

FACULTY	AGRICULTURE, ENGINEERING AND NATURAL SCIENCES		
DEPARTMENT	ENVIRONMENTAL SCIENCE		
SUBJECT	REMOTE SENSING II		
SUBJECT CODE	GRS3652		
DATE	October 2021		
DURATION	3 HOURS	MARKS	100

NORMAL EXAMINATION

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External Moderator: Dr. Z.E Mashimbye, University of Stellenbosch

INSTRUCTIONS

1. Work in an orderly manner and present your work as neatly as possible.
2. While most of the marks will be awarded for content, candidates must bear in mind the importance of presentation, i.e. insight and critical thinking.
3. Number your questions correctly and clearly.
4. This paper consists of three (3) pages (excluding front page and instruction page).
5. Answer all questions in Section A and B.
6. Usage of calculator is allowed.

SECTION A:**Total marks: 48**

1. **Differentiate** between:
 - (a) Omission and commission error [4]
 - (b) Active and passive remote sensing [4]
2. Table 1 below shows the surface reflectance values per spectral bands of Landsat 8 for three pixels in Windhoek, Namibia.
 - (a) Calculate the Normalized Difference Vegetation Index (NDVI) and Normalized Difference Water Index (NDWI) for each pixel. Show all your work. [6]
 - (b) Which of these three pixels are likely to be for water and green vegetation? Motivate your answers. [6]
 - (c) Create a scatter plot showing the relationship between NDWI and NDVI values based on three pixels. What would you conclude regarding the relationship between NDVI and NDWI based on your graph? [10]

Table 1: Surface reflectance values for each spectral band of Landsat 8 at three pixels in Windhoek, Namibia.

Band name	Pixel A	Pixel B	Pixel C
Blue	0.0364	0.3489	0.0240
Green	0.0558	0.4165	0.0417
Red	0.0523	0.4387	0.0263
NIR	0.2066	0.4214	0.0246
SWIR-1	0.1640	0.3255	0.0083
SWIR-2	0.1070	0.2986	0.0058

3. Tomas Titus computed NDWI for Etosha Pan in Etosha National Park, which get flooded with water during the rain season, from three Landsat 8 images. One image was acquired by Landsat 8 on 25 March 2021, whereas the other two images were acquired on 25 August 2021 and 25 December 2019. The pan only got the first inflow of water in 12 March 2021. Unfortunately, Tomas forgot to name his images correctly when he was calculating Normalized Difference Water Index (NDWI) and Soil Adjusted Vegetation Index (SAVI). As a result, he does not know which NDWI and SAVI images are from which month anymore.
 - (a) Explain to Tomas what approach he could use to know which NDWI and SAVI images are from which month based on NDWI and SAVI values. [4]
 - (b) Explain why it would not be strange for the Pan area to have NDWI values lower than those from the vegetated parts of Etosha National Park in January 2020. [6]
 - (c) Tomas is Wildlife Ecology. He is not so familiar with Remote Sensing and he even doubts the application of it in Wildlife Ecology. Convince him. [8]

SECTION B:**Total marks: 52**

1. Figure 1 below shows the Landsat 8 spectral curves of four targets, namely target A (blue line), target B (green line), target C (red line), and target D (black line).

- (a) If you were to perform unsupervised classification using three classes, which targets are likely to be placed in same class? Motivate your answer. [6]
- (b) If two of the targets are neither green vegetation nor water, which one would they be? Motivate your answer [4]

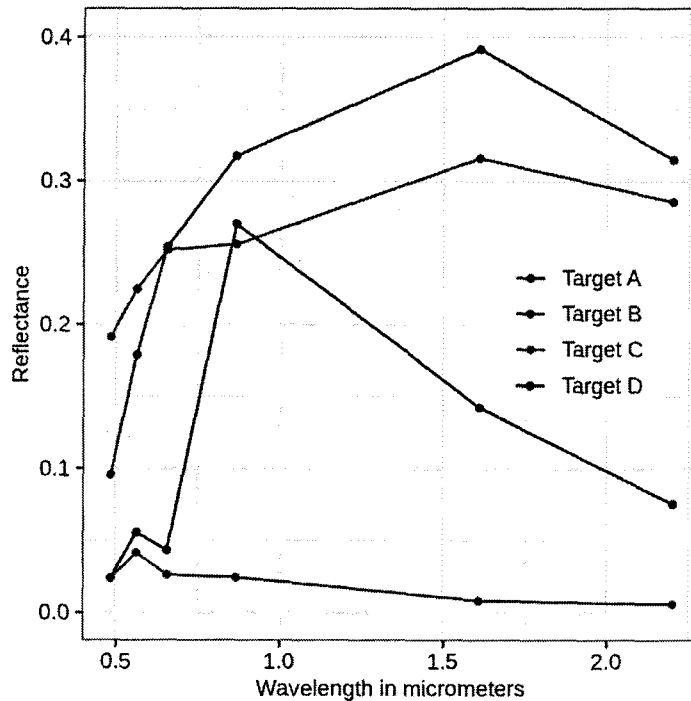


Figure 1: Landsat 8 spectral curves of four targets

2. Mention and discuss two advantages and disadvantages of supervised image classification. [4]
3. Explain why it is not possible to calculate spectral indices from non-optical remote sensing data. [4]
4. Suppose the Regional Council for Kavango East region wants to know the total area covered by water, cropland and forest every month in the region in 2020.
- (a) Explain step-by-step the approach you would use to obtain information for the total area covered by water, cropland and forest in the region every month. [20]
- (b) Discuss the steps or actions you would undertake to assure the information you are giving the Regional Council is reliable as a remote sensing scientist. [6]
5. Discuss the application of remote sensing in the following fields:
- (a) Agriculture [4]
- (b) Hydrosphere [4]

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