



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF ENVIRONMENTAL SCIENCES

DEPARTMENT OF ENVIRONMENTAL SCIENCE

BACHELOR OF SCIENCE HONOURS DEGREE IN ENVIRONMENTAL SCIENCE AND HEALTH

GIS AND REMOTE SENSING 1

ESH 4105

Special Examination Paper

August 2024

This examination paper consists of 4 pages

Time Allowed: 3 hours

Total Marks: 100

Special Requirements: None

Examiner's Name: Dr Auther Maviza

INSTRUCTIONS

1. Answer **any FOUR (4)** questions
2. Each question carries 25 marks

MARK ALLOCATION

QUESTION	MARKS
1	25
2	25
3	25
4	25
5	25
6	25
TOTAL	100

Question 1

- a) Analyse the relation (Table 1) and answer the questions that follow:

Table 1

ID	Geometry	Long	Lat	SYMBOL_N	PROVINCE	DISTRICT	TYPE
1	MultiPoint	30.16	-16.91	Mhangura	MASHONALAND WEST	MAKONDE	Small Town
2	MultiPoint	30.85	-17.03	Mvurwi	MASHONALAND CENTRAL	MAZOWE	Small Town
3	MultiPoint	30.40	-17.39	Banket	MASHONALAND WEST	ZVIMBA	Small Town
4	MultiPoint	31.04	-17.08	Nzvimbo	MASHONALAND CENTRAL	MAZOWE	Village
5	MultiPoint	30.68	-17.16	Mutorashanga	MASHONALAND WEST	ZVIMBA	Village
6	MultiPoint	32.04	-18.27	Headlands	MANICALAND	MAKONI	Village
7	MultiPoint	28.88	-20.03	Ntambazinduna	MATEBELELAND NORTH	UMGUZA	Village
8	MultiPoint	28.94	-20.31	Esigodini	MATEBELELAND SOUTH	UMZINGWANE	Village
9	MultiPoint	31.54	-16.33	Kaitano	MASHONALAND CENTRAL	MOUNT DARWIN	Place of local Importance
10	MultiPoint	27.62	-17.35	Chete	MATEBELELAND NORTH	BINGA	Place of local Importance
11	MultiPoint	27.70	-17.25	Siantula	MATEBELELAND NORTH	BINGA	Place of local Importance
12	MultiPoint	27.94	-17.07	Mujere	MATEBELELAND NORTH	BINGA	Place of local Importance
13	MultiPoint	29.07	-18.28	Njelele	MIDLANDS	GOKWE SOUTH	Place of local Importance
14	MultiPoint	28.91	-17.87	Goredema	MIDLANDS	GOKWE NORTH	Place of local Importance
15	MultiPoint	30.74	-20.30	Bondolfi	MASVINGO	MASVINGO	Mission
16	MultiPoint	30.84	-19.95	Zimuto	MASVINGO	MASVINGO	Mission

- i. Name the attributes on Table 1. [4]
- ii. Present a query (using SQL syntax) that can be used to extract Places of local importance in Midlands, Villages in Manicaland and all Missions in Table 1. [6]
- iii. Present the results of the execution of the SQL query in (ii). [6]
- b) Present a diagram illustrating the different forms of interactions of electromagnetic with features on the earth's surface based on the principle of conservation of energy. [9]

Question 2

- a) With the aid of a diagram, describe the Universal Transverse Mercator (UTM) coordinate reference system. [10]
- b) 'Garbage-In-Garbage-Out (GIGO)'. Explain the significance of this phrase in as far as utilisation of GIS and Remote sensing is concerned. [15]

Question 3

- a) Briefly describe the main steps in preparing a GPS handheld device for a successful field data collection. [7]
- b) Describe the main stages of the geospatial information life cycle. [8]
- c) Distinguish between multi-spectral and hyperspectral remote sensing highlighting their advantages and disadvantages in environmental remote sensing. [10]

Question 4

Figure 1 is a map of Zimbabwe showing settlements and other features. Critically analyse it and answer the questions that follow.

