



The University of Fiji
(An Entity of Arya Pratinidhi Sabha of Fiji)



SCHOOL OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF SCIENCE
Semester 1, 2026

FINAL EXAMINATION PAPER

ESC203: GEOGRAPHIC INFORMATION SYSTEMS

Important Instructions to Students:

1. There are eight (8) pages. Read the questions, instructions carefully and answer the questions.
2. You are allowed an **extra 10 minutes reading time** (during this time, you are not allowed to write with pen) and **180 minutes (3 Hours) to complete this paper**.
3. Silent, non-programmable calculators are allowed, but not supplied.
4. Write all your answers in the answer booklet provided. If you need extra sheets, please ask the supervisor. Write your name, course code and student identification number in the answer booklet and in the attendance sheet.
5. This paper contains **three (3) sections A, B and C**. All questions are compulsory to answer.
6. Write all your answers legibly. The marker has the right to award zero for answers that are not legible.
7. This is a **Closed Book Examination**. The University views plagiarism, cheating and dishonest practice as serious offences and if found, offenders are penalized.

Examination Paper Content (Format):

<u>Section</u>	<u>Question</u>	<u>Content</u>	<u>Marks</u>	<u>Suggested Time</u>
A	1-20	Multiple Choice	20	35 minutes
B	21-26	Short Answer Questions	25	45 minutes
C	27-37	Long Answer Questions	55	100 minutes
		TOTAL	100	180 Minutes

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Registration Certificate Number (RGN0020/11)*

SECTION A**Multiple Choice****(20 MARKS)**

This section contains **twenty (20)** compulsory multiple-choice questions. Each question is worth 1 mark. **Write only the question number and the letter corresponding to the correct answer in the answer booklet.**

1. Which process describes the transformation of three-dimensional geographic data to a two-dimensional plane?
 - A. Ellipsoidal stretching
 - B. Datum alignment
 - C. Map projection
 - D. Georeferencing

2. Which of the following scenarios represents a problem that Geographic Information Systems (GIS) can help address?
 - A. Managing traffic flow within a city
 - B. Planning the sustainable harvesting of timber from a forest
 - C. Coordinating emergency response efforts
 - D. All of the above

3. What specific information does the output of an ASPECT analysis provide?
 - A. The steepness of a surface
 - B. The compass direction that a slope faces
 - C. The rate of change of a surface's curvature
 - D. The vertical height of a surface

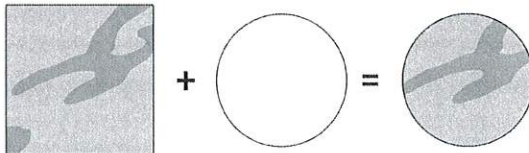
4. What is the technical term for the process of converting features from images or scanned maps into a vector format?
 - A. Geo-referencing
 - B. Digitizing
 - C. Geo-processing
 - D. Projecting

5. Which topological rule is most suitable for verifying that all land parcels (layer A) are located within a subdivision boundary (layer B)?
 - A. Layer A must intersect layer B
 - B. Layer A must be completely covered by layer B
 - C. Layer A must not overlap with layer B
 - D. Layer A must share a boundary with layer B

6. Select the correct Structured Query Language (SQL) expression to identify land parcels valued at less than \$50,000 and zoned as "R-1".

- A. "ParcelValu" < 50000 AND Zoning = R-1
- B. "ParcelValu" < 50000 AND "Zoning" = R-1
- C. "ParcelValu" < 50000 OR "Zoning" = R-1
- D. "ParcelValu" < 50000 AND 'R-1'

7. Identify the geoprocessing operation illustrated in the provided diagram.



- A. Intersect
- B. Union
- C. Dissolve
- D. Clip

8. In a three-dimensional (3D) vector feature, what quantity does the 'Z' value represent?

- A. Elevation
- B. Bearing
- C. Pixel value
- D. Angular measurement

9. What fundamental characteristics of a geographic entity are stored within GIS data?

- A. Spatial location
- B. Attribute table information
- C. Relationships with other spatial entities
- D. All of the above

10. What is the specific term for a map projection where the projection surface intersects the globe along two lines?

- A. Tangent projection
- B. Planar projection
- C. Geometric projection
- D. Secant projection

11. Which of the following data types is classified as continuous data within a GIS layer?

- A. Road networks
- B. Terrain elevation
- C. Building footprints
- D. Forest boundaries

