d + 100$$

- i) Determine the equilibrium price and quantity (5)
- ii) What will be the equilibrium price and quantity if a tax of 5% is deducted from the market price of the good? (5)
- iii) What will the tax revenue and producer revenue be? (5)
- iv) What will the equilibrium price and quantity be if a lump sum tax of E10 is imposed on the price of the good? (5)
- v) Determine the tax revenue and producer revenue for the type of tax described in (iv). (5)

QUESTION 3

A Manufacturer has the following information about the costs of producing a machine:

Output (x)	5	10	15
Total Costs	20	65	160

- Determine the equation of the cost function, assuming it can be represented by a quadratic expression. (4)
- What is the cost of producing 20 units of output? (4)
- Sketch the graph of the cost function for $0 < x < 20$. (7)
- If the revenue function is $TR = 10x + 15$, show that there are two levels of output at which total revenue equals total costs, and illustrate this graphically. (10)

QUESTION 4

The demand function for a product is $Q_d = 200 - 2P$ and the Total Cost Function is

$$TC = 20 + 5Q_d.$$

- Determine the net-revenue function. (6)
- Determine the break – even levels of output and price. (7)
- Sketch the graph of the net revenue for $Q_d = 0$ to $Q_d = 200$, showing explicitly the vertex, y intercept, x intercepts and the shape of the graph.

(12)

QUESTION 5

A horticulturist wishes to mix fertilizer that will provide a minimum of 15 units of potash, 20 units of nitrates and 24 units of phosphates. Brand 1 provides 3 units of potash, 1 unit of nitrates and 3 units of phosphates; it costs E120. Brand 2 provides 1 unit of potash, 5 units of nitrates and 2 units of phosphates; it costs E60.

- a) Express the least cost combination of fertilizers that will meet the desired specifications as equations and inequalities. **(5)**
- b) Using the graphical approach of Linear Programming determine the least cost combination of fertilizers that will meet the desired specifications. **(20)**

GOOD LUCK!!!!!!!!!!!!!!!!GOOD LUCK!!!!!!!!!!!!!!!!GOOD LUCK!!!!!!!!!!!!!!!!