NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCES

BSC HONOURS IN EARTH SCIENCE

GEOGRAPHICAL INFORMATION SYSTEMS

SES 4104

First Semester Examination Paper
December 2024

This examination paper consists of 4 printed pages

Time Allowed:	**3 hours**
Total Marks:	**100**
Special Requirements:	**None**
Examiner's Name:	**Mr. C. Chuma**

INSTRUCTIONS

ANSWER ALL PARTS OF QUESTION 1 IN SECTION A AND ANY THREE QUESTIONS FROM SECTION B. SECTION A CARRIES 40 MARKS AND SECTION B CARRIES 60 MARKS

MARK ALLOCATION

QUESTION	MARKS
1.	**40**
2.	**20**
3.	**20**
4.	**20**
5.	**20**
6.	**20**
Maximum possible mark	**100**

SECTION A

1. (a) Describe the capabilities of *Geographical Information Systems* in (GIS) [8]

   (b) Define *Database Management System (DBMS)* [3]

   (c) Suppose one has two maps, one at scale 1: 10,000, and another at scale 1: 1,000,000. Which of the two maps can be called a large-scale map, and which a small-scale map? [2]

   (d) Location, shape, size and orientation are potentially relevant characteristics of geographic objects. Try to provide an application example in which the following characteristics do make sense:
   (i) Point object, [2]
   (ii) Line objects, [2]
   (iii) Area objects. [2]

   (e) Describe the architecture of GIS [6]

   (f) Distinguish between *regular* and *irregular tessellations.* [4]

   (g) Modelling the shape of the Earth is needed for *spatial referencing*. Why is essential to use a *geoid* to model the Earth when coming up with datums for spatial referencing. [4]

   (h) What are the characteristics of a *geographic phenomenon*? [3]

   (i) Explain the seek *computation* as spatial neighbourhood function [3]

SECTION B

2. (a) There exists an obvious relationship between remotely sensed images and geographic fields, yet the two are not the same thing. Elaborate on this and discuss what are the differences. [6]

   (b) Compare and contrast between *interactive spatial selection* and *attribute queries.* [6]

   (c) A mining company situated on the Great Dyke requires you to give them a hydrogeological model of their water resources. Your model should include evaluation of both surface and groundwater resources. Describe the data type that is required, the procedures to be used and the spatial analysis required. [8]

3. (a) Rasterization of vector data is sometimes required in data preparation. What reasons may exist for this? [4]

   (b) Assume you wish to reconcile spatial data from two neighbouring miners to resolve a claim border dispute. Published maps in the two mines are based on different local horizontal datums and map projections. Which steps should you take to render the data sets spatially compatible? [10]

   (c) Discuss the components of spatial data quality. [6]

4. (a) A database management system (DBMS) can be compared to GIS operational toolbox. Discuss the reasons for using DBMS in your company. [8]

   (b) Due to the difficulties of representing the curved surface of Earth on a plain map, only some aspects of the representation are geometrically correct, or in other words, maps do not exist without distortions. Describe the major aspects which are used for grouping the projections [6]

   (c) Consider the hypothetical case that your institute or company equips you for field surveys with a GPS receiver, a mobile phone (global coverage) and portable computer. Compare that situation with one where your employer only gives you a notepad and pencil for field surveying. What is the gain in time efficiency? What sort of project can be contemplated now that was impossible before? [6]

5. (a) Argue why spread computations are much more naturally supported by raster data than by vector data. [5]

   (b) Outline the procedures for demarcating a sub catchment from a DEM [10]

   (c) Describe several ways in which a three-dimensional terrain can be represented on a flat map display [5]

6. (a) As a GIS consultant you are given a tender to carry out a qualitative analysis to determine the level of illegal construction which has taking place in a city in Zimbabwe (2000 to 2020) and to give relevant recommendations. Describe the approach you will take and the type of data you will need as well as the integration of data into GIS. [10]

(b) Discuss on the advantages and disadvantages of *vector* and r*aster* data representations. [10]

End of Examination Paper: 2024