12. Which geoprocessing operation is used to create a buffer zone of a uniform distance around a vector feature?
- A. Intersect
 - B. Dissolve
 - C. Query
 - D. None of the above
13. Which geometric shape most accurately approximates the Earth's true physical form?
- A. Perfect sphere
 - B. Geoid
 - C. Ellipsoid
 - D. Cube
14. What is a key advantage of using open-source GIS software, such as QGIS, compared to proprietary GIS software?
- A. Superior map production capabilities
 - B. Enhanced capacity for complex spatial analysis
 - C. Absence of licensing fees
 - D. Simplified topological editing functionality
15. What functionality does a data query provide within a GIS layer/ environment?
- A. Modification of features within a selected dataset
 - B. Display of attribute data for selected features
 - C. Calculation of summary statistics for selected features
 - D. All of the above
16. What is remote sensing?
- A. Any method of collecting data from scanned images.
 - B. Any method of collecting data about an object or location while making physical exploring contacts.
 - C. Any method of collecting data of an object or location by sending electromagnetic wave towards it.
 - D. None of the above.
17. Which of the following is NOT a typical example of spatial data in a GIS?
- A. Lines representing linear features like rivers or roads
 - B. Timestamps of specific events
 - C. Polygons delineating areas of land use
 - D. Points indicating the locations of individual objects

18. What is a potential disadvantage of using raster data compared to vector data?
- A. The level of detail is limited by the cell size
 - B. Output maps from raster data may not meet high cartographic standards
 - C. Each raster cell can only represent one attribute
 - D. All of the above
19. What is Cartography?
- A. The science and art of making maps, including design, creation, and communication of spatial information
 - B. A raster-based terrain model where the surface is represented using a grid of cells, each containing an elevation value
 - C. The use of terrain models to identify flood prone areas.
 - D. None of the above
20. Which types of geometric features are typically used to construct a network dataset in GIS?
- A. Lines and points
 - B. Lines and polygons
 - C. Points and polygons
 - D. Polygons and attributes

SECTION B**Short Answer Questions****(25 MARKS)**

This section contains **six (6) compulsory short answer questions**. **Answer all questions**. Allocate three questions per page, and write on both sides of the paper. You are not required to rewrite the questions. Present your answers in the same order as the questions.

21. Define Geographic Information Systems (GIS), and support your definition with relevant examples. (3 marks)
22. Using diagrams, describe the two controlling variables involved in generating a hill shade from a Digital Elevation Model (DEM). Explain the influence of each variable on the appearance of the resulting hill shade. (4 marks).
23. Discuss the significance of the statement “Data is the key: fuel for the system” within the context of Geographic Information Systems (GIS) (3 marks).
24. Use the following diagram to answer the questions that follow.

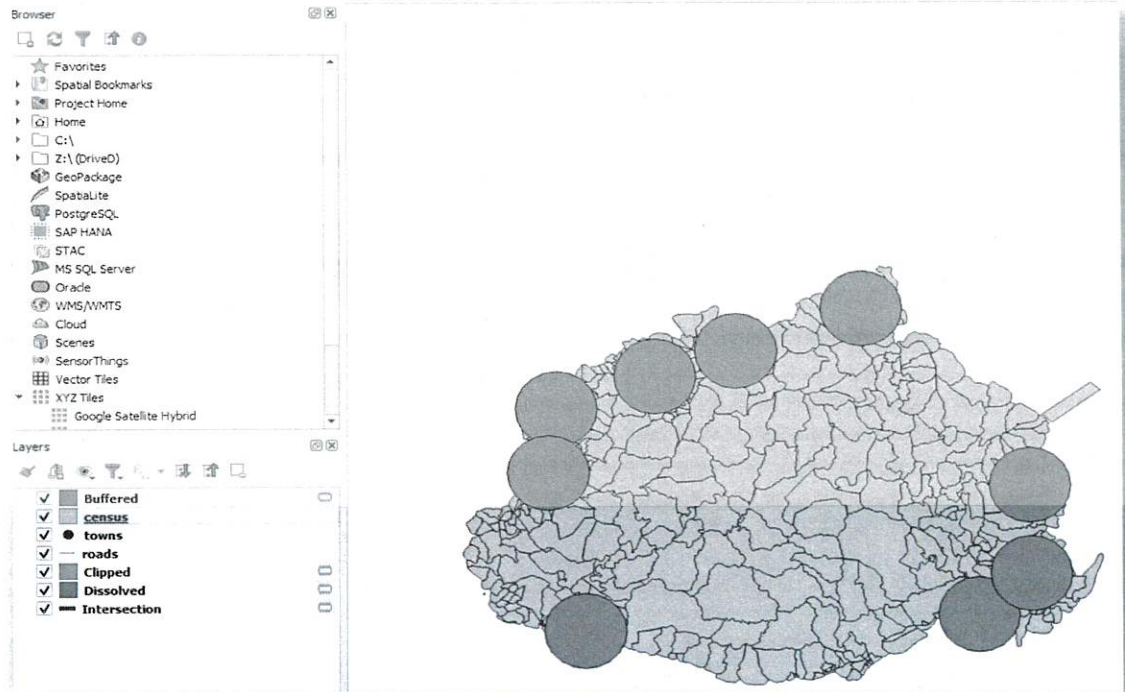
census.shp	SHP File	1,560 KB	No	2,506 KB	38%	6/17/2012 7:35 PM
census.shx	SHX File	7 KB	No	10 KB	38%	6/17/2012 7:35 PM
readme	Text Document	2 KB	No	3 KB	47%	9/19/2008 3:05 PM
roads.dbf	DBF File	38 KB	No	388 KB	91%	6/17/2012 9:10 AM
roads.prj	PRJ File	1 KB	No	1 KB	37%	6/17/2012 9:10 AM
roads.sbn	SBN File	6 KB	No	9 KB	39%	6/17/2012 9:10 AM
roads.sbx	SBX File	1 KB	No	1 KB	47%	6/17/2012 9:10 AM
roads.shp	SHP File	1,767 KB	No	2,353 KB	25%	6/17/2012 9:10 AM
roads.shx	SHX File	5 KB	No	7 KB	38%	6/17/2012 9:10 AM
towns.dbf	DBF File	1 KB	No	1 KB	81%	6/17/2012 9:06 AM
towns.prj	PRJ File	1 KB	No	1 KB	37%	6/17/2012 9:06 AM
towns.sbn	SBN File	1 KB	No	1 KB	40%	6/17/2012 9:06 AM
towns.sbx	SBX File	1 KB	No	1 KB	46%	6/17/2012 9:06 AM
towns.shp	SHP File	1 KB	No	1 KB	61%	6/17/2012 9:06 AM

