***1. What is SQL, and what are its different types of statements?***

-SQL (Structured Query Language) is a standard language for managing and manipulating relational databases.

- Types of SQL Statements:

- DDL (Data Definition Language): `CREATE`, `ALTER`, `DROP`, `TRUNCATE`

- DML (Data Manipulation Language): `SELECT`, `INSERT`, `UPDATE`, `DELETE`

- DCL (Data Control Language): `GRANT`, `REVOKE`

- TCL (Transaction Control Language): `COMMIT`, `ROLLBACK`, `SAVEPOINT`

***2. What is a Primary Key? How is it different from a Unique Key***

- Primary Key is a column or a set of columns that uniquely identifies each row in a table. It cannot contain `NULL` values and must be unique.

- Unique Key also ensures all values in a column are unique, but it can contain a single `NULL` value. Unlike the primary key, there can be multiple unique keys in a table.

**3.What is the difference between `INNER JOIN` and `OUTER JOIN`?**

- `INNER JOIN`: Returns only the rows that have matching values in both tables.

- `OUTER JOIN`: Can be of three types:

- `LEFT OUTER JOIN` (or `LEFT JOIN`): Returns all rows from the left table, and the matched rows from the right table. Unmatched rows from the right table will have `NULL` values.

- `RIGHT OUTER JOIN` (or `RIGHT JOIN`): Returns all rows from the right table, and the matched rows from the left table. Unmatched rows from the left table will have `NULL` values.

- `FULL OUTER JOIN`: Returns all rows when there is a match in either table. Rows with no match will have `NULL` values.

***4.What is Normalization? Explain its different forms.***

- Normalization is the process of organizing data in a database to reduce redundancy and improve data integrity.

- 1NF (First Normal Form): Ensures that all columns contain atomic (indivisible) values and each value in a column is of the same data type.

- 2NF (Second Normal Form): Ensures that the table is in 1NF and that all non-key attributes are fully functionally dependent on the primary key.

- 3NF (Third Normal Form): Ensures that the table is in 2NF and that all non-key attributes are not transitively dependent on the primary key.

**5. What is an Index in SQL, and how does it improve query performance?**

- An Index is a database object created on a table to improve the speed of data retrieval operations. It works like a pointer that helps the database engine quickly find rows without scanning the entire table.

- Indexes improve performance by:

- Reducing the amount of data that needs to be scanned.

- Organizing data in a way that makes searching faster (e.g., B-tree, hash indexes).

- However, indexes can slow down `INSERT`, `UPDATE`, and `DELETE` operations because the index must also be updated.

**6.What are ACID properties in SQL?**

-ACID stands for Atomicity, Consistency, Isolation, Durability

- Atomicity: Ensures that a transaction is fully completed or fully rolled back (all-or-nothing).

- Consistency: Ensures that the database remains in a consistent state before and after the transaction.

- Isolation: Ensures that transactions are executed independently and transparently.

- Durability: Ensures that the results of a committed transaction are permanently saved, even in the event of a system failure.

***7.What is the difference between `WHERE` and `HAVING` clauses?***

- `WHERE` clause: Used to filter rows before any grouping is done. It applies to individual rows and is used with `SELECT`, `UPDATE`, and `DELETE` statements.

- `HAVING` clause: Used to filter groups created by the `GROUP BY` clause. It applies to the grouped rows after the grouping has been performed.

***8.Explain the concept of a Foreign Key.***

- A Foreign Key is a column or a set of columns in one table that uniquely identifies rows in another table. It is used to establish a relationship between two tables, ensuring referential integrity by matching values with the primary key of the referenced table.

**9.What are Views in SQL? How are they different from Tables?**

- A View is a virtual table that is based on the result set of an SQL query. It does not store the data itself; instead, it stores the SQL query used to generate the view.

- Differences between Views and Tables:

- A view is a stored query, while a table stores data.

- Views are not directly manipulated by `INSERT`, `UPDATE`, and `DELETE` (depending on the database rules).

- Views provide a layer of security by restricting access to a subset of data from tables.

