GWANDA STATE UNIVERSITY

FACULTY OF ENGINEERING AND ENVIRONMENT

DEPARTMENT OF GEOMATICS AND SURVEYING

GIS Data Structures and Algorithms

ESG 2110

Examination Paper

June 2024

This examination paper consists of 2 pages

Time Allowed: **2 hours**

Total Marks: **100**

Examiner's Name: Mr N.S. Maphosa

INSTRUCTIONS

1. **Choose and Answer any 4 questions**

1. (a) Explain the concept of spatial indexing in GIS. Discuss at least three commonly used spatial indexing techniques and compare their advantages and disadvantages [15].
   (b) Discuss the pros and cons relating to the use of vector data models in land surveying [10].
2. Distinguish between Vector and Raster data models as they are used in Geographic Information Science [25].

3. Develop an innovative algorithm that automatically identifies and extracts meaningful patterns from large-scale geospatial datasets, such as satellite imagery. Explain the steps of your algorithm, the data structures used, and how it can be applied to solve specific real-world problems, such as urban expansion and planning [25].

4. (a) Discuss the concept of spatial query processing in GIS. Explain the difference between spatial and non-spatial queries and provide examples of each [10].

   (b) Briefly explain the following Attribute data types;

   I. Text [5]
   II. Float [5]
   III. Integer [5]

5. Write a python script that calculates Normalized Difference Vegetation Index (NDVI) of a maize field at Gwanda State University Agro-Ecological Farm [25].