



**NAMIBIA UNIVERSITY  
OF SCIENCE AND TECHNOLOGY**

**FACULTY OF HEALTH, NATURAL RESOURCES AND APPLIED SCIENCES**

**SCHOOL OF AGRICULTURE AND NATURAL RESOURCE SCIENCES**

**DEPARTMENT OF NATURAL RESOURCE SCIENCES**

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| <b>QUALIFICATION: BACHELOR OF NATURAL RESOURCE MANAGEMENT HONOURS</b> |  |
| <b>QUALIFICATION CODE:</b> 08BNRH                                     | <b>LEVEL:</b> 8  |
| <b>COURSE CODE:</b> GRS811S   | <b>COURSE NAME:</b> GIS AND REMOTE SENSING IN PRACTICE |
| <b>DATE:</b> JULY 2024  |  |
| <b>DURATION:</b> 3 HOURS  | <b>MARKS:</b> 100                                      |

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| <b>SECOND OPPORTUNITY EXAMINATION QUESTION PAPER</b> |                          |
| <b>EXAMINER(S)</b>                                   | Prof. Vera De Cauwer     |
| <b>MODERATOR:</b>                                    | Ms. Foibe Nelao Johannes |

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| <b>INSTRUCTIONS</b>  |  |
| <ol style="list-style-type: none"><li>1. Answer ALL the questions.</li><li>2. Write clearly and neatly.</li><li>3. Number your answers clearly.</li><li>4. Show your detailed work for calculations.</li></ol> |  |

**PERMISSIBLE MATERIALS**

1. Calculator

**THIS QUESTION PAPER CONSISTS OF 3 PAGES** (Excluding this front page)

**Question 1****[6]**

- a) What are microwaves?
- b) How do microwaves travel when transmitted?
- c) What are the advantages of using an active microwave sensor compared to passive sensors for remote sensing purposes?

**Question 2****[23]**

Indicate if the following statements are True or False. If false, correct the statement.

1. LiDAR is an active sensor.
2. A satellite image contains geospatial information in vector format.
3. It is advised to always use illumination from the southwest to display hill shades on a map.
4. A QGIS project file (qgz) does not contain any GIS data.
5. GPS data is vector data and most often in gpx format.
6. Thermal radiation from animals and humans is emitted in the visible light range.
7. Each pixel of a raster image stores a single value.
8. Green plants absorb green light.
9. Thermal radiation can be carried through a vacuum.
10. The location with latitude 15.55 and longitude - 22.15 is south of the equator.
11. Coordinates of longitude represent the Y-axis for the grid of latitude and longitude lines covering the world.
12. Visible light contains more energy than radio waves.
13. Each image layer in a GIS has an attribute table.
14. Vector data can be imported into Google Earth if it is in shp format.
15. Water reflects most radiation with higher wavelengths from near-infrared onwards.

**Question 3****[5]**

You start a new project in QGIS and you add the layers waterpoints.gpx and regions.shp to the project. The file extension .shp stands for a file in ..... format. Next to regions.shp, two other files are needed to open the regions layer in a GIS: .....and ..... The data of the waterpoints.gpx file was collected with a ..... You also have a file regions.xml. This file contains .....

**Question 4****[11]**

Electromagnetic radiation consists of electromagnetic waves characterised by wavelength and frequency.

1. Explain wavelength and indicate the measurement unit.
2. Explain frequency and indicate the measurement unit.
3. What is the relation between wavelength and frequency? What is this expression representing?

4. Give an example of electromagnetic radiation with a large wavelength.
5. Give an example of electromagnetic radiation with a high frequency.

**Question 5**

[7]

Below is an attribute table of a GIS layer.

1. How many features does the GIS layer contain?
2. List the attributes (fields) of the GIS layer.
3. Why do we have a column with heading ID in the attribute table?
4. Is this a vector or a raster layer? Explain briefly why.

| ID | Vegetation | Area | Protected |
|----|------------|------|-----------|
| 1  | Woodland   | 12.5 | N         |
| 6  | Grassland  | 25.2 | Y         |
| 2  | Woodland   | 12.1 | N         |
| 3  | Shrubland  | 35.0 | N         |
| 9  | Shrubland  | 28.1 | Y         |
| 11 | Woodland   | 11.9 | Y         |
| 8  | Bare       | 2.3  | Y         |

**Question 6**

[6]

What are the advantages of vector data versus raster data in a GIS?

**Question 7**

[6]

- a) What do multispectral and hyperspectral remote sensing data have in common?
- b) What are the differences between multispectral and hyperspectral remote sensing data?
- c) Give an example of a multispectral and hyperspectral satellite.
- d) What advantage has hyperspectral data compared to multispectral data for rangeland management?

**Question 8**

[14]

Compare the use of a UAV with that of an aeroplane to collect remote sensing data by describing the differences.

**Question 9**

[12]

Convert the following coordinates to decimal format. Indicate clearly which coordinate is latitude and which is longitude.

1. 24° 15' 57" S, 23° 14' 12" E
2. N 50° 4.6151', E 19 ° 43.8381'

**Question 10**

**[10]**

An important image processing technique for satellite data is image classification.

- a) What is satellite image classification?
- b) Distinguish and describe the different methods of image classification.