UNIVERSITY OF SWAZILAND

FACULTY OF SOCIAL SCIENCE

DEPARTMENT OF ECONOMICS

MAIN EXAMINATION

DECEMBER 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. IN EVERY STAGE OF YOUR CALCULATIONS ROUND YOUR ANSWER TO TWO (2) DECIMAL PLACES.

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QUESTION 1 (COMPULSORY)

a) Write short explanatory notes on the following economics concepts; you may use examples where applicable to illustrate your point. **(5 marks each)**

   i)   What are the advantages of a mathematical approach to economics versus the verbal approach?

   ii)   Differentiate between an exogenous variable and an endogenous variable.

   iii) What is the economic meaning of a multiplier?

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

$$P = Q_s + 40$$

$$P = -2Q_d + 100$$

   i)   Determine the equilibrium price and quantity.   (4)

   ii)   What will be the equilibrium price and quantity if a tax of 8% is levied on the market price of the good?   (4)

   iii) What will be the tax revenue and producer revenue after the tax charged in ii)?   (4)

   iv)   What will the equilibrium price and quantity be if a lump sum tax of E5 is imposed on the price of the good?   (4)

   v)   Determine the tax revenue and producer revenue for the type of tax described in (iv)   (4)

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

$$Y = C + I + G$$
$$C = 250 + 0.02Y_d$$
$$I = 90 - 10i$$

   i) Given that $T = 2 + 0.02\,Y$ and $G = 5000$; determine the IS equation.   (5)

   ii) If the transaction – precautionary demand for money is given by $L_1 = 0.5Y$ and the speculative demand for money is $L_2 = 50 - 30i$ and money supply is fixed at $M_s = 6500$; determine the LM equation and hence the equilibrium values of Y and i.   (5)

   iii) What is the effect on the equilibrium if G increases to 6500?   (5)

QUESTION 2

a) Suppose that the Economy of Swaziland is defined by the following industries: Agriculture, Services and the Manufacturing industries. Let E1 of agriculture require 2c of its own output, 5c in services, and 20c in the manufacturing sector. Let E1 of services require 4c in agriculture, 3c in services & 1c in the manufacturing industry; while E1 of manufacturing require 4c in agriculture, 1c in services & 10c of its own output.

  i)   Construct the consumption matrix for this economy.   (3)
  ii)   Determine the amount of primary input required to produce the solution output levels.   (3)
  iii)   Find the production schedule for the economy if the demand for agriculture is E400, for services & the manufacturing sectors the demand is E200 and E600 respectively.   (10)

b) Write short explanatory notes on the following economic concepts: (3 marks each)
  i)   Rationale for the Leontief input-Output analysis.
  ii)   Technology matrix
  iii)   Differentiate between a minor and a cofactor

QUESTION 3

a) 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) Marginal revenue is at maximum   (3)
     b) Average cost is at minimum   (3)
     c) Profit is maximized   (3)
iii)   What is the firm's profit when output is 25 units?   (3)

b) Find the present value of a 10 year bond with a face value of E150,000 and no coupons, assuming that the rate of interest is 6% and compounded annually.   (6)

QUESTION 4

A company manufactures two products X and Y. Each product has to be processed in three departments: welding, assembly and painting. Each unit of X spends two hours in the welding department, three hours in the assembly and one hour in the painting department. The corresponding times for a unit of Y are 3, 2 and 1 respectively. The man-hours available in a month are 1500 in the welding department, 1500 in the assembly and 550 in the painting department. The contribution to profits and fixed overheads are E100 for product X and E120 for product Y.

a) Formulate the linear programming problem and show it graphically by shading the feasible region. (10)
b) Find the optimal solution and the maximum contribution. (10)
c) Which department has spare capacity and how much? (5)

QUESTION 5

a) Write short explanatory notes on the following concepts: **(5 marks each)**
    i)   Discounting.
    ii)   Properties of exponential functions.
    iii)   The difference between the slack variables and surplus variables.
    iv)   Objective Function in Linear Programming.
    v)   Parabola

*********************************GOOD LUCK*******************************