***10.What is a `JOIN`, and what are different types of `JOIN` operations?***

- A JOIN operation is used to combine rows from two or more tables based on a related column between them.

- `INNER JOIN`: Returns rows that have matching values in both tables.

- `LEFT JOIN` (or `LEFT OUTER JOIN`): Returns all rows from the left table and matched rows from the right table. Unmatched rows will contain `NULL`.

- `RIGHT JOIN` (or `RIGHT OUTER JOIN`): Returns all rows from the right table and matched rows from the left table. Unmatched rows will contain `NULL`.

- `FULL JOIN` (or `FULL OUTER JOIN`): Returns all rows when there is a match in either table.

- `CROSS JOIN`: Returns the Cartesian product of both tables.

- `SELF JOIN`: Joins a table with itself.

**11.What is a Subquery?**

- A Subquery is a query nested within another SQL query. Subqueries can be used in the `SELECT`, `INSERT`, `UPDATE`, or `DELETE` statements and can return a single value or a result set.

**12. Explain the concept of transactions in SQL.**

- A transaction is a unit of work that is performed against a database. It is a sequence of operations performed as a single logical unit of work. A transaction ensures that all operations are completed successfully; if not, the transaction is rolled back to the initial state.

***13.What is a Stored Procedure, and how is it different from a Function?***

- A Stored Procedure is a precompiled collection of SQL statements stored in the database, which can be executed as a single unit. Stored procedures can return zero, one, or multiple values.

- Differences from a Function:

- Functions must return a value (single scalar or table), whereas stored procedures may or may not.

- Functions can only have input parameters, while stored procedures can have both input and output parameters.

- Functions cannot change the data in the database (read-only), while stored procedures can perform DML operations.

***14.What are Triggers in SQL?***

- A Trigger is a set of SQL statements that automatically executes when a specific event occurs in the database (e.g., `INSERT`, `UPDATE`, `DELETE`).

- Triggers are used for maintaining data integrity, enforcing business rules, auditing changes, etc.

**15. What are the different types of relationships in databases?**

- One-to-One (1:1): A record in Table A is related to one and only one record in Table B.

- One-to-Many (1:N): A record in Table A can have multiple related records in Table B, but a record in Table B can only have one related record in Table A.

- Many-to-Many (M:N): Multiple records in Table A can be related to multiple records in Table B. Typically implemented using a junction table.

**16.How would you handle performance issues in SQL queries?**

* Performance issues can be addressed by:
  + Optimizing queries (e.g., avoiding SELECT \*, using WHERE clauses effectively).
  + Creating and maintaining indexes.
  + Analyzing query execution plans.
  + Using proper database schema design.
  + Reducing the use of subqueries and joins when possible.

**17.Describe the differences between UNION and UNION ALL.**

* **UNION:** Combines the results of two or more queries and removes duplicate rows.
* **UNION ALL:** Combines the results of two or more queries but includes all rows, including duplicates.

***18.SQL DATA TYPES.***

SQL data types define the type of data that can be stored in a column of a table. Different SQL databases might have variations in their data types, some of the most common major SQL databases:

* Numeric data type - INT, FLOAT, DECIMAL, DOUBLE PRECISION, ….
* Character & String Data Types - Text, Varchar, Char
* Date & Time Data Types – Date, Time, Timestamp, Datetime, …
* Boolean Data Type – Boolean = BOOLEAN can store values like TRUE or FALSE.
* Binary Data Types – Binary, Var binary, Blob (Binary Large Objects)
* Miscellaneous Data Types – Enum, Set.

***19.What Is SQL Constraints & Types?***

NOT NULL - Ensures that a column cannot have a NULL value

UNIQUE - Ensures that all values in a column are different / Unique.

PRIMARY KEY - A combination of a NOT NULL and UNIQUE. Uniquely identifies each row in a table

FOREIGN KEY - Ensures that a value in one table matches a value in another table's primary key. It creates a relationship between two tables.

CHECK - Ensures that the values in a column satisfies a specific condition

DEFAULT - Sets a default value for a column if no value is specified during an insert query.

CREATE INDEX - Used to create and retrieve data from the database very quickly