

**UNIVERSITY OF KWAZULU-NATAL  
WESTVILLE/HOWARD COLLEGE CAMPUS  
EXAMINATION: NOVEMBER 2011**

**SCHOOL: ENVIRONMENTAL SCIENCES  
LEVEL: III  
MODULE: GIS AND REMOTE SENSING  
CODE: ENVS316**

**DURATION: 3 HOURS**

**TOTAL MARKS: 200 (reduced to 100)**

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**INTERNAL EXAMINERS: MR N NGETAR AND MR P YOUNG  
EXTERNAL EXAMINER: PROF S GRAB  
UNIVERSITY OF WITWATERSRAND**

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**INSTRUCTIONS:**

- 1) There are **THREE SECTIONS A, B AND C.**
- 2) You **HAVE** to answer **FOUR 50 marks** questions (**Total: 200 marks**)
- 3) You may choose to answer **EITHER SECTION A** and **ONE** question from **SECTION B** and **TWO** questions from **SECTION C**

**OR**

- 4) Choose **TWO** questions from **SECTION B AND TWO** questions from **SECTION C**
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**SECTION A**

**Answer FIVE of the SEVEN questions.**

1. Explain the kriging interpolation method. (10)
2. When data within a neighbourhood are continuous, whole area methods or local interpolators can be used. What is the difference between the whole and local areas interpolators? (10)
3. In most of our work, what is the unit of wavelength measured in and what is the general SI unit for wavelength? What can you thus deduce about the wavelengths' sizes we deal with in remote sensing? (10)
4. Comment on measuring electromagnetic radiation taking the variation of wavelength into account. (10)
5. Explain the term 'scattering'. (10)
6. What is the difference between spatial and spectral resolution? (10)
7. What will inform your choice about using temporal satellite data? (10)

## SECTION B

8. GIS data from different sources can present problems during integration and analysis. Discuss the different sources of GIS data, the possible difficulties during integration and how they can be resolved. (50)
9. You are employed by an organization as a GIS specialist to help them implement a new GIS program for use. Discuss the entire implementation process. (50)
10. Provide an overview of the various spatial analyses in GIS and define the function classes used for each type of analyses. (50)
11. With a particular case study in mind, discuss the application of GIS in agriculture. (50)
12. Spatial interpolation uses a number of methods to predict spatial locations. Explain **four** of these methods and briefly discuss their advantages and disadvantages. (50)

## SECTION C

13. Discuss the various ways in which incident energy will interact with targets on the earth's surface. Briefly explain the spectral reflectance characteristics of the following targets: green vegetation, water, and soil. (50)
14. Provide a detailed description of different sensor types and their functionality in remote sensing. (50)
15. In the electromagnetic spectrum, atmospheric windows play an important role in remote sensing. Give an overview of the electromagnetic spectrum, and discuss the various atmospheric windows used in remote sensing and their capabilities. (50)
16. Discuss in detail remote sensing application in urban management. Include in your discussion some of the challenges faced. (50)

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**OR**

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**SECTION A**

**Answer FIVE of the SEVEN questions.**

1. Explain the concept 'Remote Sensing'. (10)
2. Discuss the orientation of two (2) electromagnetic fields by relating them to the propagation of electromagnetic radiation as applied in Remote Sensing. (10)
3. Explain what happens when electromagnetic radiation energy passes through a certain atmospheric path length. (10)
4. Explain why nonselective scatter is a problem for Remote Sensing? (10)
5. Spectral reflectance is characteristic of Remote Sensing. By providing appropriate examples, briefly explain what determines spectral reflectance. (10)
6. Explain the requirements to operate a passive Remote Sensing scanner. (10)
7. Outline how spatial resolution is related to the area detectable by the sensor and accordingly explain what other considerations would thus be required. (10)

## **SECTION B**

8. Discuss the different categories of errors and their assessment methods in Geographic Information Systems (GIS). (50)
9. Provide an overview of GIS, paying particular attention to: GIS building blocks, components of geographic data, feature spatial relationships, data organization, and GIS capabilities. (50)
10. Spatial interpolation uses a number of methods to predict spatial locations. Explain **four** of these methods and briefly discuss their advantages and disadvantages. (50)
11. A good GIS should be able to support a variety of vector and raster data formats. Discuss the different vector and raster data formats used in GIS. (50)

## **SECTION C**

12. With the aid of diagrams, discuss the different sources and types of geometric distortions in remotely sensed data. (50)
13. With reference to energy interactions within the atmosphere, discuss whether or not you agree with the view that “Not all energy from a source is incident on a target”? (50)
14. Discuss the most common sensors and platforms used in Remote Sensing. In your answer elaborate on the various types of resolutions applicable to Remote Sensing. (50)
15. Image enhancement and image transformation are two forms of digital image processing. Contrast these methods, giving a detailed account on the techniques they employ to enhance remotely sensed images. (50)