Name: _____ **Student ID:** _____

Exam Duration: 60 minutes

Points: 5 points per question

Note: Each question may have multiple correct answers. You are allowed to have one page of notes.

1. Why is an ERD primarily useful in database design? (5 points)

A. It guarantees all business rules are enforced in queries.

B. It helps visualize entities and their relationships.

C. It ensures automatic indexing of all tables.

D. It generates efficient SQL queries.

2. How many errors are in this SQL query? (5 points)

Query: SELECT name age FROM users WHERE username = "admin";

A. 0

B. 1

C. 2

D. 3

3. Which entity-relationship setup best fits an online course platform? (5 points)

A. Entities: Student, Course, Instructor | Relationships: Students enroll in Courses, Instructors teach Courses

B. Entities: Student, Instructor, Grade | Relationships: Students are taught by Instructors, Instructors assign Grades

C. Entities: Course, Instructor, Assignment | Relationships: Courses are assigned to Instructors, Assignments belong to Instructors

D. Entities: Student, Course, Department | Relationships: Students belong to Departments, Courses are part of Departments

4. Which set of attributes best fits an ERD for a library system? (5 points)

A. Entities: Book, Author, Library | Attributes: Title, Biography, Location

B. Entities: Member, Staff, Transaction | Attributes: Age, Salary, Timestamp

C. Entities: Book, Member, Loan | Attributes: Title, Name, Due Date

D. Entities: Book, Genre, Publisher | Attributes: Title, Category, Address

5. Which SQL data types best fit this sample data? (5 points)

A. OrderID: INT, Price: FLOAT, OrderDate: DATE

B. OrderID: VARCHAR, Price: DECIMAL, OrderDate: TIMESTAMP

C. OrderID: INT, Price: DECIMAL, OrderDate: DATETIME

D. OrderID: BIGINT, Price: STRING, OrderDate: TIME

6. Which SQL constraints best enforce data integrity? (5 points)

A. UserID: NOT NULL, Email: UNIQUE, Name: PRIMARY KEY

B. UserID: PRIMARY KEY, Email: UNIQUE, Name: NOT NULL

C. UserID: UNIQUE, Email: NOT NULL, Name: UNIQUE

D. UserID: PRIMARY KEY, Email: NOT NULL, Name: UNIQUE

7. Which of the following SQL operations ensures data integrity by enforcing rules on the values allowed in a column? (5 points)

A. Primary Key

B. Foreign Key

C. Check Constraint

D. Index

8. Which approach is best for generating unique IDs in a database? (5 points)

A. Auto-increment for sequential numeric IDs

B. Custom ID format based on business rules

C. UUID for globally unique identifiers

D. Using a manually entered primary key

9. Why did Edgar F. Codd choose relational algebra for databases? (5 points)

A. It provides a formal foundation based on set theory.

B. It simplifies database storage structures.

C. It ensures all queries run in constant time.

D. It avoids the need for indexing and optimization.

10. How does relational algebra operate on data? (5 points)

A. It manipulates sets of tuples.

B. It processes tuples separately.

C. It splits attributes into relations.

D. It performs only calculations.

11. Which relational algebra operation is used to retrieve specific columns from a relation? (5 points)

A. Selection (σ)

B. Projection (π)

C. Join (⋈)

D. Union (∪)

12. Which transformation optimizes the following relational algebra query? (5 points)

Query: π_name(σ_age > 30 (Employee ⋈ Department))

A. π_name(Employee ⋈ σ_age > 30 (Department))

B. σ_age > 30 (π_name (Employee ⋈ Department))

C. π_name(σ_age > 30 Employee ⋈ Department)

D. Employee ⋈ π_name(σ_age > 30 Department)

13. Which SQLite dot command is used to display the database schema? (5 points)

A. .read

B. .schema

C. .tables

D. .mode

14. How do PostgreSQL and SQLite handle primary key generation differently? (5 points)

A. PostgreSQL uses SERIAL, while SQLite auto-increments INTEGER PRIMARY KEY.

B. Both use SERIAL for automatic primary key generation.

C. SQLite requires manual primary key insertion, unlike PostgreSQL.

D. PostgreSQL does not support automatic primary key generation.

15. How do a console, API, and web interface differ? (5 points)

A. A web interface is text-based, an API is graphical, a console is automated.

B. A console is command-line, an API is programmatic, a web interface is graphical.

C. An API is for users, while a console and web interface automate tasks.

D. A console and API are the same, but a web interface has graphics.

16. Which SQL command is used to add a new column to an existing table? (5 points)

A. ADD COLUMN

B. MODIFY TABLE

C. UPDATE TABLE

D. ALTER TABLE

17. Which SQL command is used to create a new table? (5 points)

A. CREATE TABLE

B. ADD TABLE

C. NEW TABLE

D. INSERT TABLE

18. Which query correctly retrieves departments with more than 10 employees? (5 points)

A. SELECT department, COUNT*() FROM employees WHERE COUNT()* > 10;

B. SELECT department FROM employees GROUP BY department HAVING COUNT*() > 10;*

C. SELECT department FROM employees WHERE COUNT() > 10 GROUP BY department;

D. SELECT department, COUNT*() FROM employees HAVING COUNT()* > 10 GROUP BY department;

19. Which JOIN retrieves only matching rows from both tables? (5 points)

Query: SELECT employees.name, departments.name FROM employees ___ JOIN departments ON employees.dept_id = departments.id;

A. LEFT

B. RIGHT

C. INNER

D. FULL

20. Which statement correctly describes normalization levels in databases? (5 points)

A. Unnormalized form (UNF) allows duplicate and multi-valued attributes.

B. First normal form (1NF) eliminates duplicate rows but allows repeating groups.

C. Second normal form (2NF) requires 1NF and ensures all non-key attributes depend on the full primary key.

D. Third normal form (3NF) requires 2NF and ensures all attributes depend only on the primary key.