CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF BACHELOR OF AGRICULTURAL ECONOMICS

AGEC 313: ECONOMETRICS

STREAMS: AGEC **TIME: 2 HOURS**

DAY/DATE: MONDAY 14/04/2025 **2.30 P.M. – 4.30 P.M.**

INSTRUCTIONS

- **Answer question ONE and any other THREE**
- **Show all calculations for mathematical problems.**

SECTION A

Question One

a) State and explain five key assumptions of the Classical Linear Regression Model (CLRM). **(5 Marks)**

b) Define multicollinearity, explain its consequences, and describe one method to detect and one method to correct it. **(4 Marks)**

c) Explain what heteroscedasticity is and describe a formal test used to detect it. **(3 Marks)**

d) Suggest methods to correct for heteroscedasticity. **(3 Marks)**

e) Differentiate between fixed effects and random effects models in panel data analysis. How would you decide which model to use? **(5 Marks)**

f) Explain the importance of stationarity in time-series analysis. **(3 Marks)**

g) Describe the Augmented Dickey-Fuller (ADF) test and how it is used to check for unit roots. **(2 Marks)**

Question Two

a) Explain what autocorrelation is, how it can be detected, and its impact on regression results. **(5 Marks)**

b) A researcher studies the relationship between household consumption (Y, in shillings) and household income (X, in shillings). The estimated regression equation is:

$$Y=500+0.8X+\epsilon$$

Where:

- Y = Household consumption
- X = Household income
- ϵ = Error term

(i) Interpret the coefficients $\hat{\beta}_0$ and $\hat{\beta}_1$. **(4 Marks)**

(ii) If household income increases by Sh. 1000, what is the predicted change in household consumption? **(2 Marks)**

(iii) Suppose the standard error of $\hat{\beta}_1$ is 0.05. Conduct a hypothesis test at the 5% significance level to determine if income has a significant effect on consumption. **(4 Marks)**

Question Three

a) What are the causes of endogeneity in regression analysis? Provide an example. **(5 Marks)**

b) Explain the purpose of dummy variables in regression models and provide an example of how they are used. **(5 Marks)**

c) Describe omitted variable bias and how it affects regression estimates. **(5 Marks)**

Question Four

Econometrics is widely used to evaluate public policies and interventions.

a) Explain the steps involved in conducting an econometric study to assess the impact of a new government program (e.g., an education subsidy). **(5 Marks)**

b) Discuss three key econometric challenges that may arise when conducting policy evaluation. **(3 Marks)**

c) Suppose you are analyzing the impact of a job training program on employment rates using panel data.

i. How would you design an econometric model to estimate the program's effect? **(4 Marks)**

ii. What methods would you use to control for selection bias? **(3 Marks)**

Question Five

Econometrics and machine learning techniques are increasingly integrated in economic research.

a) Compare and contrast traditional econometrics with machine learning models (e.g., OLS vs. decision trees). **(4 Marks)**

b) Discuss situations where machine learning might outperform classical econometrics. **(6 Marks)**

c) What are the key limitations of using machine learning in economic modeling? **(5 Marks)**

……