



**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**

<b>QUALIFICATION:</b> BACHELOR OF NATURAL RESOURCE MANAGEMENT HONOURS	
<b>QUALIFICATION CODE:</b> 09MNRM	<b>LEVEL:</b> 8
<b>COURSE CODE:</b> GRS811S	<b>COURSE NAME:</b> GIS AND REMOTE SENSING IN PRACTICE
<b>DATE:</b> June 2023	
<b>DURATION:</b> 3 HOURS	<b>MARKS:</b> 90

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

<b>INSTRUCTIONS</b>
<ol style="list-style-type: none"><li>1. Number your answers clearly.</li><li>2. Show your detailed work for calculations.</li></ol>

**PERMISSIBLE MATERIALS**

1. Calculator

**THIS QUESTION PAPER CONSISTS OF 4 PAGES (Excluding this front page)**

**Question 1**

**[18]**

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

1. 22° 18.9' S, 15° 54.2' E
2. 18° 39' 57" S, 23° 8' 22" W
3. S 20° 25.1251', E 19 ° 19.7381'

**Question 2**

**[5]**

Radar systems can collect remote sensing data from a plane or a satellite.

- a) What does the acronym RADAR mean?
- b) Give two examples of applications in which Radar can be used.
- c) What are the advantages of using an active microwave sensor (compared to a passive sensor)?

**Question 3**

**[5]**

You start a new project in QGIS and you add the layers trees.gpx and admin.shp to the project. The file extension .shp stands for ..... Next to admin.shp, two other files are needed to open the admin layer: .....and ..... The data of the trees.gpx file was collected with a ..... You save your QGIS project as a file with the file extension .... .

**Question 4**

**[9]**

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. What is "ID" referring to? Explain what it stands for.
4. Is this a vector or a raster layer? Explain briefly why.
5. Does the layer contain points, lines or polygons? Explain briefly why.

ID	Vegetation	Area	Fenced
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 5****[7]**

- a) What is a vegetation index?
- b) Why are vegetation indices used?
- c) Which is the most used vegetation index?
- d) Why do areas with no vegetation have a low vegetation index?

**Question 6****[9]**

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 7****[21]**

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

1. Thermal radiation from animals and humans is emitted in the visible light range.
2. The distance between two meridians of longitude is a constant (always the same).
3. Lines are composed of at least three vertices that are connected.
4. Each cell of a raster image stores a single value.
5. Green plants absorb green light.
6. The location 1,215,000 m E ; 581,355 m S is expressed in geographical coordinates.
7. Thermal radiation can be carried through a vacuum.
8. It is best to use satellite images of the warm, dry season to map vegetation in Namibia.
9. Terrain slope can be expressed in degrees (°) or in per cent (%).
10. Google Earth is a GIS.
11. The EIS is a local data repository that contains GIS data.
12. A map scale of 1:250,000 is larger than a map scale of 1:25,000.
13. The location with latitude 15.55 and longitude - 22.15 is south of the equator.

**Question 8****[5]**

During a guest lecture, the use of hyperspectral satellite images for research in the ProNamib Nature Reserve was demonstrated.

- 1) What is a hyperspectral image?
- 2) How can the data be verified in the field?
- 3) Give an example of a hyperspectral satellite.
- 4) What advantage has hyperspectral data compared to multispectral data for rangeland management?

**Question 9****[4]**

Terrain relief is useful to show on a map.

- a) Define terrain relief.
- b) Explain the different methods to show terrain relief on a map.
- c) Name a type of map that has always terrain relief data shown on it.

**Question 10****[7]**

You are collecting samples at sampling stations placed every 10 kilometres along a transect. The transect runs along a meridian of longitude, starting at latitude  $-20^{\circ}$  and ending at latitude  $-22^{\circ}$ .

- a) What is a transect?
- b) Are you performing a random or a systematic sampling?
- c) How many sampling stations do you have? Explain our answer.