

1. What is a database?

- a) A random collection of unstructured files.
- b) A systematic collection of data supporting electronic storage and manipulation.
- c) A specific programming language for building websites.
- d) A hardware component used to store RAM.

2. Which of the following is NOT an advantage of a Relational Database over a Traditional File System?

- a) Reduced data redundancy.
- b) Easier searching and data retrieval.
- c) Always faster performance, regardless of table count.
- d) Better data protection and backup capabilities.

3. In the Relational Data Model, what is a "Tuple"?

- a) A single column (attribute).
- b) The total number of rows (cardinality).
- c) A single row containing a single record.
- d) The primary key of a table.

4. Which database language is used to define the structure of the database (e.g., CREATE, ALTER, DROP)?

- a) Data Manipulation Language (DML).
- b) Data Control Language (DCL).
- c) Data Definition Language (DDL).
- d) Transaction Control Language (TCL).

5. Which key is defined as the minimal set of fields which can uniquely identify each record in a table?

- a) Foreign Key.
- b) Candidate Key.
- c) Secondary Key.
- d) Composite Key.

6. What does "Physical Data Independence" mean?

- a) Changes in the logical structure do not affect application programs.

- b) Changes in physical storage (like moving from HDD to SSD) do not affect the logical structure.
- c) Data is independent of the user who entered it.
- d) Users do not need an internet connection to access the data.

7. In an Entity-Relationship (ER) Diagram, what shape represents an Attribute?

- a) Rectangle.
- b) Diamond.
- c) Ellipse (Oval).
- d) Double Rectangle.

8. If a student can be assigned to many projects, and a project can be assigned to many students, what type of relationship is this?

- a) One to One.
- b) One to Many.
- c) Many to One.
- d) Many to Many.

9. What is the purpose of the SQL UNION operator?

- a) To return only the rows that are common to both SELECT statements.
- b) To join two tables side-by-side based on a related column.
- c) To combine the result sets of two or more SELECT statements, removing duplicates by default.
- d) To retrieve records from a subquery.

10. If you have an existing MySQL/MariaDB environment installed via XAMPP, why might you still need to install a standalone MySQL server?

- a) Because XAMPP does not include any database software.
- b) To practice advanced database administration outside the web server environment.
- c) Because XAMPP only supports MongoDB.
- d) Because XAMPP cannot run SQL queries.

11. Which database users interact directly with the database using SQL queries but do not write full application code?

- a) Sophisticated Users.
- b) Parametric End Users.
- c) Casual Users.
- d) Naive Users.

12. Which SQL command is used to remove all data from a table without deleting the table structure?

- a) DROP.
- b) DELETE.
- c) TRUNCATE.
- d) ALTER.

13. To undo changes in a database and maintain data integrity after an error, which TCL command is used?

- a) SAVEPOINT.
- b) ROLLBACK.
- c) COMMIT.
- d) REVOKE.

14. Who introduced the relational model of databases in 1970?

- a) Bill Gates.
- b) Edgar Frank "Ted" Codd.
- c) Steve Jobs.
- d) Linus Torvalds.

15. In the Relational Model, what is a "Domain"?

- a) The total number of rows in a table.
- b) A set of values permitted for an attribute in a table.
- c) A single row of a table.
- d) The primary key of the table.

16. An entity that cannot be uniquely identified by its own attributes and relies on a relationship with another entity is called a:

- a) Strong Entity.
- b) Composite Entity.
- c) Weak Entity.
- d) Derived Entity.

17. If a customer can place many orders, but many customers cannot place an order, this is an example of which cardinality?

- a) One to One.
- b) One to Many.
- c) Many to One.
- d) Many to Many.

18. An entity that cannot be uniquely identified by its own attributes and relies on a relationship with another entity is called a:

- a) Strong Entity.
- b) Composite Entity.
- c) Weak Entity.
- d) Derived Entity.

19. How is a Derived Attribute (e.g., Age calculated from Date of Birth) represented in an ER diagram?

- a) Dashed oval.
- b) Double oval.
- c) Rectangle.
- d) Double diamond.

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- a) One to One.
- b) One to Many.
- c) Many to One.
- d) Many to Many.

21. When installing a DBMS, which hardware component is most critical for caching data (Buffer Pool) to improve performance?

- a) CPU.
- b) HDD Storage.
- c) SSD Storage.
- d) Memory (RAM).

22. What refers to "Data about data" in a DBMS?

- a) Metadata.
- b) Flat files.
- c) Super Keys.
- d) Transactions.

23. If you already have XAMPP installed, you do not necessarily need to install MySQL separately because XAMPP includes:

- a) PostgreSQL.

- b) MariaDB.
- c) Oracle.
- d) MongoDB.

24. Which command ensures that a user's newly granted privileges take effect immediately?

- a) COMMIT PRIVILEGES.
- b) SAVEPOINT.
- c) FLUSH PRIVILEGES.
- d) UPDATE PRIVILEGES.

25. The INSERT INTO ... SELECT statement is used to:

- a) Delete records from a table.
- b) Add new empty columns to a table.
- c) Insert records from another existing table.
- d) Create a new database.

26. Which operator is used in a WHERE clause to filter for a range of values?

- a) BETWEEN.
- b) EXISTS.
- c) LIMIT.
- d) ALIAS.

27. What keyword is used to temporarily rename a column in a query output?

- a) DESC.
- b) LIMIT.
- c) AS (ALIAS).
- d) DISTINCT.

28. Which SQL clause is used to sort the result set?

- a) SORT BY.
- b) GROUP BY.
- c) ORDER BY.
- d) FILTER BY.

29. Which JOIN returns only the records that have matching values in both tables?

- a) LEFT JOIN.

