CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN MICROBIOLOGY AND BIOTECHNOLOGY

BOTA 302: BIOSTATISTICS

STREAMS: **TIME: 2 HOURS**

DAY/DATE: WEDNESDAY 18/12/2024 **2.30 P.M – 4.30 P.M**

INSTRUCTIONS:

- **Answer ALL questions in section A and TWO questions in section B**
- **Do not write on the question paper**
- **Answer each question on a fresh page**

SECTION A: SHORT ANSWER QUESTIONS (30 MARKS)

1. **a.** Explain the concept of stratified sampling using a relevant example. (3 marks)

   b. Outline two main differences between probability sampling and non-probability sampling. (2 marks).

2. a. Give three distinct differences between bar graphs and histograms as tools of data presentation. (3 marks)
   b. Give two advantages of graphs in data presentation compared to tables. (2 marks)

3. The heights of students in a school are approximately normally distributed with a mean of 165 cm and a standard deviation of 10 cm.

   a. Provide the proportion of students who have a height above 180 cm (2 marks)

   b. Calculate the probability that a randomly selected student will have a height between 150 cm and 175 cm? (3 marks)

4. Describe five properties of a normal distribution (5 marks)

5. Two samples from normal distribution gave means of 14.29 and 14.18 and a variance of 16.89 and 12.55 respectively based on 10 and 12 observations. Determine whether the samples come from distribution with the same mean (5 marks).

6. Explain five assumptions of parametric tests. (5 marks)

SECTION B: ESSAY QUESTIONS (40 MARKS)

7. A researcher is interested in studying the effect of different types of fertilizer on the growth of tomato plants. The researcher selects four different types of fertilizer (A, B, C, and D) and applied each type of fertilizer to a separate group of 5 tomato plants. After 8 weeks, the height (in centimetres) of each plant was measured. The data collected is as follows:

	Fertilizer A	Fertilizer B	Fertilizer C
	45	52	55
	50	53	56
	48	54	57
	47	51	58
	49	52	56

Using a one-way ANOVA, determine if there is a statistically significant difference in the mean heights of the tomato plants between the different types of fertilizer. (20 marks)

8. a. Discuss the applications of biostatistics in scientific research (10 marks)

   b. Discuss the importance of using the correct sampling design in scientific research

   (10 marks).

9. a. In a certain species of plants, flower color is determined by a single gene with two alleles: red and white. The red allele is dominant over the white allele. When two heterozygous plants (Rr) are crossed, what is the probability of obtaining a plant with either red flowers or white flowers? (10 marks)

   b. Discuss the application of computer in research. (10 marks)
