(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2021/2022 ACADEMIC YEAR

FOURTH YEAR SECOND SEMESTER

MAIN EXAMINATION

FOR THE DEGREE OF BACHELOR OF SCIENCE

COURSE CODE: **STA 427**

COURSE TITLE: **STATISTICAL METHODS IN ECONOMETRICS**

DATE: 02/09/2022 **TIME:** 9:00 AM - 11:00 AM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

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

QUESTION ONE (30 MARKS)

(a). Consider a linear regression model.

Show that the model can be written in matrix form as

$\underline{Y} = X\beta + \underline{\varepsilon}$

Where $\underline{Y}$, β and $\underline{\varepsilon}$ are vectors of order n×1; (k+1)×1 and n×1 respectively, while X is a matrix of order n×(k+1) .

(4marks)

$\underline{\hat{\beta}} = (X^TX)^{-1}X^TY$ (4marks)

(b) Let $S^2 = \frac{1}{n-k-1}\sum_{i-1}^{n}(y_i - \underline{X}_i^T \underline{\hat{\beta}})^2$ where $\underline{X}_i^T$ is the i-th row of the matrix X. Show that if

$\text{Var}(\underline{\varepsilon}) = \sigma^2 I$ then $E(S^2) = \sigma^2$ (6marks)

(c) The table below gives the quantity demanded of a commodity Y at various price X (holding everything else constant)

X	12	14	10	13	17	12	11	15
Y	5	11	7	8	11	7	6	19

(i) Estimate the regression equation of Y on X (3mks)

(ii) Test for the significance of the parameter estimates at 5% level of significance (t=2.45) (8mks)

(iii) Calculate the 95% confidence interval for the predicted values of Y when X=10 (5mks)

QUESTION TWO (20 MARKS)

Consider the following model:

$Y_i = b_0 + b_1X_1 + b_2X_2 + \mu$

Where Y is the expenditure on ladies' clothing

X_1 is income and X_2 is the wealth and μ is the stochastic term

You are told that low incomes are normally associated with low wealth and high incomes, with abundant wealth.

(i) What problem is likely to manifest in this model

(ii) If the problem is severe, what are the likely consequences?

(iii) Under condition (ii) what would you suggest for remedy?

QUESTION THREE (20 MARKS)

(a) Define the following terms

(i) Endogenous variables (1mk)

(ii) Exogenous variables (1mk)

(b) Describe three types of identification procedure (5mks)

(c) For the following supply-demand model described below

$Q_t = \alpha_1 + \alpha_2 P_t + \alpha_3 Y_t + \mu_{1t}$

$Q_t = \beta_1 + \beta_2 P_t + \mu_{2t}$

Where Q is the equilibrium quantity

P is the price

Y is the income of consumer

$\alpha_2 \geq 0, \alpha_3 \geq 0, \beta_2 \geq 0$

(i) State the endogenous and exogenous variable (2 marks)

(ii) Derive the reduced form equation of this model (9marks)

(iii) State the identification status of the both equations (2mks)

QUESTION FOUR (20 MARKS)

(a) Distinguish the following terms as used in econometrics

(i) Autocorrelation and auto regression

(ii) Cross-sectional data and time series data

(b) The ministry of education wishes to determine education expenditure in 43 towns in districts in Kenya on the basis of cross-sectional data. In this exercise, educational expenditure function is specified as follows

$E = a_o + a_1 Y_i + a_2 CH + a_3 FA + u$

Where E=expenditure on education

Y = median income in the relevant town

CH = number of school age children

FA = government financial aid going into education

(i) Is heteroscedasticity likely in this model?

(ii) Explain how this problem is likely to arise.

(iii) Which method would you employ to test for its presence? Explain

QUESTION FIVE (20 MARKS)

For the model

$$Y = x\beta + \mu,$$

Where $E\ (\mu) = 0$

$$E\ (\mu'\mu) = \sigma^2 I$$

With other condition as standard as possible and with β satisfying a linear restriction condition

Rβ=r

Where R is unknown matrix and r is known

(a) Find the restricted OLS estimator of β (7 mks)

(b) Find its mean and variance (8mks)

(c) For the residue vector of a GLM model show that

$$\delta^2 = \frac{e'e}{n-k-1}$$

is unbiased estimator of δ^2 (5mks)