UNIVERSITY OF SWAZILAND
FACULTY OF SOCIAL SCIENCE
DEPARTMENT OF ECONOMICS

SUPPLEMENTARY EXAMINATION 2005

TITLE OF PAPER: QUANTITATIVE METHODS IN ECONOMICS

COURSE CODE : ECON 205

TIME ALLOWED : 3 HOURS

INSTRUCTIONS

1. Answer TWO QUESTIONS FROM EACH SECTION TO MAKE A TOTAL OF FOUR.
2. SHOW ALL RELEVANT WORKINGS TO YOUR ANSWER
3. ALL QUESTIONS CARRY EQUAL MARKS OF TWENT FIVE (25) EACH

Question 1

Explain the following concepts as they are used in matrix algebra (give examples where applicable)

a) Singular matrix
b) Minor
c) Cofactor matrix
d) Adjoint matrix
e) Inverse   [2 marks each]

b). The equilibrium condition for three related markets is given by:

$$11P_1 - P_2 - P_3 = 31$$
$$-P_1 + 6P_2 - 2P_3 = 26$$
$$-P_1 - 2P_2 + 7P_3 = 24$$

Find the equilibrium price for each market using matrix inversion [15 marks]

2. Find the equilibrium income (Y) and rate of interest (r) given the following information on the commodity and money markets of a closed economy without government activities.

   I. Commodity Market

        a) Consumption function
          $C = 50 + 2/5Y$
        b) Investment function
          $I = 790 - 21r$

  II. Money Market
        a)   Transactions and Precautionary demand
              $L_1 = 1/6Y$
        b)   Speculative demand
              $L_2 = 1000 - 9r$
        c)   Money Supply
              $M_s = 1200$ **[10 marks]**

b) A single commodity model is given by:

    $P = -Q_d + 50$

    $P = \frac{1}{2} Q_s + 20$

    $Q_d = Qs = Q$

i) find the equilibrium price and quantity   **[5 marks]**

ii) what will be the equilibrium price and quantity if a fixed tax of E5 is imposed on the price of the good?   **[5 marks]**

iii) Find the equilibrium price and quantity if a tax of 10% is deducted from the market price of the good.   **[5 marks]**

Question 3

a) You are given the following demand function for good m:

$$Q_m = 3700 - 4P_m + 2.4 P_r + 0.15 PY$$

Find the following

i) the own price elasticity of demand at $P_r = 50$; $P_m = 100$; $Y = 2000$ and interpret your results.

[5 marks]

ii) the income elasticity of demand at $Y = 2000$; $P_r = 50$ and $P_m = 100$, interpret your results.

[5 marks]

iii) the cross elasticity of demand at $P_r = 50$; $P_m = 100$; and $Y = 2000$, interpret your results.

[5 marks]

b) Swaziland's Gross National Product (GNP) measured in billions of Emalangeni, has an average annual growth rate of 3%. The model representing this growth rate is given by:

$$GNP = 40e^{0.03t}$$

i)   What is the current value of GNP?   [3 marks]

II) what would be the value of GNP four years from now?   [4 marks]

iii) After how long would GNP be E48 billiion?   [3 marks]

3

Question 4

Use an Input- Output Analysis to determine the maximum final demand that can be met in the following situation:

[17 marks]

| | Input To | | Level of Output |
	Industry1	Industry 2	
Industry 1	200	300	1500
Industry 2	500	100	2500

b) What final demand can be met when the level of output of industry 1 is increased to 200 units? [8 marks]

SECTION B

Given the table below are the price and quantities of three items, steak, rice and bread.

| item | Prices | | Quantities | |
	1990	2000	1990	2000
Steak	E2.20	E3.00	50	40
Rice	2.00	2.00	2	3
Bread	0.50	0.60	80	100

If 1990 is the base year

a) Define, calculate and interpret the Laspeyres Price Index. [6 marks]

b) Define, calculate and interpret the Paasche Price Index [6 marks]

c) Calculate and interpret the Laspeyres Quantity Index [3 marks]

d) Calculate the Fisher's Ideal Price Index. [3 marks]

e) Calculate the total Total Cost Index. [3marks]

f) Does the Laspeyres Index pass the Factor Reversal Test [4 marks]

Question 6

A sales report, as indicated in the data below, shows the number of hours worked, and months of experience, for 10 randomly selected part- time sales personnel in the women's dress department of a large store.

Dresses sold Y	Hours worked $X1$	Months of experience $X2$
2	6	0
4	4	2
16	16	4
10	10	6
12	12	8
8	8	10
14	12	12
18	16	14
16	14	16
3	4	3

a) Fit an equation $Y = b_o + b_1X_1 + b_2X_2$ to these data [20 marks]

b) Using the equation obtained in part (a) to predict the sales by a part – time salesperson who works five hours and who has 2.5 months of experience.

[5 marks]

Question 7

Consider the following data

Y	X	W
6	6	1
8	4	3
10	2	5
9	3	4
7	5	1

    a) Determine the regression equation $Y = a + bX + cW$ [13 marks]
    b) Calculate the standard error of estimate   [4 marks]
    c) Calculate the multiple coefficient of determination   [4 marks]
    d) Interpret the values of a, b, and c   [4 marks]

Question8

Briefly explain the following

    a) Coefficient of correlation   [6 marks]
    b) Coefficient of determination   [6 marks]
    c) Multicollinearity   [6 marks]
    d) Autocorrelation   [7 marks]