



**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

MAIN EXAMINATION

**UNIVERSITY EXAMINATIONS
2023/2024 ACADEMIC YEAR**

FOURTH YEAR FIRST SEMESTER EXAMINATIONS

**FOR THE DEGREE
OF
BACHELOR OF SCIENCE IN ECONOMICS**

COURSE CODE: ECO 413

COURSE TITLE: ECONOMETRICS

DATE: MONDAY, 18-12-2023

TIME: 12:00 -14:00

INSTRUCTIONS TO CANDIDATES

ATTEMPT QUESTION ONE AND ANY OTHER TWO

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 4 Printed Pages. Please Turn Over.

QUESTION ONE (COMPULSORY)

- i. The model relationships in scalar and matrix notations depend on whether we are making reference to the population or sample. In reference to the statement and assuming a univariate linear regression with intercept, examine the various relationships clearly showing relevant models in matrix notation. **(12 marks)**
- ii. The data in Table 1.1 are the estimated cost of power plant which depends on the capacity (megawatts) and years of operation,

Table 1.1

Plant	Estimated Cost in millions(Y)	Capacity in megawatts (X ₁)	Years of operation (X ₂)
A	14	24	6
B	64	33	18
C	65	65	13
D	98	72	25
E	95	110	18

With the knowledge of BLUE property of linear regression and matrix notation estimate and interpret the model as appropriate. **(18 marks)**

QUESTION TWO

- i. An analyst extracted the model $(Y = X b + \varepsilon)$ during estimation. Using relevant mathematical estimations show that the model satisfies the assumptions of linearity, homoscedasticity and independence between the error term and explanatory variable. **(10 marks)**
- ii. In a system of simultaneous equations the stochastic term (ε) is correlated with the independent variables an indication that if analysis is done using OLS, the estimates will be biased and inconsistent. Show that the estimate b_1 is **biased** given a two sector closed economy defined by;

$$Y_t = C_t + I_t$$

$$C_t = b_0 + b_1 Y_t + \varepsilon_t$$

(10 marks)

QUESTION THREE

Table 2.1 contains data on maize yield, fertilizer applied and area used for five farmers.

Table 2.1: Data on maize yield

Yield (kg) (Y)	Fertilizer(kg) (X ₁)	Area (m ²) (X ₂)
746	37	66
895	38	68
442	47	64
440	32	53
1598	1	101

Suppose it is thought that the yield obtained depends primarily on the fertilizer applied and farm area. Using an appropriate estimation technique, determine whether the analysis output for the data set suffers from;

- i. Multicollinearity (6 marks)
- ii. Serial correlation (14 marks)

QUESTION FOUR

- i. Define the term simultaneous equations and distinguish between structural and reduced form equations. Suppose we want to obtain the reduced form equations from the structural equations, briefly discuss steps involved. (9marks)

- ii. Consider the following Keynesian model of income determination :

$$Y_t = C_t + I_t + G_t$$

$$C_t = \beta_0 + \beta_1 Y_t - \beta_2 T_t + \varepsilon_{1t}$$

$$I_t = \alpha_0 + \alpha_1 Y_{t-1} - \alpha_2 R_t + \varepsilon_{2t}$$

Where Y=income, C=consumption expenditure, I= investment expenditure, G=government expenditure

Obtain the reduced form equations for this model and identify the simultaneous equation model. **(11 marks)**

QUESTION FIVE

- i. With relevant example, briefly discuss how and when to use a dummy variable and how to interpret the results. **(4 marks)**
- ii. Consider the following model:

$$Y=1000+25X_1+10X_2-30X_3+15X_4$$

Where; Y= annual sales Kenya shillings generated by an auto parts counter person, X4=years of experience, X1, X2, and X3 are dummy variables representing the education level for the counter person as coded in the table below

Category/variable	X1	X2	X3
Primary school	0	0	0
Secondary school	1	0	0
Undergraduate	0	1	0
Graduate	0	0	1

Using above information from the table, answer the following questions:

- a. If a salesperson has a graduate degree how much will sales change according to this model compared to a person with primary school education? **(3marks)**
- b. How much in sales will a counter person with 10 years of experience and secondary education generate? **(3marks)**
- c. Why do we need three dummy variables to use “educational level” in this regression equation? **(2 marks)**
- iii. Suppose you used Logit model in analyzing factors affecting choice for a brand and found the coefficient of education to be 0.55. Explain how you would interpret the result in reference to log likelihood, odds and probability. **(8 marks)**

