KISII UNIVERSITY
UNIVERSITY EXAMINATIONS

THIRD YEAR EXAMINATION FOR THE AWARD OF THE DEGREE OF BACHELOR OF SCIENCE IN AGRICULTURAL EDUCATION AND EXTENSION
SECOND SEMESTER, 2023/2024
(JANUARY-APRIL, 2024)

AGEC 313: ECONOMETRICS

STREAM: Y3 S2 **TIME: 2 HOURS**

DAY: MONDAY, 3:00 – 5:00 P.M. **DATE: 08/04/2024**

INSTRUCTIONS
1. ***Do not write anything on this question paper.***
2. ***Answer Question ONE and any other THREE questions.***

1. Table1 gives the bags of maize per hectare, Y, resulting from the use of various amounts of fertilizer in kilograms per hectare, X, produced on a farm in each of 10 years from 2014 to 2023.

Table 1 - 1: Maize Production as a result of the Fertilizer Used

Year	n	Y	X
2014	1	40	6
2015	2	44	10
2016	3	46	12
2017	4	48	14
2018	5	52	16
2019	6	58	18
2020	7	60	22
2021	8	68	24
2022	9	74	26
2023	10	80	32

a) Use the following the following formulae to calculate the intercept, slope, and regression equation, $\hat{Y}_i = \hat{\beta}_0 + \hat{\beta}_1 X_i$. $\hat{\beta}_1 = \frac{\sum x_1 y_i}{\sum x_i^2}$ Where $\hat{\beta}_0$ is the intercept and β_1 is the slope of the regression equation? (6 marks)

b) Calculate $S^2_{\beta_0}$ ad $S^2_{\beta_1}$, the variances (2.5 marks)

c) Calculate S_{β_0} ad S_{β_1}, the standard errors (2.5 marks)

d) Calculate t_{β_0} and t_{β_1}, the t values (5 marks)

e) Test for the statistical significance of the parameter estimates of the regression at 5% level of significance. (4 marks)

f) The coefficient of determination, (3 marks)

g) Report all the previous results in standard summary form (2 Marks)

2. Mr. James is a young scientist from Kisii University who was recently employed in KARI as Agricultural economist to assist a multidisciplinary team in developing a new HYV for sorghum at Alupe. Mr. James's first talk to ascertain whether past efforts in developing the HYV has followed a systematic pattern in which case yield increases could be explained by previous yields and resources put into research. He thus developed a simple econometric model as shown below:

$Y_t = \alpha + \beta X_t + \mu_t$

Where Y_t = yield at any given period

X_t = Research resources at any given period

μ_t =Omitted variables that explain yield at any given period.

In carrying out his analysis, Mr. James encounters two problems. He observes that when the resources devoted to research are large, the variances also become large and vice versa. The other problem he notes from the data is that there is a high serial correlation among the omitted variables which influence the estimation procedure. If you are in Mr. James's shoes, how will you handle these problems? What problems do you foresee particularly with regard to serial correlation in the error terms? (25 Marks)

3. Define the term Multicollinearity as used in econometrics. How can Multicollinearity be detected? What are practical consequences of multicollinearity? Outline and explain five remedial measures of multicollinearity. (20 Marks)

4. State each of the five assumptions (five assumptions of the error term) of the classical linear regression model (OLS) and give an intuitive explanation of the meaning and need for each of them. How the analysis can change if the assumptions are violated? (25 Marks)

5.

A. As an econometrician, outline and explain the eight-step procedure (methodology of econometrics), you would consider appropriate in studying an economic phenomenon such as liquidity preference, cost, demand, supply etc. Use following demand model in your explanations:

$$Q = \beta_0 + \beta_1 P$$

Where: Q = Quantity of a normal good and P =Price of a normal good.

(11 marks)

B. With the help of examples distinguish the following terms as used in econometrics:

I. Behavioural models and technical relationship models (6 Marks)

II. Macro-models and Micro-models (4 Marks)

III. Static and dynamic models (4Marks)

6.

(a) Autocorrelation and Heteroscedasticity can pose serious problems in the estimation of parameters in econometrics. Using appropriate examples discuss how these two problems can be handled and proceed to show how the estimation can be affected if the techniques of handling these problems are not correctly followed. (15 marks)

(b) Given the following model: -

$$Y_i = \alpha_0 + \alpha_1 X_i + \varepsilon_i$$

i. Derive the OLS estimator for α_0 (4 Marks)

ii. Derive the OLS estimator for α_1 (6 marks)