Course: Data Base Semester: 1st term 2025/2026	Lecturers: Dr. Nehal El Azaly, Dr. Dina Abdelhafiz
SQLQuestions (Revision)	

Introduction to Database & SQL

1. Question: Explain the purpose and basic syntax of the SQL SELECT statement. What is the function of the WHERE clause?
Answer: The SELECT statement is a Data Query Language (DQL) command used to retrieve data from a database. Its basic syntax is `SELECT column1, column2 FROM table_name;`. You specify the columns you want to see and the table from which to get them. The WHERE clause is an optional but crucial part of the SELECT statement. It is used to filter the records and return only those that satisfy a specified condition (e.g., `WHERE dept = 'Sales'`). Without a WHERE clause, the query returns all rows from the table.

2. Question: What is the difference between SELECT and SELECT DISTINCT? Provide a practical example of when you would use SELECT DISTINCT.
Answer: The standard SELECT statement retrieves all rows that match the query criteria, including duplicate values. SELECT DISTINCT, however, returns only unique values for the specified column(s). You would use SELECT DISTINCT when you need a list of unique entries without repetition. For example, to get a list of all unique product categories from a "Products" table (e.g., 'Electronics', 'Furniture') and avoid seeing the same category name multiple times, you would use: `SELECT DISTINCT Category FROM Products;`.

3. Question: Describe the function of Data Definition Language (DDL) in SQL. Name and explain three key DDL commands.
Answer: Data Definition Language (DDL) is a subset of SQL used to define, modify, and delete the structure of database objects like databases and tables. Three key DDL commands are:

- **CREATE DATABASE:** Used to create a new database (e.g., CREATE DATABASE COMPANY;).
- **CREATE TABLE:** Used to create a new table within a database, defining its columns and their data types (e.g., CREATE TABLE EMPLOYEE (...);).
- **DROP TABLE/DATABASE:** Used to permanently delete an entire table or database and its data (e.g., DROP TABLE EMPLOYEE;).

4. Question: What are SQL data types? List and explain five common data types used when creating a table.
Answer: SQL data types define the kind of data a column can hold. Five common types are:

- **INT (INTEGER):** Used for whole numbers (e.g., Employee ID).
- **VARCHAR(n):** Used for variable-length character strings, where 'n' is the maximum length (e.g., for names or addresses).
- **DATE/DATETIME:** Used for storing date and time values.
- **DECIMAL(p,s):** Used for precise numerical values with a specified precision (p) and scale (s), ideal for monetary values.
- **BOOLEAN/BOOL:** Used for true/false values.

5. Question: Explain the purpose of the PRIMARY KEY and NOT NULL constraints in a CREATE TABLE statement.
Answer: Constraints enforce rules on table data.

- **PRIMARY KEY:** Uniquely identifies each record in a table. It must contain UNIQUE values and cannot be NULL. A table can have only one primary key (e.g., empId INTEGER PRIMARY KEY).
- **NOT NULL:** Ensures that a column cannot have a NULL value, meaning a value must be provided for that column whenever a new record is inserted (e.g., name TEXT NOT NULL).

6. Question: What is the purpose of Data Manipulation Language (DML)? Name and explain the three core DML statements.
Answer: Data Manipulation Language (DML) is used for managing and manipulating data stored within existing database tables. The three core statements are:

- **INSERT INTO:** Adds new records/rows to a table (e.g., INSERT INTO EMPLOYEE VALUES (0001, 'Clark', 'Sales');).
- **UPDATE:** Modifies existing records in a table based on a condition (e.g., changing an employee's address).
- **DELETE:** Removes existing records from a table based on a condition.

7. Question: Explain the syntax and importance of the WHERE clause in UPDATE and DELETE statements.
Answer: The syntax for UPDATE is UPDATE table_name SET column = value WHERE condition; and for DELETE is DELETE FROM table_name WHERE condition;. The WHERE clause is critically important in both statements because it specifies which record(s) should be updated or deleted. If the WHERE clause is omitted, the UPDATE statement will modify *every* row in the table, and the DELETE statement will remove *all* rows, which could lead to catastrophic data loss.

