NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF ENVIRONMENTAL SCIENCES

DEPARTMENT OF ENVIRONMENTAL SCIENCE

BACHELOR OF SCIENCE HONOURS DEGREE IN ENVIRONMENTAL SCIENCE AND HEALTH

GEOGRAPHIC INFORMATION SYSTEM AND REMOTE SENSING I

ESH 4105

Final Examination Paper

December 2024

This examination paper consists of 4 pages

Time Allowed: **3 hours**

Total Marks: **100**

Special Requirements: **Calculator**

Examiner's Name: **Mr P L Moyo**

INSTRUCTIONS

1. Answer **QUESTION 1** and any **THREE** questions
2. Each question carries 25 marks

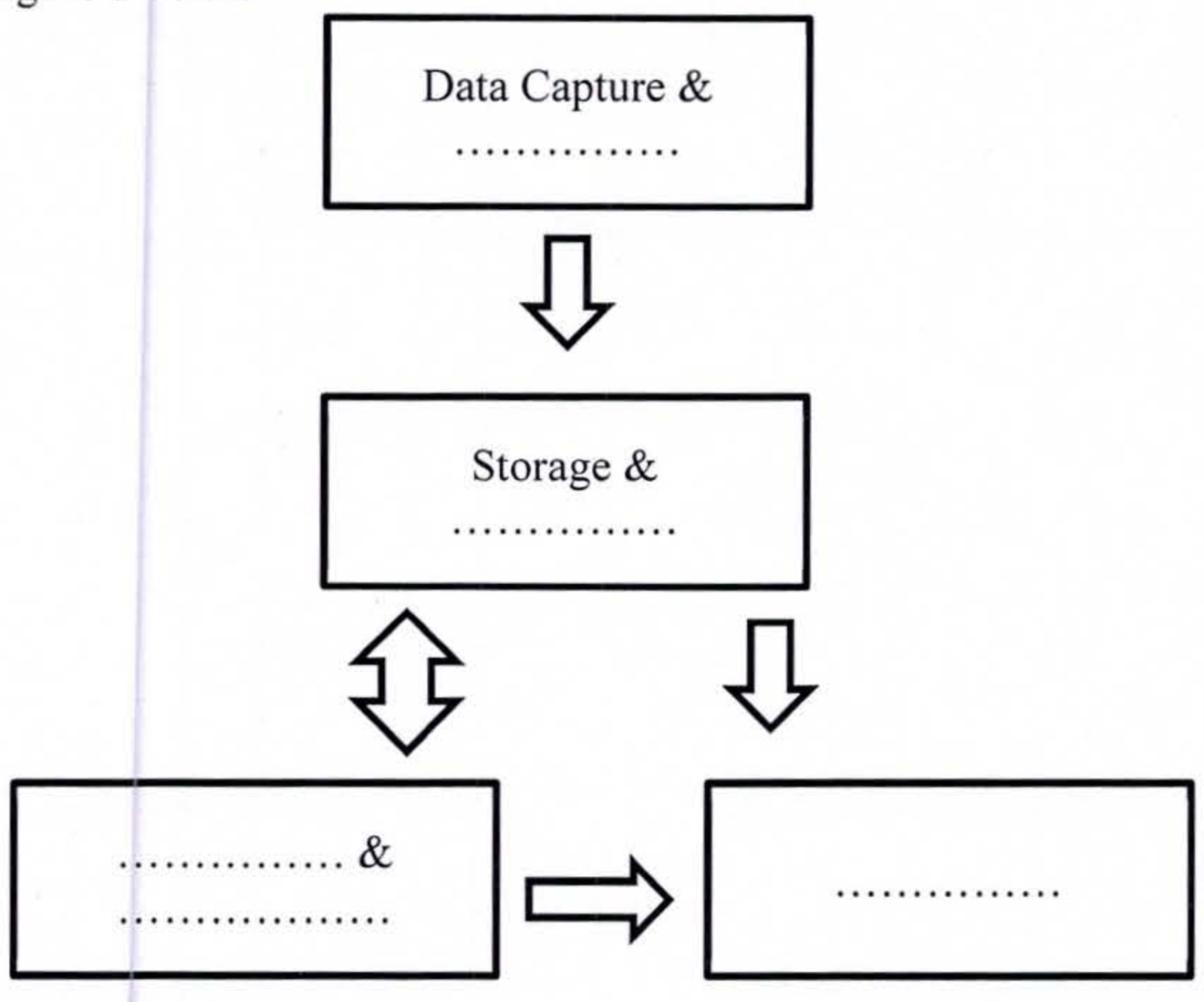
MARK ALLOCATION

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

QUESTION 1 (Compulsory)

a) Describe and explain with relevant examples the components of Geographic Information System (GIS) **(20)**

b) Complete Figure 1 below **(5)**



QUESTION 2

a) Outline and explain the measures of data quality in GIS and remote sensing **(10)**

b) A city is experiencing a rise in respiratory illnesses among its residents, particularly in neighbourhoods near industrial zones. Local health officials suspect that air quality may be a contributing factor.