- b) FULL OUTER JOIN.
- c) INNER JOIN.
- d) RIGHT JOIN.

30. Which operator combines the result sets of two SELECT statements but KEEPS duplicate records?

- a) UNION.
- b) UNION ALL.
- c) INTERSECT.
- d) INNER JOIN.

31. Which operator returns only the rows that are common to both SELECT statements?

- a) INTERSECT.
- b) UNION.
- c) EXISTS.
- d) NOT IN.

32. In a subquery, which query executes first?

- a) The outer query (main query).
- b) The inner query (subquery).
- c) They execute simultaneously.
- d) It depends on the WHERE clause.

33. Which operator returns TRUE if a subquery returns at least one row?

- a) IN.
- b) NOT IN.
- c) EXISTS.
- d) INTERSECT.

34. In the Relational Data Model, what is a Tuple equivalent to?

- a) A Row.
- b) A Column.
- c) A Table.
- d) A Database.

35. Which TCL command sets a point in a transaction to which you can later roll back?

- a) COMMIT.
- b) SAVEPOINT.
- c) ROLLBACK.
- d) GRANT.

36. Which type of NoSQL database is MongoDB?

- a) Key-value store.
- b) Wide-column store.
- c) Graph database.
- d) Document-oriented.

37. What does the acronym ACID stand for in database transactions?

- a) Accuracy, Consistency, Isolation, Durability.
- b) Atomicity, Consistency, Isolation, Durability.
- c) Atomicity, Concurrency, Independence, Data.
- d) Access, Control, Independence, Duration.

38. Which command deletes the entire table or database structure?

- a) DELETE.
- b) TRUNCATE.
- c) DROP.
- d) ALTER.

39. Which of the following is NOT an advantage of the Relational Model?

- a) Simplicity.
- b) Reduced Data Redundancy.
- c) Free and low cost of physical storage.
- d) Data Independence.

40. In ER Modeling, a double rectangle represents a:

- a) Strong Entity.
- b) Weak Entity.
- c) Relationship.
- d) Multivalued Attribute.

- Q18** Write a query to retrieve the first name, last name, and email of all students, ordered alphabetically by their last name.
- Q19** Write a query using the LIKE wildcard operator to retrieve all students whose email addresses end with "@gmail.com".
- Q20** Write a query to retrieve students who enrolled between January 1, 2023, and December 31, 2023, using BETWEEN. Limit the result to 5 records.
- Q21** Write a query that joins the Students and Courses tables (through an Enrollments table) to display each student's name next to the course they are taking.
- Q22** Write a query to list all courses that do not have an instructor assigned (highlight those where instructor_id IS NULL).
- Q23** Write a nested subquery using the IN operator to find the names of all students enrolled in the "Advanced PHP OOP" course.
- Q24** Write the SQL statement(s) to insert TEN new students into the Students table, including their names (Last Name & First Name), email addresses, and enrollment dates.
- Q25** A student named "Uwimana Sifa" recently changed his phone number. Write an SQL query to update his phone number record.
- Q26** Write the SQL statement to delete the course called "Introduction to Php" from the Courses table.
- Q27** Write a query to retrieve the first name, last name, and email of all students, ordered alphabetically by their last name.
- Q28** Write a query using LIKE to retrieve all students whose email addresses end with "@gmail.com".
- Q29** Write a query using BETWEEN to retrieve students who enrolled in 2023. Limit the result to 5.
- Q30** Write a JOIN query to display each student's name next to the course name they are taking.
- Q31** Write a query to list all courses that do not have an instructor assigned.
- Q32** Write a subquery with the IN operator to find all students enrolled in "Advanced PHP OOP".
- Q33** Write a query using COUNT, GROUP BY, and HAVING to display only the courses that have more than 20 students enrolled.

Q34 — School Management System

Given the following tables:

```
students ( student_id, full_name, class_id )
classes ( class_id, class_name )
teachers ( teacher_id, teacher_name )
subjects ( subject_id, subject_name, teacher_id )
marks ( marks_id, student_id, subject_id, score )
```

- A. Write a query to add a new student named "Ineza Emmanuella" with student_id 100 into class_id 5.
- B. Write a query to change the class_id to 6 for ALL students who are currently in class_id 5.
- C. Write a query to display all student names (full_name) along with their class names (class_name). Only include students actually assigned to a class.
- D. Write a query to display ALL subjects (subject_name) and the teacher names (teacher_name). If a subject has no teacher, it should still appear.
- E. Write a query to find the names of all students who have a record in the marks table. Use a subquery with the IN operator.
- F. Write the commands to create a new user 'teacher_admin' (password: 'pass123') and grant them SELECT, INSERT, and UPDATE privileges only on the marks table.

Q35 – Q41 — School System 2

Given the following tables:

```
students ( student_id, full_name, class_id )
classes ( class_id, class_name )
teachers ( teacher_id, teacher_name )
```

- Q36 (DDL) Write a DDL command to create a database named school_db.
- Q37 (DCL) Write a DCL command to grant ALL privileges on school_db to a user named 'admin'@'localhost' with password 'secret123'.
- Q38 (DML) Write a DML command to INSERT a new student named "Paul" with student_id 10 into class_id 2.
- Q39 (DML) Write a DML command to UPDATE the class_id to 3 for the student whose student_id is 10.
- Q40 Write a query to retrieve all student names sorted in Descending (Z–A) order.
- Q41 Write a query using INNER JOIN to display the full_name of students along with their class_name.

Q42 – Q45 — Theory Questions

Q42 List four common types of NoSQL databases.

Q43 Briefly explain the difference between Logical Data Independence and Physical Data Independence.

Q44 What is the difference between the DROP and TRUNCATE commands?

Q45 Explain the difference between UNION and UNION ALL.