- i. What type of information does the above folder represent? (1 mark)
- ii. How many layers can be generated from the information revealed in the above folder?
Name these layers. (2 marks)
- ii. How many shapefiles are contained inside this set? (1 mark)
- iv. What file type does the extensions “.shp” represent? (1 mark)

25. In GIS, the position of a spatial feature or object can be represented in two ways: relative or absolute. Describe the distinction between these two methods of positional representation. (5 marks)

26. Refer to the diagram provided below and answer the questions that follow.

Tool usage.



- i. Name the software tool shown in the above image? (1 mark)
- ii. How many layers of features are contained in the above map? (1 mark)
- iii. Name the feature shown in the diagram above which represents the circular geometry as an overlay. What does it specifically represent on the map? (2 marks)
- iv. Specify the type of data being used in the map shown? (1 mark)

SECTION C**Long Answer Questions****(55 MARKS)**

This section contains **eleven (11) compulsory long-answer questions**, each worth 5 marks. **Answer all questions.** Allocate two-three questions per page, and write on both sides of the paper. You are not required to rewrite the questions. Present your answers in the same order as the questions.

27. Discuss the concepts of positional accuracy and positional precision in the context of raster data. Use diagrams to support your explanation. (5 marks)
28. Geographic Information System data is typically categorized into two primary types or formats. Identify and describe these two data types, detailing their key characteristics and fundamental differences. (5 marks)
29. Describe the difference between latitude and longitude coordinates, and explain their crucial role in the process of mapping. You may include diagrams in your response. (5 marks)
30. Discuss the various sources of inaccuracies and errors that can occur during the data capture stage in GIS. Provide specific examples to illustrate your points. (5 marks)
31. Define the term “metadata” and explain its importance within GIS. Describe four essential elements that should be included in a comprehensive metadata description of a GIS data layer. (5 marks)
32. Explain the distinction between “cell size” and “cell value” when working with raster data. Use diagrams to support your explanation. (5 marks)
33. Compare and contrast the Union, Clip, and Dissolve operations as they are applied to vector data in a GIS. Use diagrams to aid in your explanation. (5 marks)
34. Explain the fundamental differences between a Digital Elevation Model (DEM) and a Triangulated Irregular Network (TIN). Use diagrams and relevant examples to support your answer. (5 marks)
35. Define the concept of map projection. What types of distortions are inherently introduced when projecting the three-dimensional surface of the Earth onto a two-dimensional plane? (5 marks)
36. Provide a concise explanation of the difference between a “map” and the field of “cartography.” List three important design considerations that must be taken into account when creating a map. (5 marks)
37. Give a brief description of the six primary components that constitute the process of remote sensing. Use diagrams and examples to support your description. (5 marks)

-END OF EXAMINATION-