JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF AGRICULTURAL AND FOOD SCIENCES

THIRD YEAR SECOND SEMESTER UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN FOOD SECURITY

2019/2020 ACADEMIC YEAR

REGULAR

COURSE CODE: AFB 3324

COURSE TITLE: BASIC QUANTITATIVE METHODS IN FOOD SECURITY

EXAM VENUE: **STREAM: BSc. Food Security**

DATE: **EXAM SESSION:**

TIME: 2 HOURS

Instructions:

Answer ALL questions in section A and ANY other 2 Questions in section B.

1. **Candidates are advised not to write on question paper.**
2. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

SECTION A: [30 MARKS]

Answer ALL questions from this Section

QUESTION ONE [6 MARKS]

Explain the following:

a. Type II error [2 marks]

b. Significance level of a test of hypothesis [2 marks]

c. P-value of a test [2 marks]

QUESTION TWO [6 MARKS]

Distinguish between:

a. Predictor and Response variables [2 marks]

b. Simple linear Regression and Multiple Regression [2 marks]

c. Statistically significant test and Statistically non-significant test [2 marks]

QUESTION THREE [8 MARKS]

Given the matrices A= $\begin{pmatrix} -3 & 0 \\ 7 & -4 \end{pmatrix}$ B= $\begin{pmatrix} 2 & -1 \\ -7 & 4 \end{pmatrix}$, C= $\begin{pmatrix} 1 & 0 \\ -2 & -4 \end{pmatrix}$

Determine:

a. M = 2A -3B + 4C [4 marks]

B. M^{-1} [4 marks]

QUESTION FOUR [10 MARKS]

a. Given that M = $\begin{pmatrix} x-8 & 8 \\ 4 & 2 \end{pmatrix}$ is a singular matrix, determine the:

i. value of x [2 marks]

ii. the matrix M [2 marks]

b. A coin is suspected to be biased. 400 throws of the coin give the following results

Outcome	Heads	Tails
Number of appearances	210	190

Is there evidence that the coin is biased [6 marks]

SECTION B: [40 Marks]

Answer any Two Questions from this Section.

QUESTION FIVE [20 MARKS]

To test H_0: $\mu = 105$ Vs H_0: $\mu \neq 105$ a sample of size 35 is selected

Sample mean =101.9 and $\sigma = 5.9$, $\alpha = 1\%$

a. Compute the test statistic [4 marks]

b. i. Determine P-value of the test [4 marks]

ii. Use P-value to draw your conclusion on the hypothesis [3 marks]

c. i. Determine the critical value for the test [4 marks]

iii. Compare the of the results from P-value and Critical value [2 marks]

QUESTION SIX [20 MARKS]

a. Food aid needed by a family in hunger stricken county is thought to depend on family size as shown in the table below.

Family size	3	4	5	7	8
Food aid needed	4	6	7	12	14

You are required to determine if the relationship is linear.

Find:

a. i. the slope coefficient [5 marks]

ii. the intercept coefficient [3 marks]

b. i. write the regression of food aid needed on family size [1 mark]

ii. explain the model [3 marks]

c. Find: i. the coefficient of determination between family size and food aid needed [5 marks]

ii. explain the R^2 [3 marks]

QUESTION SEVEN [20 MARKS]

In a study of two variable x and y which have a linear relationship, it is found that: $\sum x = 75$, $\sum y = 42$, $\sum xy = 825$, $\sum x^2 = 1375$, $\sum y^2 = 514$, $n=5$

a. Find the total variation in model relating x and y [5 marks]

b. Find the correlation between x and y [6 marks]

c. Test the linear relationship between x and y and draw your conclusion at $\alpha = 0.05$ [9 marks]

QUESTION EIGHT [20 MARKS]

a. Given A= $\begin{pmatrix} 2 & -1 & 3 \\ 1 & 3 & 4 \\ 1 & -2 & -2 \end{pmatrix}$ B= $\begin{pmatrix} 1 & -1 & 1 \\ -1 & 2 & 1 \\ 0 & 1 & 3 \end{pmatrix}$

Show that $A^T + B^T = (A + B)^T$ [4 marks]

b. Given

x	3	5	7	9	11
y	0	2	3	6	9

Find: i. Covariance between x and y [5 marks]

ii. Explain the covariance [1 marks]

c. Blood is classified as A, B, AB, O. In addition, blood is classified as Rh^+ or Rh^-. In a survey of 500 randomly selected individuals the following results were obtained.

	Blood-type			
Rh-status	A	B	AB	O
Rh^+	176	28	22	198
Rh^-	30	12	4	30

It is desired to test for independence of Rh-status and blood-type

i. State hypotheses for the test [2 marks]

ii. Is there any evidence showing the independence of the variable at $\alpha = 0.05$ [8 marks]