NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF ENGINEERING AND THE BUILT ENVIRONMENT

DEPARTMENT OF LAND AND SPATIAL SCIENCES

QUALIFICATIONS: DIPLOMA IN GEOMATICS, BACHELOR OF GEOMATICS, BACHELOR OF GEOINFORMATION TECHNOLOGY	
QUALIFICATION CODES: 06DGEO, 07BGEO, 07BGEI	**LEVEL:** 5
COURSE CODE: RES512S	**COURSE NAME:** REMOTE SENSING 1
DATE: JUNE 2024	**SESSION:** 1
DURATION: 3 HOURS	**MARKS:** 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER:	Ms Roxanne Murangi
MODERATOR:	Ms Celeste Espach

INSTRUCTIONS
1. Write your student number on each answer sheet used. 2. Answer ALL the questions. 3. Read each question carefully before attempting to answer. 4. Write clearly and neatly.

PERMISSIBLE MATERIALS
1. Non-Programmable Calculator. 2. Pen. 3. Pencil. 4. Eraser and ruler.

This paper consists of six (6) pages (including this cover page)

Question 1

Answer the multiple-choice questions listed below. Please select the ONE most relevant response to the following questions. Indicate the correct answer on the answer sheet.

1.1. The velocity of light can be given as _____. (2)

A. $1*10^8$m/s
B. $3.9*10^8$m/s
C. $3*10^8$m/s
D. $3*10^{18}$m/s

1.2. The relation between velocity, wavelength and frequency can be given as. (2)

A. $\lambda = c / r$
B. $\lambda = c / f$
C. $\lambda = c / h$
D. $\lambda = h*c / f$

1.3. Polar-orbiting satellites are generally placed at an altitude range of_____. (2)

A. 7-15 km
B. 7000-15000 km
C. 700-1500 km
D. 70-150 km

1.4. Select which single answer, in the correct order of words, you think will complete these statements to make it true:
An "Atmospheric Window" is a region of the spectrum where incoming light is ____ and is not ____ by atmospheric particles. These windows are regions, which in remote sensing, are used to study the properties of the_____. (2)

A. Transmitted, absorbed, atmosphere
B. Absorbed, transmitted, atmosphere
C. Transmitted, absorbed, earth's surface
D. Absorbed, transmitted, earth's surface

1.5. Select the correct choice which will complete this sentence to make it true: A short wavelength has ____ frequency and ____ energy. (2)

A. Low, low
B. Low, high
C. High, high
D. High, low

[10]

Question 2

2.1. What is remote sensing? (5)

2.2. What are the names and heights above the earth's surface of the three (3) orbital height regions that satellites can orbit in? (3)

2.3. Figure 1 shows a schematic of the many types of electromagnetic radiation and their applications. Answer the following questions with this schematic: (4)

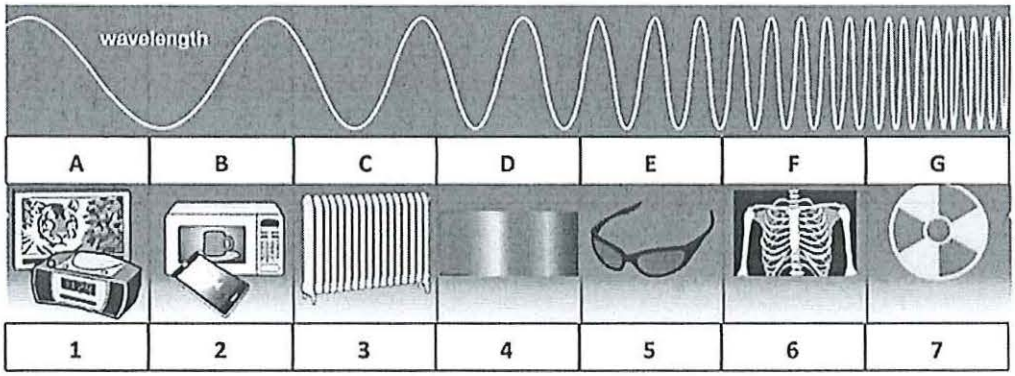

Figure 1

2.4. Indicate which part of the electromagnetic spectrum is represented by the letters A through G. (*Each correct answer will count 0.5 marks*). (3.5)

