SQL

What is a Database?
A database is a collection of data that is organized, which is also called structured data.

What is a Relational Database?
A relational database is a type of database that organizes data into rows and columns, which collectively form a table where the data points are related to each other.

What is SQL?
SQL (Structured Query Language) is a standard programming language used for managing and manipulating relational databases. It allows users to create, read, update, and delete data within a database.

What are the different types of SQL commands?

- DDL **(Data Definition Language)**: CREATE, ALTER, DROP
- DML **(Data Manipulation Language)**: SELECT, INSERT, UPDATE, DELETE
- DCL **(Data Control Language)**: GRANT, REVOKE
- TCL **(Transaction Control Language)**: COMMIT, ROLLBACK, SAVEPOINT
- DQL **(Data Query Language)**: SELECT

What is a primary key?
A primary key is a unique identifier for each row in a table. It must contain unique values and cannot contain NULL values. Each table can have only one primary key.

What is a foreign key?
A foreign key is a field or collection of fields in one table that refers to the primary key in another table. It creates a relationship between the two tables.

What is normalization? Explain its types.
Normalization is the process of organizing data in a database to reduce redundancy and improve data integrity. Types of normalization:

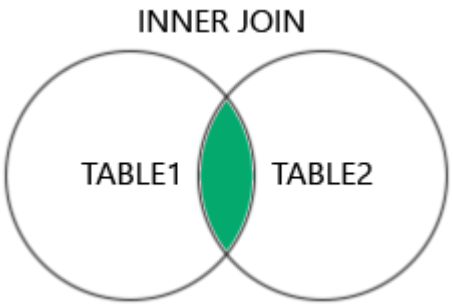
- 1NF **(First Normal Form)**: Remove duplicate columns from the same table and create separate tables for related data.
- 2NF **(Second Normal Form)**: Meets all the requirements of 1NF and ensures that all non-key attributes are fully functional and dependent on the primary key.
- 3NF **(Third Normal Form)**: Meets all the requirements of 2NF and ensures that no transitive dependency exists between non-key attributes.
- BCNF **(Boyce-Codd Normal Form)**: A stronger version of 3NF where every determinant is a candidate key.
- 4NF **(Fourth Normal Form):** It is in Boyce Codd's normal form and has no multi-valued dependency.
- 5NF **(Five Normal Form)**: It is in 4NF and does not contain any join dependency, joining should be lossless.

What is a stored procedure?
A stored procedure is a precompiled set of SQL statements stored in the database. It can be executed as a single SQL statement, allowing for efficient and secure database operations.

What is a join? List its types.
There are six types of join in SQL.

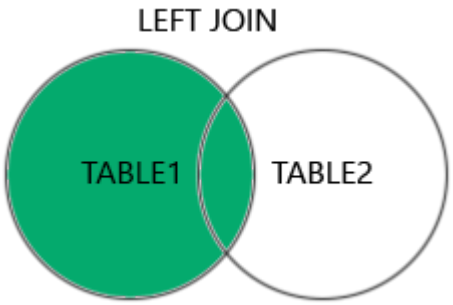
INNER JOIN: It Returns records that have matching values in both tables.

```
SELECT a.*, b.*
FROM table1 a
INNER JOIN table2 b ON a.id = b.id;
```



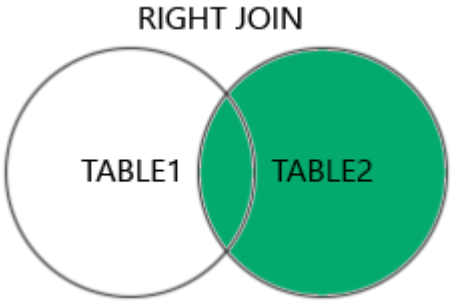
LEFT JOIN **(LEFT OUTER JOIN)**: It Returns all records from the left table and matches records from the right table.

```
SELECT a.*, b.*
FROM table1 a
LEFT JOIN table2 b ON a.id = b.id;
```



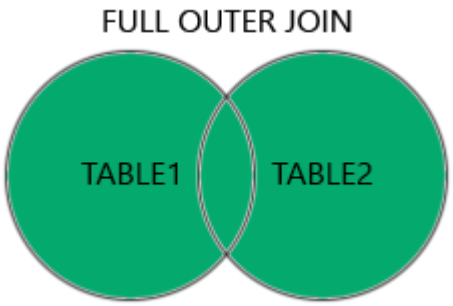
RIGHT JOIN **(RIGHT OUTER JOIN)**: It Returns all records from the right table and matches records from the left table.

```
SELECT a.*, b.*
FROM table1 a
RIGHT JOIN table2 b ON a.id = b.id;
```



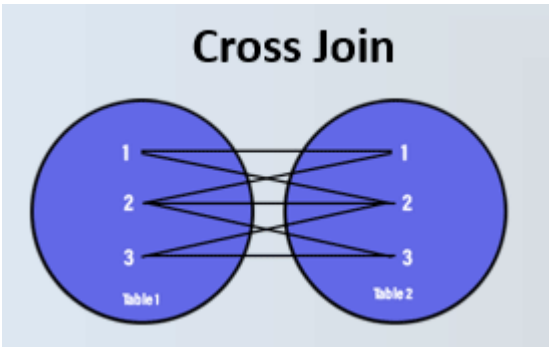
FULL JOIN **(FULL OUTER JOIN)**: It Returns all records when there is a match in either the left or right table.

```
SELECT a.*, b.*
FROM table1 a
FULL OUTER JOIN table2 b ON a.id = b.id;
```



