



UNIVERSITY EXAMINATIONS

FIRST SEMESTER 2025/2026 ACADEMIC YEAR

**FOURTH YEAR EXAMINATION FOR THE DEGREE OF
BACHELOR OF EDUCATION (SCIENCE/ARTS)**

GEOG 417: QUANTITATIVE TECHNIQUES IN GEOGRAPHY

STREAM: BEd (SCIENCE/ARTS)

TIME: 2 HRS

DAY: MONDAY [11.30 – 13.30 P.M]

DATE: 26/01/2026

THIS QUESTION PAPER CONSISTS OF FOUR (4) PAGES

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Section A: Answer ALL the questions (30 marks)**QUESTION ONE (30 MARKS)**

a) Giving examples, define the following terms:

- i) Null hypothesis **(3 Marks)**
- ii) 1% level of significance **(3 Marks)**
- iii) Type I error **(3 Marks)**
- iv) Two tailed test **(3 Marks)**
- v) Population **(3 Marks)**

b) The table below shows the distribution of the daily savings (in Kes) of 30 randomly selected students from a university.

Daily Savings (Kes)	Number of Students
10 - 19	4
20 - 29	8
30 - 39	10
40 - 49	5
50 - 59	3

- i) Calculate the estimated mean daily savings **(3 Marks)**
- ii) Calculate the estimated median daily savings **(6 Marks)**
- iii) Calculate the estimated mode of the daily savings **(6 Marks)**

SECTION B: ANSWER ANY TWO QUESTIONS**QUESTIONS TWO (20 MARKS)**

A national weather service states that the mean annual rainfall for a particular region is 850 mm. Historical data shows that annual rainfall in this region follows a normal distribution with a known standard deviation of 120 mm. A researcher is studying climate change impacts and believes the mean annual rainfall has changed. They take a random sample of 49 weather stations across the region and find that the sample mean annual rainfall is 815 mm.

Conduct a hypothesis test at the 5% significance level ($\alpha = 0.05$) to determine if there is sufficient evidence to support the researcher's claim that the mean annual rainfall has changed.

- i) State the null and alternative hypotheses (4 Marks)
- ii) Calculate the test statistic (Z-score) (6 Marks)
- iii) Determine the critical value(s) and decision rule (6 Marks)
- iv) State your conclusion in the context of climate and rainfall patterns (4 Marks)

QUESTION THREE (20 MARKS)

An environmental geography researcher is studying river water quality after the installation of new wastewater treatment plants. The regulatory standard for mean nitrate concentration in this river system is 15 mg/L with standard deviation of **0.58 mg/L**. The researcher collects water samples from 12 monitoring stations along the river. The nitrate concentrations (mg/L) recorded are: 13.2, 14.1, 12.8, 13.9, 14.5, 13.1, 12.7, 14.2, 13.6, 14.0, 13.3 and 12.9

Conduct a hypothesis test to determine if the mean nitrate concentration is significantly below the regulatory standard at 5% level of significance.

- i) State the null and alternative hypotheses (4 Marks)
- ii) Calculate the sample mean (2 Marks)
- iii) Calculate the t-test statistic (6 Marks)
- iv) Determine the critical value (4 Marks)
- v) State your conclusion in the context of water quality management (4 Marks)

QUESTION FOUR (20 MARKS)

A researcher wants to determine whether the **use of cooking fuel types** is equally distributed among households in a village. A sample of **120 households** was surveyed, and the results were as follows:

Fuel type	Firewood	Charcoal	Briquettes	LPG gas
Frequency	50	40	20	10

Using the Chi-Square Test, test the hypothesis that the four fuel types are used equally in the population of households at $\alpha = 0.05$ (20 Marks)

QUESTION FIVE (20 MARKS)

A researcher wants to determine whether three types of fertilizers have different effects on the growth (height in cm) of kales. The experiment was conducted and the plant heights recorded were:

Type of fertilizer	Plant height (cms)				
A	18	20	22	19	21
B	25	27	26	24	28
C	15	14	16	13	17

Using a One-Way ANOVA, test whether the mean plant heights differ significantly among the three fertilizers at 5% level of significance **(20 Marks)**