AFRICA UNIVERSITY
A United Methodist-Related Institution

"Investing in Africa's Future"

COLLEGE OF HEALTH, AGRICULTURE AND NATURAL SCIENCES

NACP 202: BIOMETRY

END OF FIRST SEMESTER EXAMINATION

NOVEMBER 2025

LECTURER: MR. E. CHIKAKA

DURATION: 3 HOURS

INSTRUCTIONS

Answer all questions in Section A and any **three** from Section B

Section A carries **40 marks** and each question in section B carries **20 marks**.

Section A (40 Marks: Short Answer Questions – Answer ALL)

QUESTION 1

a. Define **Statistics** and **Biometry**. State two importance of statistics in agriculture. [2]

b. Differentiate between **qualitative** and **quantitative data** with one example each. [2]

c. What is the difference between **discrete** and **continuous data**? Give an agricultural example of each. [2]

d. List and briefly describe the **four scales of measurement** with examples relevant to agriculture. [2]

e. State two advantages and two disadvantages of **observation** as a data collection method in agriculture. [2]

QUESTION 2

a. Differentiate between **random** and **non-random sampling**. Give one example of each. [2]

b. What is a **frequency table**? Briefly describe one situation in agriculture where it would be useful. [2]

c. Sketch and label a **histogram** using the following data: [2]

Yield (tons/ha)	2-4	4-6	6-8	8-10
Frequency	4	6	8	2

d. Define **coefficient of variation (CV)** and state why it is useful in comparing agricultural experiments. [2]

e. Differentiate between **independent** and **dependent events** in probability with examples. [2]

QUESTION 3

a. State two applications of the **normal distribution** in agriculture. [2]

b. Explain the difference between a **null hypothesis (H_0)** and an **alternative hypothesis (H_1)**. [2]

c. What is a **Type I error** and a **Type II error** in hypothesis testing? [2]

d. Give one agricultural example where a **paired samples t-test** would be more appropriate than an independent samples t-test. [2]

e. What does the **Chi-square test of association** assess in agricultural research? [2]

QUESTION 4

a. State two assumptions of **one-way ANOVA**. [2]

b. Differentiate between **correlation** and **regression analysis**. [2]

c. In simple linear regression, what does the **slope (b_1)** represent in relation to agricultural data? [2]

d. A study records the following data:

Fertilizer applied (kg/ha)	20	40	60	80
Yield (tons/ha)	1.2	2.1	2.9	3.8

Is the relationship **positive, negative, or none**? [4]

Section B (60 Marks: Structured Questions – Answer ANY THREE)

QUESTION 5

(a) Differentiate between **simple random sampling** and **stratified random sampling**, giving examples from agricultural research. [6]

(b) A maize farm is divided into 5 plots. A researcher wants to select a sample of 2 plots using **systematic sampling**. Explain the procedure step-by-step. [6]

(c) Discuss the advantages and disadvantages of **experimentation** as a method of data collection in agriculture. [8]

QUESTION 6

The table below shows the weights (kg) of 40 harvested tomato fruits.

Weight Class (kg)	50-59	60-69	70-79	80-89	90-99	100-109
Frequency	3	6	10	12	6	3

(a) Construct a **histogram** for the data. [6]
(b) Compute the **mean weight** of the tomatoes. [6]
(c) Compute the **standard deviation**. [8]

QUESTION 7

(a) Define the following terms in probability:
Complementary event
Mutually exclusive events
Independent events
Conditional probability [8]

(b) A bag contains 5 red, 3 green, and 2 blue seeds. If a seed is drawn at random:

i. Find the probability of drawing a red seed. [2]
ii. Find the probability of drawing a green or blue seed. [2]
iii. If two seeds are drawn without replacement, find the probability that both are red. [4]
iv. If two seeds are drawn with replacement, find the probability that both are red. [4]

QUESTION 8

A study investigated the effect of two different fertilizers (A and B) on maize yield. The yields (tons/ha) from 6 plots are given below:

Fertilizer A	3.2	3.5	4.0	4.1	4.2
Fertilizer B	3.5	3.8	4.3	4.6	4.7

(a) State the null and alternative hypotheses for testing whether the two fertilizers produce the same mean yield. [4]

(b) Perform an **independent samples t-test** at 5% significance level. [12]
(c) State your conclusion. [4]

QUESTION 9

The following data shows the relationship between fertilizer input (kg/ha) and maize yield (tons/ha):

Fertilizer (X)	10	20	30	40	50
Yield (Y)	1.2	2.0	2.8	3.5	4.3

(a) Calculate the **correlation coefficient (r)** between fertilizer and yield. [6]
(b) Fit a **simple linear regression equation** of the form $Y = a + bX$ [8]
(c) Predict the yield when 60 kg/ha of fertilizer is applied. [4]
(d) Comment on the strength of the relationship based on your findings. [2]

END OF EXAMINATION PAPER