8. Question: Describe the concept of a FOREIGN KEY. How does it help maintain referential integrity in a relational database?
Answer: A FOREIGN KEY is a column (or set of columns) in one table that refers to the PRIMARY KEY in another table. It creates a link between the two tables. It helps maintain referential integrity by ensuring that the value in the foreign key column must match an existing value in the referenced primary key column. This prevents orphaned records. For example, an EMPLOYEE_ID in a PAYROLL table must exist as an EMPLOYEE_ID in the EMPLOYEE table.

9. Question: What is the purpose of the AUTO_INCREMENT attribute, and on which kind of column is it typically used?
Answer: The AUTO_INCREMENT attribute automatically generates a unique, sequential number when a new record is inserted into a table. It is typically used on a primary key column (e.g., EMPLOYEE_ID INT AUTO_INCREMENT PRIMARY KEY) to ensure that each new record gets a unique identifier without requiring manual input.

10. Question: Explain the meaning and function of the ON DELETE CASCADE and ON UPDATE CASCADE clauses in a foreign key constraint.
Answer: These clauses define the behavior when a referenced record in the parent table is deleted or updated.

- **ON DELETE CASCADE:** If a record in the parent table (e.g., EMPLOYEE) is deleted, all related records in the child table (e.g., PAYROLL) will be automatically deleted. This ensures data consistency and prevents orphaned records.
- **ON UPDATE CASCADE:** If the primary key value in the parent table is updated, the change is automatically propagated to the corresponding foreign key values in the child table.

11. Question: Outline the step-by-step process of creating a new database and its tables, as demonstrated in the lecture with the "COMPANY" example.
Answer: The process is:
1. Create the database: CREATE DATABASE COMPANY;
2. Select the database to use: USE COMPANY;
3. Create the tables, defining columns, data types, and constraints. First, create the primary/independent table (e.g., CREATE TABLE EMPLOYEE (...)), then create the dependent table with the foreign key relationship (e.g., CREATE TABLE PAYROLL (... FOREIGN KEY ...)).

12. Question: Why is it necessary to use the USE COMPANY; command before creating tables or inserting data?
Answer: A single database management system (DBMS) can host multiple databases. The USE COMPANY; command tells the DBMS to set the "COMPANY" database as the current, active database. All subsequent commands (like CREATE TABLE, INSERT) will be executed within the context of this selected database.

13. Question: In the context of the INSERT statement, what do the "Affected Rows" in the output indicate?
Answer: The "Affected Rows" value in the output message indicates the number of rows that were successfully modified by the SQL statement. For an INSERT statement, this number tells you how many new records were added to the table (e.g., a value of '1' means one row was inserted).

14. Question: In the payroll table example, why was it necessary to use a SELECT query before inserting data?
Answer: The PAYROLL table required an EMPLOYEE_ID as a foreign key. Since the EMPLOYEE_ID in the EMPLOYEE table was set to AUTO_INCREMENT, its value was generated automatically upon the first insert. To get the correct EMPLOYEE_ID to use in the PAYROLL table, it was necessary to first

run SELECT * FROM EMPLOYEE; to retrieve and see the generated ID for the new employee.

15. Question: Describe a real-world scenario where you would use the UPDATE statement, including the crucial use of the WHERE clause.
Answer: A real-world scenario is when an employee moves to a new address. The SQL command would be UPDATE EMPLOYEE SET ADDRESS = 'New Address' WHERE EMPLOYEE_ID = 123;. The WHERE clause is crucial here to ensure that only the address for the specific employee with ID 123 is updated. Without it, the address for *every single employee* in the table would be changed to 'New Address'.

16. Question: What is the ultimate consequence of executing DELETE FROM EMPLOYEE; without a WHERE clause?
Answer: Executing DELETE FROM EMPLOYEE; without a WHERE clause will delete every single record in the EMPLOYEE table, resulting in a complete and empty table. This action is often irreversible and would lead to massive data loss.

17. Question: How does the UNIQUE constraint differ from the PRIMARY KEY constraint?
Answer: Both enforce uniqueness, but they are different. A PRIMARY KEY uniquely identifies each record and implicitly includes both UNIQUE and NOT NULL constraints. A table can have only one primary key. A UNIQUE constraint also ensures all values in a column are different, but it allows for NULL values (unless also defined as NOT NULL), and a table can have multiple unique constraints.

