



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCES

DEPARTMENT OF APPLIED PHYSICS

BSc HONOURS IN EARTH SCIENCES

REMOTE SENSING

SES 3101

First Semester Examination Paper

December 2024

This examination paper consists of 3 pages

Time Allowed: 3 hours

Total Marks: 100

Special Requirements: Scientific Calculator, Ruler

Examiner's Name: C. Makura

INSTRUCTIONS

ANSWER ALL QUESTIONS IN SECTION A AND ANY 3 QUESTIONS IN SECTION B.

MARK ALLOCATION

QUESTION	MARKS
1.	40
2.	20
3.	20
4.	20
5.	20
Maximum possible mark	100

SECTION A

QUESTION 1

- a. Raw remotely sensed images contain inherent distortions, which require correction before they can be subjected to further image processing. These inherent distortions are predominantly geometric and radiometric in nature.
- What is noise as applied to imagery. [1]
 - Distinguish three types of noise common in satellite imagery. [3]
 - Why is it important to correct for distortions caused by noise in an image before any subsequent image processing can take place? [2]
 - During image data transmission, a portion of a line of the acquired remotely sensed image was dropped as shown in the table below :-

41	41	41	41	41	38	35	35	38
36	36	36	36	36	31	31	34	34
31	34	31	26	29	29	29	31	31
23	27	0	0	0	0	0	0	0
21	23	25	33	35	30	35	38	41

- Name three possible ways of correcting for the pixels in this dropped line. [4]
- b. Provide major historical highlights that have contributed to the development of modern day remote sensing. [10]
- c. Image pre-processing, enhancement and visualization are critical processes in deriving information from remotely sensed imagery. Discuss. [20]

SECTION B

QUESTION 2

- a. With relevant application examples, describe the three major satellite orbits commonly used in remote sensing. [10]
- b. Reflectance properties of earth surface objects are important to the interpretation and remotely sensed images.
- What is reflectance and what is its importance in remote sensing. [3]
 - Differentiate between a specular and diffuse reflector. Which of these reflectors exhibit the reflectance characteristics of real world features? [4]
 - If the transmission of very clear water is high, explain why it is possible for measured reflectance values from water bodies to be very low in some instances and very high in others. [3]

QUESTION 3

- a. Describe the importance of image classification in Remote Sensing. [2]
- b. Identify and explain the major advantages and disadvantages of the two classification techniques commonly applied on remotely sensed imagery. [10]
- c. What are the advantages and limitations of visual image interpretation and digital image processing? [8]

QUESTION 4

- a. Image quality relies on the interaction between the electromagnetic radiation and atmospheric components at the time of image acquisition. Briefly describe the causes and different types of scattering in relation to the electromagnetic spectrum that may affect image quality. [10]
- b. Using appropriate illustrations, explain the relationship between wavelength and frequency and amount of energy and its implication on the type of remotely sensed data that can be acquired. [6]
- c. Explain the major factors that determine the dwell time in whiskbroom scanners. [4]

QUESTION 5

- a. Write short notes on
 - i. Atmospheric window [2]
 - ii. Orbital parameters of satellite. [2]
 - iii. Why ground truth verification is necessary for RS interpretation. [4]
- b. What are the bands and their uses of Landsat ETM? [6]
- c. Explain the remote sensing studies in geophysics application. [6]