KATHMANDU UNIVERSITY
End Semester Examination
January 2025

Marks Scored:

Level : B.E.
Year : IV
Exam Roll No. :
Time: 30 mins.
Course : GEOM 405
Semester : I
F. M. : 10
Registration No.:
Date : 31 JAN 2025

SECTION "A"

[20Q. × 0.5 = 10 marks]

Choose the most appropriate answer from the given alternatives and ***encircle****.*

1. In a WebGIS with real-time data integration, which problem can arise due to high-frequency updates?
   a. Reduced data accuracy
   b. Increased latency in data visualization
   c. Both a and b
   d. Neither a nor b

2. What is the default format of GetCapabilities output in WMS?
   a. XML b. JSON c. HTML d. CSV

3. Which HTTP method is primarily used for sending data to a server in WebGIS applications?
   a. GET b. POST c. PUT d. DELETE

4. Which layer in the TCP/IP model is most relevant for ensuring secure data transmission in WebGIS?
   a. Application layer b. Transport layer c. Internet layer d. Link layer

5. Which operation in WMS is used to retrieve metadata about available layers?
   a. GetMap b. GetFeatureInfo c. GetCapabilities d. GetLegendGraphic

6. What is a primary feature of GML (Geography Markup Language)?
   a. Storing and exchanging raster-based data
   b. Describing spatial geometries and feature properties in XML format
   c. Optimizing spatial database performance
   d. Compressing spatial data for faster transmission

7. Which organization maintains the standards for services like WMS and WFS?
   a. ISO b. OGC c. W3C d. IETF

8. What is a typical use case for GeoJSON?
   a. Styling geospatial layers
   b. Delivering vector feature geometries and properties
   c. Providing pre-rendered map tiles
   d. Managing database indexing for spatial queries

9. In a distributed GIS system, a ____ client relies on the server for most of its processing tasks.
   a. Thick b. Thin c. Hybrid d. Standalone

10. Which standard facilitates styling of geospatial layers?
    a. GML
    b. WMS
    c. SLD (Styled Layer Descriptor)
    d. OGC Filter Encoding

11. The ____ layer is responsible for executing spatial queries and managing geospatial data storage.
a. Client b. Middleware c. Data d. Presentation

12. Which statement is true about distributed GIS systems?
a. They rely on centralized storage and processing for all operations.
b. They distribute data and processing across multiple servers or nodes.
c. They are limited to raster-based data services.
d. They cannot scale to large user bases.

13. The main components of a WebGIS system include ____.
a. Web browsers, thick clients, and static maps
b. GIS server, client applications, and spatial databases
c. Raster datasets, coordinate systems, and metadata
d. Desktop software, GPS devices, and spatial indexes

14. Which of the following is not a valid operation in WFS?
a. GetFeature b. GetCapabilities
c. DescribeFeatureType d. GetMap

15. How does a spatial database like PostGIS enhance WebGIS applications?
a. By storing non-spatial data in a structured format
b. By providing advanced spatial query capabilities, such as buffering and spatial joins
c. By limiting data redundancy through centralized data storage
d. Both b and c

16. Which XML syntax is correct for representing a point geometry in GML?
a. <Point>10,20</Point>
b. <gml:Point><gml:coordinates>10,20</gml:coordinates></gml:Point>
c. <Point coordinates="10,20"></Point>
d. <gml:Point x="10" y="20"></gml:Point>

17. Which method is used to select an element by its ID in JavaScript?
a. document.querySelector() b. document.getElementById()
c. document.getElementByClass() d. document.getSelectorById()

18. Levinsohn's presumptions for achieving interoperability emphasize ____.
a. Complete knowledge of all underlying data by users
b. Hiding complexities associated with data transfer from users
c. Restricting data access to specific client systems
d. Eliminating all server-side processing

19. What is a potential challenge of adopting FOSS in WebGIS projects?
a. Lack of customization options
b. Limited community involvement
c. Need for in-house expertise for development and maintenance
d. Mandatory licensing fees for deployment

20. What is the primary purpose of the "logical tier" in a three-tier WebGIS architecture?
a. Storing spatial data b. Handling business logic and server-side processing
c. Rendering maps on the client side d. Managing network security

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SECTION "B"
[6Q. × 4 = 24 marks]

Attempt *ANY SIX* questions.

1. Define WebGIS and discuss how it differs from traditional desktop GIS. [1+3]

2. Compare and contrast the roles of WMS and WFS in WebGIS applications. [4]

3. Explain the concept and need of XML with examples [4]

4. Describe the specific applications, libraries, or frameworks you would select for each component of client-server architecture and provide a clear justification for your choices based on their features, compatibility, and use cases. [4]

5. What are the types of interoperability? Explain difference between interoperable and non-interoperable systems. [2+2]

6. Explain the role of HTTP methods (GET, POST) in WebGIS services. [4]

7. Write short notes on any two of the following: [2+2]
   a. Future of Web Mapping and Web GIS
   b. OGC Standards
   c. Use of free and open-source applications in Web GIS

SECTION "C"
[2Q. × 8 = 16 marks]

Attempt *ANY TWO* questions.

8. Imagine developing a WebGIS application that integrates geospatial data from multiple sources (e.g., land use maps, transportation networks, and demographic datasets) across different regions. Discuss how interoperability challenges such as semantic, syntactic, and structural differences would be addressed. Briefly explain the standards and tools you would use to ensure seamless data integration and sharing in the system.

9. Write a standard GeoJSON schema to represent polygon features sticking to the GeoJSON specification, create five polygon features representing districts of Nepal with three attributes each (e.g., district name, population, and area). Explain how this GeoJSON data can be visualized using a client-side mapping library like Leaflet detailing the steps for rendering the polygons and displaying their attributes interactively. Steps with code snippets will be an advantage for marking.

10. Imagine developing a WebGIS application to map the locations of local hospitals along with their attribute information (e.g., capacity, specialization). Briefly explain the data and applications used in each tier of the system. Moreover, also describe the key tasks involved in the development process, from data collection to visualization.