

**UNIVERSITY OF SWAZILAND**  
**FACULTY OF SOCIAL SCIENCE**  
**DEPARTMENT OF ECONOMICS**  
**MAIN EXAMINATION**  
**DECEMBER 2012**

**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) 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

b) Suppose that the Economy of Swaziland is defined by the following industries: Raw Material, Services and the Manufacturing industries. Let E1 of raw material require 2c of its own output, 5c in services, and 20c in the manufacturing sector. Let E1 of services require 4c in raw material, 3c in services & 1c in the manufacturing industry; while E1 of manufacturing require 4c in raw material, 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 raw material is E400, for services & the manufacturing sectors the demand is E200 and E600 respectively. **(15)**

c) Solve the following system of linear equations, using the Gaussian Elimination method: **(10)**

$$3x_1 + 2x_2 + 6x_3 = 24$$

$$2x_1 + 4x_2 + 3x_3 = 23$$

$$5x_1 + 3x_2 + 4x_3 = 33$$

d) Evaluate the following determinant using the Laplace expansion: **(10)**

$$\begin{vmatrix} 23 & 35 & 0 \\ 72 & 46 & 10 \\ 15 & 29 & 0 \end{vmatrix}$$

## Question 2

- a) The demand and supply equations for sugar beans at UNISWA refectory are:

$$q_d = 2000 - 40p$$

$$q_s = -100 + 260p$$

- i) Determine the equilibrium values of  $p$  and  $q$  and the producer's revenue that these equilibrium values imply? **(4)**
- ii) A tax of 10% of the price is imposed on each item sold. Determine the new equilibrium position/values, the tax revenue and the producer's revenue. **(6)**
- iii) A flat-rate tax of E5 per unit is imposed on each unit sold. Determine the new equilibrium position, the tax revenue at the equilibrium and the producer's revenue. **(6)**
- b) Suppose that the Swazi economy is defined by the following closed macroeconomic model:
- $$Y = C + I + G$$
- $$C = 150 + 0.08Y_d$$
- $$I = 75 - 20i$$
- i) Given that  $T = 3 + 0.02 Y$  and  $G = 3000$ ; determine the IS equation. **(3)**
- ii) If the transaction – precautionary demand for money is given by  $L_1 = 0.2Y$  and the speculative demand for money is  $L_2 = 75 - 20i$  and money supply is fixed at  $M_s = 1500$ ; determine the LM equation and hence the equilibrium values of  $Y$  and  $i$ . **(3)**
- c) Differentiate between Sales Tax and Personal Income Tax. **(3)**

### **Question 3**

- a) Find the value of E700,000 at 5% interest for 10 years :
- i) If compounded annually (4)
  - ii) If compounded semi - annually (4)
  - iii) If compounded continuously (4)
- b) Write short explanatory notes on the following concepts: (3 marks each)
- i) Discounting
  - ii) Properties of exponential functions
- c) Find the present value of a 5 year bond with a face value of E1000 and no coupons, assuming that the rate of interest is 9% and compounded annually. (7)

### **Question 4**

A furniture manufacturer makes three types of tables: provincial  $x_1$ , contemporary  $x_2$  and modern  $x_3$ . The provincial model requires 2 hours for sanding and 3 hours for staining. Its profit margin is 36. The contemporary model requires 2 hours for sanding and 2 hours for staining. Its profit margin is 28. The modern model requires 4 hours for sanding and 1 hour for staining, while contributing a profit margin of 32.

- i) Formulate the linear programming problem and show how production should be allocated to maximize profits if 60 hours are available for sanding and 80 hours for staining. (5)
- ii) Using the graphical approach of Linear Programming find the optimal solution to this problem. (20)

**Question 5**

- a) Calculate the annual growth rate for sales if the sales volume was 2.74 million in 2007 and 4.19 million in 2012. (7)
- b) 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. (10)
- 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 (2)

\*\*\*\*\*GOOD LUCK\*\*\*\*\*