i. Identify at least three spatial data sources **(3)**

ii. Explain how each source could contribute to understanding the environmental health issues in this scenario **(6)**

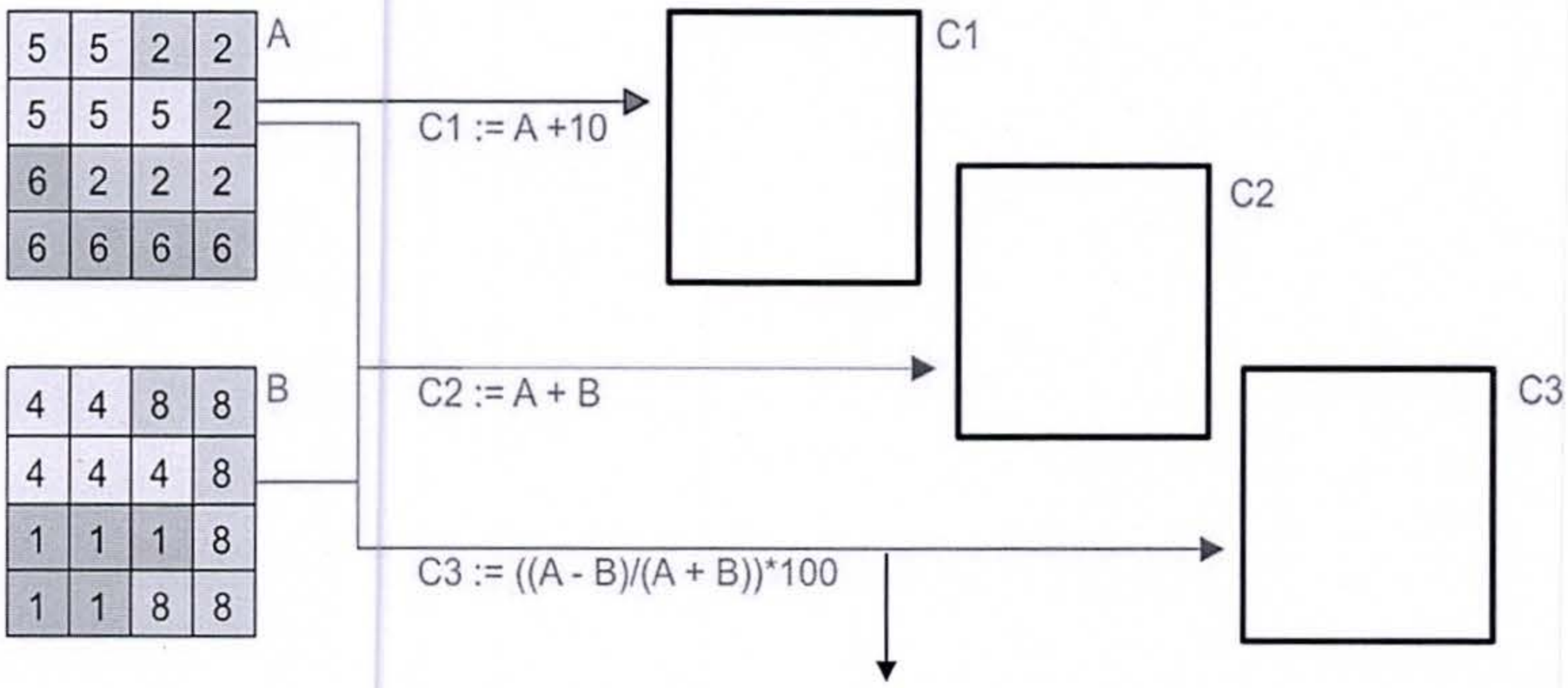
iii. What are the potential limitations or challenges in using the identified spatial data for this analysis? **(6)**

QUESTION 3

Develop a GIS/RS based solutions to help address environmental science and health problem of your choice. Critically analyse and identify the main aspects of the problem in your selected case and develop a GIS/RS based approach to assist towards solving the identified aspects of the problem. You need to specify the aim/ objective (s) of your solution, your data needs, the Spatial Data Analysis techniques you will employ in your solution giving justification for your choices/approach

QUESTION 4

a) Complete the following arithmetic functions of raster overlay operators for C1, C2 and C3 in Figure 2 below **(13)**



