KATHMANDU UNIVERSITY
End Semester Examination [C]
December, 2024

Level : B. E.		Course : GEOM 318
Year : III		Semester : I
Exam Roll No. :	Time: 30 mins.	F. M. : 10
Registration No.:		Date : 23 DEC 2024

Mark Scored :

SECTION "A"
[20 Q. × 0.5 = 10 marks]

Choose the most appropriate answer from the given choices.

1. Which component of a DBMS is responsible for translating user queries?
   a. Metadata
   b. Database Engine
   c. Application Program
   d. Data Dictionary

2. What is the purpose of a spatial database in geospatial technology?
   a. To store numerical and character data
   b. To manage and query geometric data like points, lines, and polygons
   c. To serve as a user interface for database management
   d. To store non-spatial multimedia files

3. Which characteristic is **NOT TRUE** for the relational database model?
   a. Built-in data integrity
   b. Data consistency and accuracy
   c. Dependency on physical data storage location
   d. Non-redundancy

4. Among the CODD's 12 Rules, the rule "Physical Data Independence" falls under:
   a. Rule 5 b. Rule 6 c. Rule 7 d. Rule 8

5. The MS Access version of SQL is called:
   a. Jet SQL b. T-SQL c. PL-SQL d. NoSQL

6. What is an example of a spatial query?
   a. Find all customers with sales above $10,000
   b. List all bookstores within 10 miles of a location
   c. Retrieve the names of all customers in a database
   d. Calculate the average sales revenue of a region

7. Which spatial operation computes the area of a polygon?
   a. Spatial predicates
   b. Observer functions
   c. Geometry constructors
   d. Spatial measurements

8. Which query optimization strategy is commonly used in SDBMS for spatial queries?
   a. Filter and refine
   b. Multi-scan indexing
   c. Hashing
   d. Clustering

9. In the context of spatial data models, which operation is associated with aggregate functions?
   a. Local operation
   b. Focal operation
   c. Zonal operation
   d. Topological operation

10. Which model is better suited for representing continuous or dynamic data, such as temperature or elevation?
a. Object model b. Field model c. Spaghetti model d. Network model

11. What does the term "velocity" refer to in the context of geospatial big data?
a. The accuracy of data sources
b. The volume of data collected over time
c. The speed at which data is generated and processed
d. The variety of data types available

12. In SQL, which logical operator is used to compare a value against a list of values?
a. EXISTS b. IN c. BETWEEN d. LIKE

13. What is the purpose of a Voronoi diagram in spatial analysis?
a. To calculate distances between points
b. To divide a region into sub-regions based on proximity to spatial objects
c. To represent topological relationships between geometries
d. To visualize data trends over time

14. In spatial taxonomy, which one of the following is included within "Activities"?
a. Sampling b. Land Status c. Water d. Geology

15. In spatial-temporal data mining, the Association rule is associated with which one of the following?
a. Visualization b. Prediction c. Modeling d. Exploration

16. Which of the following represents a known but missing attribute value?
a. NULL b. Zero c. Space d. Empty string

17. What is meant by 'space overhead' in data indexing?
a. The total amount of space occupied by all records in a database.
b. The additional space occupied by an index structure beyond the actual data.
c. The space required for backup copies of data.
d. The space used for temporary files during data processing.

18. Which database system is noted for using data-driven structures?
a. MySQL b. Oracle c. PostGIS d. MongoDB

19. Choose which of the statement(s) is/ are **CORRECT** from the provided options.
i. An orthorectified satellite image with a resolution of one meter per pixel stored as a raster image is an example of unstructured data.
ii. In the database approach, both the program and data are interdependent of each other.
iii. The command "GRANT" falls under the Data Control Language.
iv. The command 'DROP' removes a table and its structure, while 'DELETE' removes rows from a table but keeps the structure intact.

a. i, iii and iv b. iii and iv c. iii only d. i, ii and iii

20. Choose which of the statement(s) is/ are **CORRECT** from the provided options.
i. The number of fields in relational table represents arity.
ii. The order of column/row is relevant in 2-D relational table.
iii. Schema is sometimes called as the intension.
iv. A row/tuple can represent more than a single entity occurrence within the entity set.

a. i, ii and iii b. i, iii and iv c. i and iv only d. i and iii only

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Course : GEOM 318
Semester : I
F. M. : 40

SECTION "B"
[8 Q. × 5 = 40 marks]

Attempt *ANY EIGHT* questions. Assume suitable data when necessary. Figures in the braces indicate full marks.

1. Explain the concept of a database. What are the major characteristics that the data within a database should possess? Explain them briefly. [1+4]

2. What do you understand by Unified Modeling Language (UML)? The use case diagram is one of the major parts of UML. Explain your understanding of the use case diagram by providing a suitable example. [1+4]

3. Explain your understanding of the relational data model by providing a suitable example that illustrates how the data is stored in such a kind of model. [5]

4. Illustrate the three-layer architecture of an SDBMS. Also, explain how does an SDBMS differ from a GIS? [3+2]

5. What are the different operations that can be performed upon spatial objects? Explain with a proper example. [1+4]

6. What is spatial indexing? Briefly explain the B-Tree and R-Tree structures with suitable examples. [1+2+2]

7. What are the steps involved in designing a relational database? Explain with a proper example. [5]

8. Write short notes on following: (***ANY TWO***) [2×2.5]
   a. Voronoi diagram b. Spaghetti model c. Network data model

9.
   a. Suppose you are required to analyze the student's performance data within a university. Create a table named Student_Performance with the following fields: [1.5]
      i. Student_ID (Primary key, Integer)
      ii. Name (Text)
      iii. Course (Text)
      iv. Score (Integer)

   b. Write a simple SQL query to retrieve the names and scores of all students who scored above 80 in "Mathematics". [1.5]

   c. Write a nested SQL query to find the names of students who scored above the average score in "Physics". [2]