NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF COMMERCE, HUMAN SCIENCES AND EDUCATION

DEPARTMENT OF ECONOMICS ACCOUNTING AND FINANCE

QUALIFICATION: BACHELOR OF ECONOMICS HONOURS DEGREE	
QUALIFICATION CODE: 08HECO	**LEVEL:** 8
COURSE CODE: AEM810S	**COURSE NAME:** APPLIED ECONOMETRICS
SESSION: JULY 2023	**PAPER:** THEORY
DURATION: 3 HOURS	**MARKS:** 100

SECOND OPPORTUNITY QUESTION PAPER	
EXAMINER(S)	Prof. Tafirenyika Sunde
MODERATOR:	Dr. Reinhold Kamati

INSTRUCTIONS
1. Answer all questions. 2. Write clearly and neatly. 3. Number the answers.

PERMISSIBLE MATERIALS

1. Ruler
2. calculator

THIS QUESTION PAPER CONSISTS OF 4 PAGES

QUESTION 1 [20 marks]

a) Using examples, distinguish between cross-sectional and panel data. [3 marks]

b) Explain the conditions under which you can use the Ordinary Least Squares (OLS) methodology. [3 marks]

c) State the informal methods of testing for nonstationarity. [4 marks]

d) State the three equations used to test for nonstationarity when using the Dickey-Fuller test. [10 marks]

QUESTION 2 [20 marks]

Use Y as the dependent variable and X_1, X_2 and X_3 as the independent variables to:

a) Specify the long-run equation and the **static** error correction model (ECM). [4 marks]

b) Describe how you conduct the cointegration test. [4 marks]

c) Specify the **dynamic** error correction model (ECM). [4 marks]

d) State the short-run parameters of the model. [4 marks]

e) State the long-run parameter(s) of the model. [4 marks]

QUESTION 3 [20 marks]

Suppose you want to test for the Dynamic Granger causality between GDP (Y) and money supply (MS):

$$\Delta Y_t = \lambda_0 + \sum_{i=1}^{n} \lambda_{1i} \Delta Y_{t-i} + \sum_{i=1}^{n} \lambda_{2i} \Delta MS_{t-1} + \mu_{1t} \qquad (1)$$

$$\Delta \mathrm{MS}_t = \varphi_0 + \sum_{i=1}^{n} \varphi_{1i} \Delta Y_{t-i} + \sum_{i=1}^{n} \varphi_{2i} \Delta MS_{t-1} + \mu_{2t} \qquad (2)$$

f) What condition must be met for MS to Granger causes Y? [5 marks]

a) What condition must be met for Y to Granger cause MS? [5 marks]

b) What condition must be met if there is bidirectional causality? [5 marks]

c) What condition must be met if there is no causality? [5 marks]

QUESTION 4 [20 marks]

(a) What is the difference between a static and a dynamic model? [2]

(b) State an AR(2) model using the variable GDP. [2]

(c) State a distributed lag model (DLM) using variable GDP. [2]

(d) State the Auto Regressive Distributed Lag Model (ARDL) using the variable GDP and gross fixed capital formation (GFCF), where GDP is the dependent variable. [4]

(e) Given the following ARDL equation:

$$GDP_t = \alpha_0 + \alpha_1 GDP_{t-1} + \beta_o PCE_t + \beta_1 PCE_{t-1} + \theta_0 PDI_t + \theta_1 PDI_t$$

i. State all the short-run impact multipliers. [2]

ii. What are the short-run impact multipliers associated with PCE and PDI? [2]

iii. What are the cumulative short-run multipliers of PCE and PDI after one period? [4]

iv. Determine the long-run multipliers with respect to PCE and PDI. [2]

QUESTION 5 [20 Marks]

(a) Interpret the unit root tests in the Tables (i) and (ii) below. [5]

(b) Write down the equation employed to do these tests. [5]

(i)

Null Hypothesis: GDP has a unit root
Exogenous: Constant, Linear Trend

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		**-0.044739**	0.9934
Test critical values:	1% level	-4.309824	
	5% level	-3.574244	
	10% level	-3.221728	

*MacKinnon (1996) one-sided p-values.

(ii)

Null Hypothesis: D(GDP) has a unit root
Exogenous: Constant, Linear Trend

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		**-3.819094**	0.0304
Test critical values:	1% level	-4.323979	
	5% level	-3.580622	
	10% level	-3.225334	

*MacKinnon (1996) one-sided p-values.

(c) The diagnostic results below were derived from an estimated VAR model.

VAR diagnostic tests summary

(a) Roots of Characteristic Polynomial (No root lies outside the unit circle. VAR satisfies the stability condition).

Root	Modulus
0.744720 - 0.333526i	0.815995
0.744720 + 0.333526i	0.815995
-0.079781 - 0.748074i	0.752316
-0.079781 + 0.748074i	0.752316

(b) VAR Residual Serial Correlation LM Tests

Lag	LRE* statistics	df	Probability
1	7.898010	4	0.0954
2	7.361877	4	0.1180
3	5.466048	4	0.2427

(c) Jarque-Bera Normality test

Component	Jarque-Bera	df	Probability
1	0.635585	2	0.7278
2	1.339729	2	0.5118

(d) VAR Residual Heteroskedasticity Tests (Includes Cross Terms)

Chi-square	df	Probability
46.81562	42	0.2814

Interpret these results and give the overall conclusion you find on the estimated VAR model [10]