NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF ENVIRONMENTAL SCIENCE

DEPARTMENT OF ENVIRONMENTAL HEALTH

BACHELOR OF ENVIRONMENTAL SCIENCE HONOURS DEGREE IN PUBLIC HEALTH

RESEARCH METHODS

EPH 2201

Final Examination Paper
April 2025

This examination paper consists of 5 pages

Time Allowed: **3 hours**

Total Marks: **100**

Special Requirements: **None**

Examiner's Name: **M W Mpofu**

INSTRUCTIONS

1. Answer **ALL** Questions **in SECTION A**, and any **THREE** Questions **In SECTION B**.
2. Section A carries 40 marks and Section B carries 60 marks
3. Where the question is subdivided, part marks are indicated in brackets at the end of the sub question.

MARK ALLOCATION

QUESTION	MARKS
1.	**22**
2.	**18**
3.	**20**
4.	**20**
5.	**20**
6.	**20**
7.	**20**
TOTAL	**100**

SECTION A (Answer All questions in this section)

Question 1

The Ministry of Health is concerned about the rising incidence of respiratory illnesses among residents living near industrial zones known for high air pollution levels. It is suspected that air quality in these areas is contributing to the prevalence of conditions such as asthma and chronic obstructive pulmonary disease (COPD). The Ministry has engaged your services to analyse and interpret the collected data from the community. Data was collected on 200 individuals diagnosed with respiratory illnesses, of which 120 live within 1 km of the industrial zones, while the remaining 80 live more than 1 km away. Additionally, data was collected from 300 individuals who do not have respiratory illnesses, with 100 residing within 1 km of the industrial zones and 200 living beyond that distance.

a) Name the study design described above and justify your answer. **[3 marks]**

b) Draw a two-by-two table for this study to compare the occurrence of respiratory illnesses and proximity **[5 marks]**

c) You analyse this data to assess whether there is an association between the occurrence of respiratory illnesses and proximity to industrial zones:

I. What measure of association will you use for this design and why? **[4 marks]**

II. Calculate and interpret the measure of association. **[6 marks]**

III. Interpret your results. Is there any association between proximity to industrial zones and the occurrence of respiratory illnesses? Justify your answer. **[4 marks]**

Question 2

In a recent study conducted by the Department of Public Health, researchers aimed to investigate the relationship between maternal body mass index (BMI) and birth outcomes, specifically focusing on birth weight **(in grams)**. The study included a sample of 150 pregnant women, and data were collected on their BMI and the corresponding birth weights of their infants.

The researchers hypothesized that higher maternal BMI would be associated with increased birth weight. To analyze this relationship, a linear regression model was employed, using maternal BMI as the independent variable and birth weight as the dependent variable.

The results of the regression analysis are as follows:

- **Regression Statistics:**
  - Multiple R: 0.75
  - R Square: 0.562
  - Adjusted R Square: 0.558
  - Standard Error: 300.45
  - Observations: 150
- **ANOVA:**
  - Regression SS: 2,250,000
  - Residual SS: 740,000
  - Total SS: 2,990,000
- **Coefficients:**
  - Intercept: 2500 (Standard Error: 50, t Stat: 50.00, P-value: 0.0000)
  - Maternal BMI: 100 (Standard Error: 15, t Stat: 6.50, P-value: 0.0001)

(a) What is the primary hypothesis of the study? **[2 marks]**

(b) What does the R-Squared value of 0.562 indicate about the relationship between maternal BMI and birth weight? **[2 marks]**

(c) How much does birth weight increase, on average, for each unit increase in maternal BMI? **[1 mark]**

(d) What can be concluded about the statistical significance of the Maternal BMI coefficient based on the P-value? **[2 marks]**

(e) Considering the Standard Error of the regression (300.45), what does this tell you about the variability of birth weight around the predicted values? **[2 marks]**

(f) Giving examples differentiate the following scales of measurement:

I. Nominal **[3 marks]**

II. Ordinal **[3 marks]**

III. Continuous **[3 marks]**

SECTION B (Answer any 3 Questions)

Question 3

a) Describe the type of information obtained in each of the following research approaches and their strengths and weaknesses.

Ethnography Study **[7 marks]**

Nested Cohort Study **[7 marks]**

b) Differentiate between internal and external validity **[6 marks]**

Question 4

a) The "6 Ps of research" is a framework that provides a mnemonic device to remember key aspects to consider when planning and conducting research. Each "P" represents a different element that researchers should address in their research design. List and explain briefly the 6 Ps of research. **[12 marks]**

b) Give reasons for using a double blind study design in clinical trials and highlight the advantages and disadvantages. **[8 marks]**

Question 5

a) Discuss the reasons for reviewing literature in research. **[10 marks]**

b) Describe the responsibility of an ethical researcher to the participants. **[10 marks]**

Question 6

a) Discuss the different types of biases that are can be encountered during data collection and how they can be controlled. **[12 marks]**

b) Differentiate between Idiographic and Nomothetic research approaches **[8 marks]**

Question 7

a) Distinguish theory triangulation from investigator triangulation. **[6 marks]**

b) Sampling theory distinguishes between two basic sampling approaches, probability and non-probability. Identify and describe three types of non-probability sampling methods and three types of probability sampling methods. **[14 marks]**