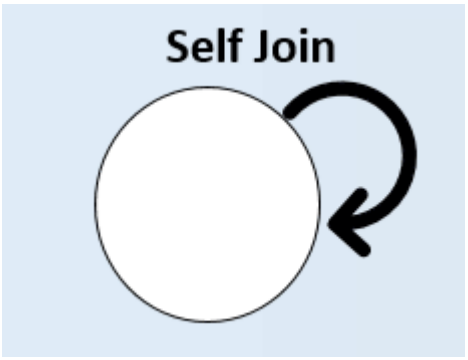
CROSS JOIN: It Returns the Cartesian product of both tables.

```
SELECT a.*, b.*
FROM table1 a
CROSS JOIN table2 b;
```



SELF JOIN: It Joins a table to itself.

```
SELECT a.*, b.*
FROM table1 a, table1 b
WHERE condition;
```



What is an index?
An index is a database object that improves the speed of data retrieval operations on a table by providing quick access to rows. It is created on one or more columns of a table.

What is a view?
A view is a virtual table created by a query, which can include columns from one or more tables in a database.

What is a subquery?
A subquery is a query nested within another query.

What is a transaction?

A transaction is a sequence of one or more SQL operations treated as a single unit of work. It ensures data integrity by following the ACID properties:

- Atomicity: All operations within a transaction are completed; otherwise, the transaction is aborted.
- Consistency: Ensures that the database changes state in a consistent manner.
- Isolation: Ensures that transactions are executed in isolation until they are completed.
- Durability: Ensures that the result of a transaction is permanently stored in the database.

What is the difference between UNION and UNION ALL?
UNION: Combines the result sets of two or more SELECT queries and removes duplicate rows.
UNION ALL: Combines the result sets of two or more SELECT queries without removing duplicates.

What are aggregate functions?
Aggregate functions are used to perform the calculations on multiple rows of a single column of a table. Examples include:

- COUNT(): Returns the number of rows.
- SUM(): Returns the sum of values.
- AVG(): Returns the average value.
- MAX(): Returns the maximum value.
- MIN(): Returns the minimum value.

What is the difference between WHERE and HAVING?
Where: The where clause helps to filter data from specific rows from a table based on certain conditions.
HAVING: The HAVING clause helps to filter data from a group of rows in a query based on conditions involving aggregate values.

What is Denormalization?
Denormalization is the inverse process of normalization, It is a database optimization technique in which we add redundant data to one or more tables.

What are the TRUNCATE, DELETE, and DROP statements?
A DELETE statement is used to delete rows from a table.
TRUNCATE command is used to delete all the rows from the table and free the space containing the table.
DROP command in SQL is used to delete a whole database or a table.

Keywords

Order By: it helps to sort the result set returned by a query.
Distinct: it helps to remove duplicate rows in the result set.
Where: it helps to filter rows based on a specified condition.
AND: combine two boolean expressions and return true if both expressions are true.
OR: combine two boolean expressions and return false if either expression is false.
Limit: it is used to limit the maximum number of records to return.

Fetch: it is used to get a specific part of rows returned by any query. it is similar to the Limit clause difference in that the fetch clause follows SQL standard while the limit is not.
Like: it filters data based on pattern-matching
Table aliases: it used to give a temporary name to a table/ column.
Group By: it is used for organizing similar data into groups.

Having: it is similar to WHERE. It is used to filter grouped rows instead of single rows like Where. WHERE keyword cannot be used with aggregate functions that's why we use Having.
UNION: it is used to combine the result set of two or more SELECT statements. it returns a unique record.
UNION All: it is similar to UNION but the difference is it returns duplicate records.

Intersect: it helps to combine two select statements and returns only the dataset that is common in both statements.
Except: It is used to retrieve all the unique records from the left operand (query), except the records that are present in the result set of the right operand (query).
Grouping sets: it is a set of columns by which the user groups. Grouping sets generate as similar result set as UNION ALL or multiple GROUP BY.

CUBE: it creates a result set that includes aggregates for all possible combinations of values in the columns that have been selected.
Rollup: it returns an output that shows aggregates for a hierarchy of values in the columns you've chosen.
Subquery – write a query nested inside another query.
Correlated subquery: it is a subquery that references the columns from the outer query.
ANY: It means that the condition will be true if the operation is true for any of the values in the range.
ALL: It means that the condition will be true only if the operation is true for all values in the range.

EXISTS: This operator is used to test for the existence of any record in a subquery.
Upsert: it is a database operation that will update an existing row if a specified value already exists in a table, and insert a new row if the specified value doesn't already exist.

BEGIN: Start a transaction.
COMMIT: Save changes made in the transaction.
ROLLBACK: Undo uncommitted changes made in the transaction.

Trigger: A trigger is a stored procedure in a database that automatically invokes whenever a special event in the database occurs.