

**UNIVERSITY OF SWAZILAND  
FACULTY OF SOCIAL SCIENCE  
DEPARTMENT OF ECONOMICS  
MAIN EXAMINATION  
DECEMBER 2015**

**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. ROUND UP YOUR FINAL 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) Write short explanatory notes on the following economic concepts: ( 5 marks each)
- i) Differentiate between the Value Added Tax and Excise Tax.
  - ii) Why Money Supply is always treated as an exogenous variable in macroeconomic models?
  - iii) Rationale for the Leontief Input – Output model.

- b) Suppose that the Swazi economy is defined by the following closed macroeconomic model:

National Income:  $Y = C + I + G$

Consumption:  $C = 250 + 0.6Y_d$

Investment:  $I = 1150 - 58i$

Disposable Income:  $Y_d = Y - T$

Money Demand:  $M_d = L_1 + L_2$

Where  $i$  is the rate of interest;  $G$  is the level of government expenditure;  $L_1$  is the transactions-precautionary demand;  $L_2$  is the speculative demand and  $M_s$  is Money Supply.

- i) List all the endogenous and exogenous variables in this model (5)
- ii) Given that  $T = 30 + 0.3Y$  and  $G = 1160$ . Determine the function which shows equilibrium in the product market. (5)
- iii) If the transaction-precautionary demand for money is given by  $L_1 = 0.7Y$ ; the speculative demand for money is  $L_2 = 1850 - 77i$  and money supply is  $M_s = 3950$ ; determine the function that shows equilibrium in the money market. (5)
- iv) What will be the overall equilibrium values of  $Y$  and  $i$  in this closed economy? (5)
- v) If government decides to reduce its expenditure to  $G = 928$  and the monetary authorities on the other hand also reduces money supply to  $M_s = 2501$ , How will these effects impact on the equilibrium values? (5)

c) The demand and supply equations for a particular product are:

$$q_d = 200 - 4p$$

$$q_s = -10 + 26p$$

- i) Determine the equilibrium values of  $p$  and  $q$  and the producer's revenue that this equilibrium values imply? (4)
- ii) A tax of 20% of the price is imposed on each item sold. Determine the new equilibrium position, the tax revenue at equilibrium and the producer's revenue. (6)

## **QUESTION 2**

- a) Find the present value of a 10 year bond with a face value of E10000 and no coupons, assuming that the rate of interest is 9% and it is compounded annually. (10)
- b) Calculate the annual growth rate for sales if the sales volume was 2.74 million in 2010 and 4.19 million in 2015. (15)

## **QUESTION 3**

Suppose that an economy of Swaziland is defined by the following industries: Labor, Transportation & the Food Industries. Let E1 in labor require 40 cents in transportation and 20 cents in food; while E1 in transportation takes 50 cents in labor and 30 cents in transportation; and E1 in food production uses 50 cents in labor, 5 cents in transportation, and 35 cents in food. Let the demand for the current production period be E10,000 labor, E20,000 transportation and E10,000 food.

- a) Using the Input –Output analysis determine a solution for this economy? (15)
- b) Calculate the amount of primary input required to produce the solution output levels. (3)
- c) Differentiate between a singular matrix and an adjoint. (7)

#### **QUESTION 4**

The firm's demand function is given by  $Q_d = 120 - P$  and its total cost function is

$TC = 2Q^2 + 6Q + 216$ . If the firm produces what it can sell, and not more,

- i) Determine the breakeven point(s) for the firm. (7)
- ii) Determine the level of output where:
  - a) Total revenue is at maximum (5)
  - b) Average cost is at minimum (5)
  - c) Profit is maximized (5)
- iii) What is the firm's profit when output is 25 units? (3)

#### **QUESTION 5**

A health enthusiast wishes to have a minimum of 36 units of vitamin A each day, 28 units of vitamin C and 32 units of vitamin D. Brand 1 cost E3 and it supplies 2 units of vitamin A, 2 units of vitamin C and 8 units of vitamin D. Brand 2 costs E4 and it supplies 3 units of vitamin A, 2 units of vitamin C and 2 units of vitamin D.

- i) Formulate the linear programming problem showing the least – cost combination guaranteeing daily requirements. (5)
- ii) Use the graphical approach to solve for the optimal solution. (15)