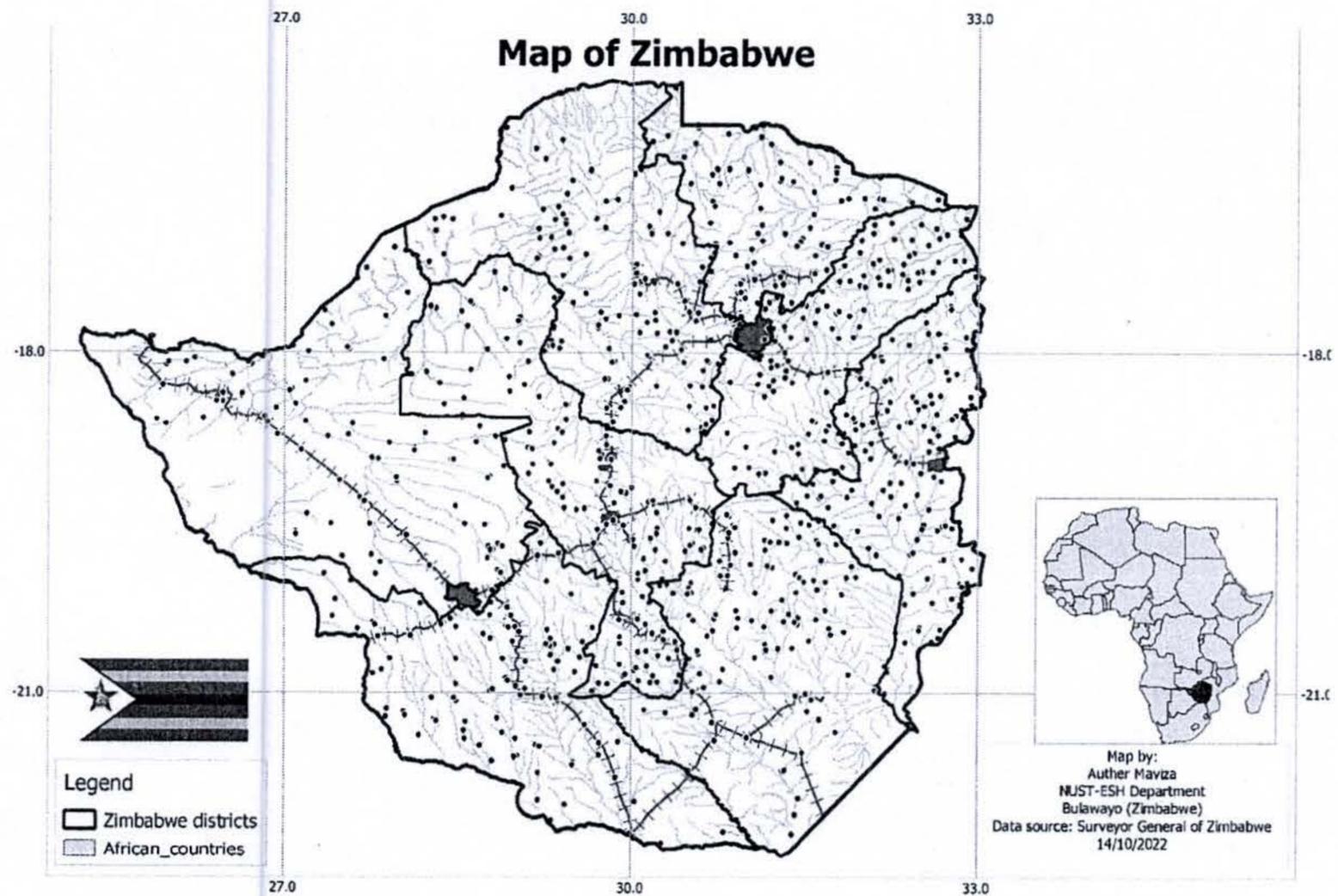


Figure 1

- What Coordinate Reference system is used on the map? [2]
- Which main map elements are missing on Figure 1? [8]
- Present (with justification) the edits/ alterations/ inserts you would make on Figure 1 to bring up to basic cartographic standards. [15]

Question 5

“Streamlining of geospatial technology is critical in ensuring effective and efficient public health service delivery in developing countries.” Discuss.

Question 6

Analyse the extract below taken from an online article title “Neglected underground coal fires threaten lives of Zimbabweans” published by Aljazeera News) and answer the questions that follow.

Residents of Zimbabwe’s Hwange area are living in fear after state-run mining company’s failure to put out raging underground blazes. Ten-year-old Simba Mulezu was driving cattle home from his mother’s corn fields when the ground gave way under his feet, plunging him into burning coal underground. “I spent several months in hospital and Hwange Colliery Company did not assist me with hospital bills and other necessities,” Mulezu, now 22, told Al Jazeera. “[Only] my parents and relatives have stood by me.” Coal fires have become a major issue over the past five years in Hwange, occurring regularly in various areas of the mining town. One blaze has been burning underground for 15 years. In late 2021, an eight-year-old girl who was relieving herself in a nearby bush area was swallowed by the ground and fell into a coal seam fire. She later died from her wounds at a hospital. Hwange Colliery Company Limited (HCCL) is based in Hwange in southwestern Zimbabwe. Residents of the town, with a population of about 40,000, are living in fear as the company has failed to fence off coal sites and take measures to put out the blazes. The incident left him with permanently deformed limbs.

(Source: <https://www.aljazeera.com/news/2022/10/2/neglected-underground-coal-fires-keep-community-on-its-feet>)

- a) Identify and describe three main environmental and/ public health aspects of the problem presented in the extract. [10]
- b) Develop and present a GIS and/ Remote sensing-based approach to contribute towards solving any two of the aspects you identified in (a). (NB: Show data needs, spatial data analyses techniques and expected outputs). [15]