18. Question: Explain the relationship between the EMPLOYEE and PAYROLL tables as defined in the lecture. Why is this a "one-to-many" relationship?
Answer: The relationship is defined by the foreign key EMPLOYEE_ID in the PAYROLL table, which references the EMPLOYEE_ID primary key in the EMPLOYEE table. This is a "one-to-many" relationship because one employee (one record in the EMPLOYEE table) can have many payroll entries over time (many potential records in the PAYROLL table), but each payroll record is linked to only one specific employee.

19. Question: What is the practical significance of the message "Rows matched: 1 Changed: 1" after an UPDATE operation?
Answer: This message provides feedback on the update operation. "Rows

matched: 1" indicates that the WHERE clause found one record that met the criteria for updating. "Changed: 1" confirms that the value in one of the columns for that record was actually modified. If "Changed: 0" appeared, it would mean the row was found but the data was already set to the new value, so no change was made.

20. Question: Summarize the entire data lifecycle for an employee as demonstrated in the lecture, from hiring to termination, using the appropriate SQL commands.
Answer: The lifecycle is managed as follows:
1. **Hiring (Creation):** The employee is added to the EMPLOYEE table using INSERT INTO EMPLOYEE ....
2. **Payroll Setup (Linking):** A corresponding record is added to the PAYROLL table using INSERT INTO PAYROLL ..., linking it via the EMPLOYEE_ID.
3. **Change of Details (Update):** If the employee's details change (e.g., address), the record is modified using UPDATE EMPLOYEE ... WHERE ....
4. **Termination (Deletion):** When the employee leaves, their record is removed from the system using DELETE FROM EMPLOYEE WHERE .... Thanks to ON DELETE CASCADE, their linked payroll records are automatically deleted, maintaining database integrity.

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20 SQL Essay Questions with One-Statement Answers

1. **What is the primary purpose of the SELECT statement in SQL?**
   The SELECT statement retrieves data from a database.
2. **How does SELECT DISTINCT differ from regular SELECT?**
   SELECT DISTINCT returns only unique values, eliminating duplicates.

3. **What does DDL stand for and what is its main function?**
   DDL (Data Definition Language) defines and modifies database structure.
4. **What is the purpose of the CREATE DATABASE statement?**
   CREATE DATABASE creates a new SQL database.
5. **Why is the DROP DATABASE command considered dangerous?**
   DROP DATABASE permanently deletes an entire database.
6. **What does the CREATE TABLE statement accomplish?**
   CREATE TABLE creates a new table with defined columns and data types.
7. **What is the function of the DROP TABLE command?**
   DROP TABLE permanently deletes a table and all its data.
8. **What does DML stand for and what is its primary use?**
   DML (Data Manipulation Language) manipulates data within database tables.
9. **What is the purpose of the INSERT INTO statement?**
   INSERT INTO adds new records to a table.
10. **How does the UPDATE statement function in SQL?**
    UPDATE modifies existing records in a table.
11. **What is the main use of the DELETE statement?**
    DELETE removes records from a table.
12. **Why is the WHERE clause important in UPDATE and DELETE statements?**
    WHERE clause specifies which records to update or delete, preventing mass changes.
13. **What is a PRIMARY KEY in database design?**
    A PRIMARY KEY uniquely identifies each record in a table.
14. **What is the purpose of a FOREIGN KEY constraint?**
    A FOREIGN KEY creates a link between two related tables.
15. **What does the AUTO_INCREMENT attribute do?**
    AUTO_INCREMENT automatically generates unique sequential numbers for a column.
16. **What is the function of the NOT NULL constraint?**
    NOT NULL ensures a column must always contain a value.
17. **How does ON DELETE CASCADE protect database integrity?**
    ON DELETE CASCADE automatically deletes related records in child tables.
18. **What is the purpose of the USE statement in SQL?**
    USE selects which database to operate on for subsequent commands.

19. **Why are SQL data types important in table creation?**
Data types define what kind of data each column can store.
20. **What does referential integrity ensure in a database?**
Referential integrity maintains consistent relationships between related tables.