2.5. Indicate what each electromagnetic radiation type can be used for as represented by the numbers 1 to 7. *(Each correct answer will count for 0.5 marks).* (3.5)

2.6. Outline the main characteristics of remote sensing data. (8)

2.7. Quantity of is scattering driven by which factors? (3)

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Question 3

3.1. What are the major differences between Mie, Raleigh, and Non-selective scattering? (3)

3.2. How does Radar remote sensing work, and provide three advantages? (6)

3.3. List at least two advantages of along-track scanners. (2)

3.4. List the four types of resolution relevant to the field of remote sensing. (4)

3.5. Use Figure 2 to assist you in answering the following questions:

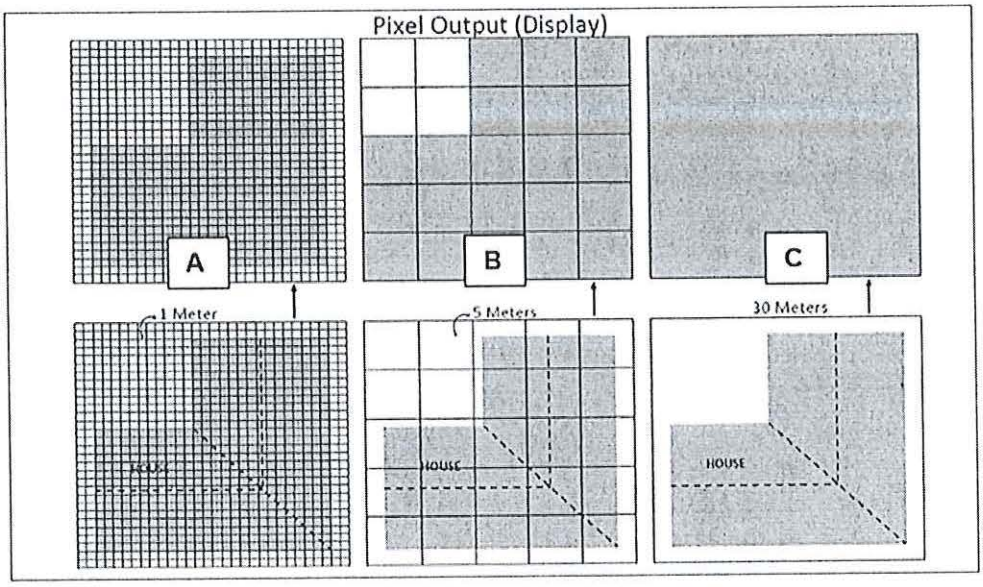

Figure 2

a) Which of these four resolutions relevant to the field of remote sensing do you think this specific Figure 2 refers to? Explain your answer. (3)

b) Each of the resolutions relevant to the field of remote sensing has specific scales (high, medium, and low), which scales are represented in Figure 2? Include the scale range values. (3)

3.6. What are the four (4) levels in image processing? (4)

[25]

Question 4

4.1. You wish to acquire an image making use of a drone that will have a ground resolution of 4 cm/pixel (IFOV). The camera to be used in the drone has a FOV of 54° and it produces images that have an image resolution (w*h) of 1900*1450. Calculate the required flight height (in ft) that is required to obtain this ground resolution. Show all your calculation steps. *(Round to two (2) decimal places for meters).* (10)

4.2. A camera having a focal length of 35 cm is used to take a vertical photograph of a terrain having an average elevation of 2500 metres. What is the height above sea level at which an aircraft must fly to get the scale of 1: 9500? (10)

4.3. A map with a final scale of 1:10,000 needs to be produced. It is decided to use aerial photographs with a scale of 1:30,000. Using the standard lens of 135 mm (focal length) calculate the flight height of the plane. *(Round to three (3) decimal places for meters and feet to the nearest whole number).* (10)

4.4. What is the wavelength (µm) of electromagnetic radiation with a frequency of 3000 MHz? (5)

[35]