



**MAASAI MARA UNIVERSITY
REGULAR UNIVERSITY EXAMINATIONS
2022/ 2023 ACADEMIC YEAR**

**SECOND YEAR SECOND SEMESTER
SCHOOL OF BUSINESS AND ECONOMICS.
DEGREE IN ECONOMICS AND STATISTICS.**

COURSE CODE: ECS 2203-1

COURSE TITLE: SOCIAL STATISTICS.

DATE: , 2023

TIME:

INSTRUCTIONS TO CANDIDATES

Answer Question ONE and any other TWO questions

This paper consists of FOUR printed pages. Please turn over.

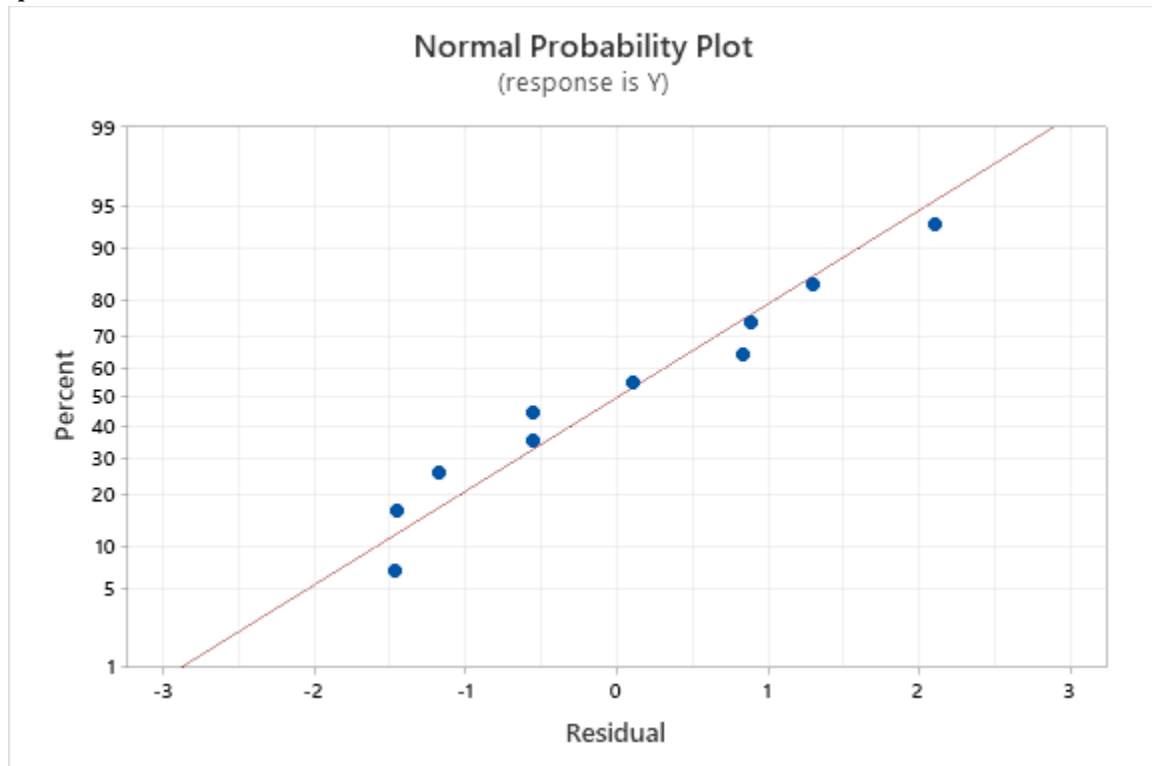
QUESTION ONE

(20 MARKS)

- a. Differentiate between a variable and a constant **(2 marks)**
- b. Explain what is meant by type I and type II errors **(1 mark)**
- c. State Gauss Markov theorem hence prove that: $var(\hat{\beta}_1) = \frac{\sigma^2}{S_{XX}}$ **(4 marks)**
- d. The table below shows the ANOVA table extracted from regression model fitted to examine the effect of experience on income.

Source of Variation	SS	df	MS	F
Regression	148.313			
Residual			12.935	
Total		19		

- i. Complete the ANOVA table **(6 marks)**
- ii. Comment on the adequacy of the fitted regression model at 95% confidence level **(2 marks)**
- iii. Calculate R^2 and interpret it in relation to model **(2 marks)**
- e. The graph below shows the output of residuals, use it to answer the following questions



- i. What is the essence of this plot? **(1 mark)**
- ii. Explain the output and recommend an appropriate regression for this data **(2 marks)**

QUESTION THREE**(15 MARKS)**

Your village members believe that economic growth is affected by agricultural output and trade. To investigate this believe you conducted a survey in your village among 26 village members. The statistical data related to the survey were as follows;

$$(X'X)^{-1} = \begin{bmatrix} 0.1132 & -0.0044 & -0.0001 \\ -0.0044 & 0.0027 & -0.00004 \\ -0.0001 & -0.00004 & 0.0000 \end{bmatrix}, y'y = 18310.629 \text{ and}$$

$$X'y = \begin{bmatrix} 559.60 \\ 7375.44 \\ 337072.00 \end{bmatrix}$$

Suppose the regression equation to be examined was given by;

$$\text{Economic Growth} = \beta_0 + \beta_1 \text{Agriculture} + \beta_2 \text{Trade}$$

- Using the statistical data, fit the appropriate regression model **(3 marks)**
- At 95% confidence level, test for the adequacy of the fitted regression model **(5 marks)**
- Compute and interpret the Adjusted R^2 **(2 marks)**
- Test for the significance of β_2 and comment on the results at 5% significance level **(3 marks)**
- Construct 99% confidence interval for β_1 **(2 marks)**

QUESTION FOUR**(15 MARKS)**

In the following table are recorded data showing the test score made by salesmen on intelligence test and their weekly sales.

Salesmen	1	2	3	4	5	6	7	8	9	10
Test score	40	68	50	64	80	53	76	40	66	60
Sales (000 Sh.)	2.5	6.4	4.0	5.5	4.0	2.5	5.5	3.0	4.5	3.7

- Fit the regression line of sales on test score **(5 marks)**

- ii. Calculate the probable weekly sales volume if a salesman makes a score of 120 **(1 marks)**
- iii. Find the estimate of the variance **(4 marks)**
- iv. At 99% confidence level, test for significance of the slope and interpret the results **(3 marks)**
- v. Calculate 95% confidence interval for the slope coefficient **(2 marks)**

QUESTION FOUR

(15 MARKS)

- a. Using the fitted model in question (3.i), calculate the residuals and prove that $\sum_{i=1}^n \varepsilon_i = 0$ **(6 marks)**
- b. Using the data in question three, we are interested in adding the quadratic effect the model. By applying the relevant computations, investigate whether the quadratic effect is significant or not **(9 marks)**