Normalised Difference Vegetation Index (NDVI)

b) Map visualisation is important to effectively communicate geo-spatial information to users. Outline any **four** important elements that any map output should have and explain why they are so important **(8)**

c) Distinguish between large-scale and small-scale map **(4)**

QUESTION 5

a) Explain the following terms as they are used in GIS and Remote Sensing

i. Spatial resolution **(2)**

ii. Spectral bands **(2)**

iii. Atmospheric windows **(2)**

iv. Spectral signatures **(2)**

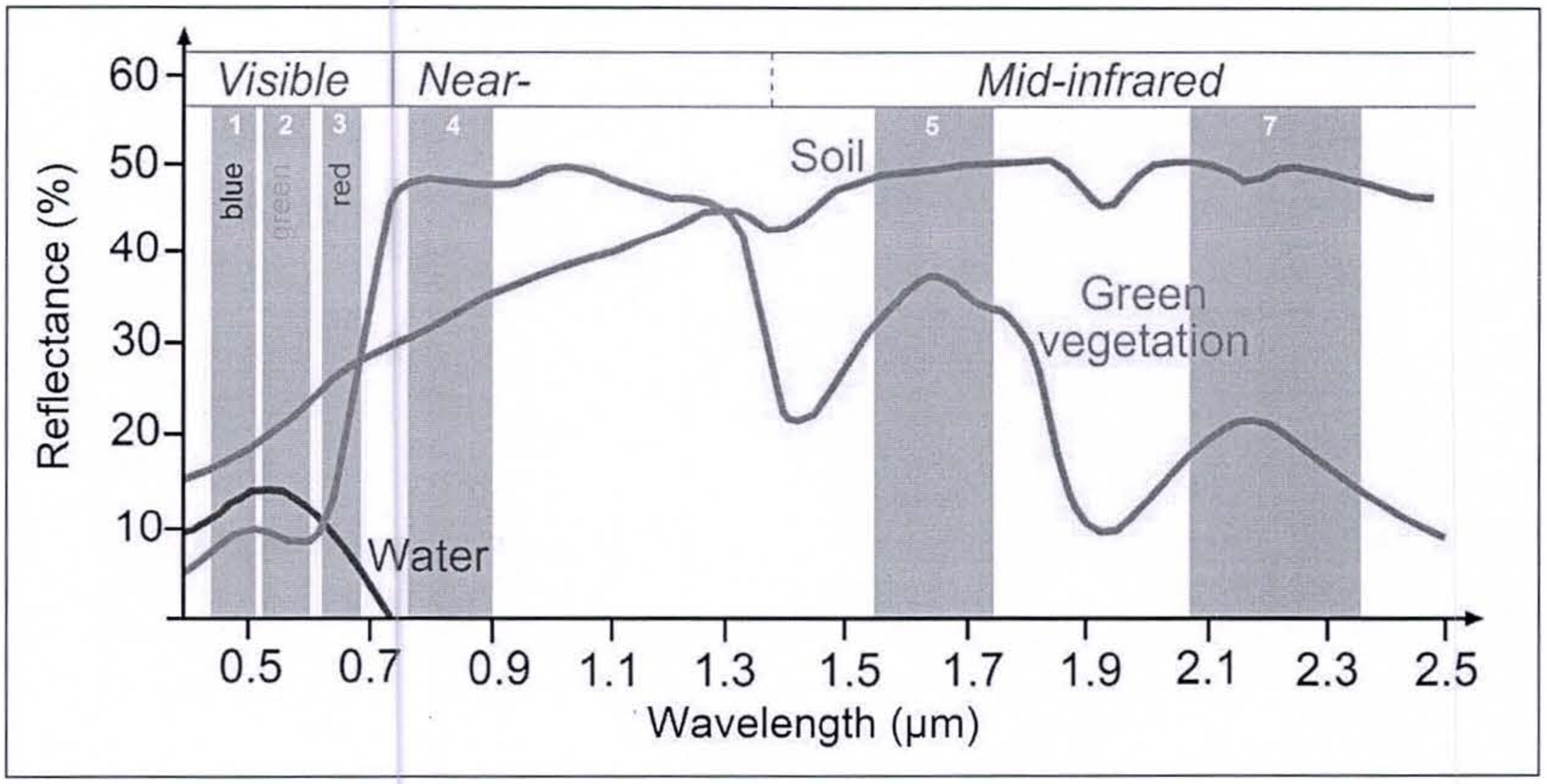
v. Temporal resolution **(2)**

b) Satellites can be classified by their functions. List any **five (5)** different types of satellite **(5)**

c) Explain using a diagram the operational principle of an active sensor in remote sensing **(10)**

QUESTION 6

a) Explain the spectral reflectance of green vegetation as shown in Figure 3 below **(10)**



b) Outline any five examples of Satellite positioning systems **(5)**

c) Explain the three major components of a Global Positioning System (GPS) **(10)**