

EXPERIMENT – 01

INTRODUCTION TO SQL AND ITS COMPONENTS

SQL:

SQL is the standard language for dealing with Relational Databases. SQL can be used to insert, search, update, and delete database records. SQL can do lots of other operations, including optimizing and maintenance of databases. SQL stands for Structured Query Language, pronounced as “S-Q-L” or sometimes as “See-Quel.” Relational databases like MySQL use SQL.

History of SQL:

1970 – Dr. Edgar F. “Ted” Codd described a relational model for databases.

1974 – Structured Query Language appeared.

1978 – IBM released a product called System R.

1986 – IBM developed the prototype of a relational database, which is standardized by ANSI.

1987 – First-ever version launched of SQL.

1999 – SQL 3 launched with features like triggers, object-orientation, etc.

SQL 2003 – Window functions, XML-related features, etc.

SQL 2006 – Support for XML Query Language.

SQL 2011 – Improved support for temporal databases.

Features of SQL:

- 1) Flexibility and Scalability: SQL offers more flexibility and scalability for relational database management systems.
- 2) A Comprehensive Application Development Tool.
- 3) Rich Functional Support.
- 4) High Performance.
- 5) High Accessibility.
- 6) High Security.
- 7) SQL's Management Ease.

Uses of SQL:

1. Helps users access data in RDBMS systems.
2. Describes data and allows defining and manipulating data in databases.
3. Enables creating and dropping databases and tables.
4. Provides functions for creating views and stored procedures.
5. Allows setting permissions on tables, procedures, and views.

Datatypes in SQL:

SQL datatypes define the type of value that can be stored in a table column. For example, if we want a column to store only integer values, we can define its datatype as INT.

SQL datatypes can be broadly divided into the following categories:

- 1) Numeric Datatypes: INT, TINYINT, BIGINT, FLOAT, REAL, etc.
- 2) Date & Time Datatypes: DATE, TIME, DATETIME, etc.
- 3) Character & String Datatypes: CHAR, VARCHAR, TEXT, etc.
- 4) Unicode Character String Datatypes: NCHAR, NVARCHAR, NTEXT, etc.
- 5) Binary Datatypes: BINARY, VARBINARY, etc.
- 6) Miscellaneous Datatypes: CLOB, BLOB, XML, CURSOR, TABLE, etc.

String Datatypes:

Data Type	Description
CHAR(size)	A fixed length string (can contain letters, numbers, and special characters). Default is 1.
VARCHAR(size)	A variable length string (can contain letters, numbers, and special characters). Size can be 0 to 65535.
BINARY(size)	Equal to CHAR, but stores binary byte strings. The size specifies column length in bytes. Default is 1.
VARBINARY(size)	Equal to VARCHAR, but stores binary byte strings. The size specifies maximum column length in bytes.

Numeric Datatypes:

Data Type	Description
BOOL	Zero is considered as false; nonzero values are considered as true.
INTEGER(size)	A medium integer. Signed range is from -2147483648 to 2147483647.
FLOAT(size,d)	A floating-point number. Total digits in size, digits after decimal in d. Deprecated in MySQL 8.0.17.

Date and Time Datatypes:

Data Type	Description
DATE	A date in the format YYYY-MM-DD.
DATETIME(fsp)	A date and time combination in the format YYYY-MM-DD hh:mm:ss.
TIME(fsp)	A time in the format hh:mm:ss.
YEAR	A year value from 1901 to 2155 (two-digit format not supported in MySQL 8.0).

COMPONENTS OF SQL:

SQL commands are divided into five categories:

1. Data Definition Language (DDL)
2. Data Manipulation Language (DML)
3. Data Control Language (DCL)
4. Transaction Control Language (TCL)
5. Data Query Language (DQL)

DATA DEFINITION LANGUAGE:

The Data Definition Language (DDL) consists of SQL statements used to define the database structure or schema. It simply deals with descriptions of the database schema and is used to create and modify the structure of database objects in databases.

The DDL provides a set of definitions to specify the storage structure and access methods used by the database system.

A DDL performs the following functions:

- 1) It should identify the type of data division such as data item, segment, record, and database file.
- 2) It gives a unique name to each data item type, record type, file type, and database.
- 3) It should specify the proper data type.
- 4) It should define the size of the data item.
- 5) It may define the range of values that a data item may use.
- 6) It may specify privacy locks for preventing unauthorized data entry.

SQL commands that come under Data Definition Language are:

- Create: To create tables in the database.
- Alter: Alters the structure of the database.
- Drop: Deletes tables from the database.
- Truncate: Removes all records from a table, also releases the space occupied by those records.

DATA MANIPULATION LANGUAGE:

A Data Manipulation Language (DML) is a computer programming language used for adding (inserting), removing (deleting), and modifying (updating) data in a database. In SQL, the data manipulation language comprises the SQL-data change statements, which modify stored data but not the schema of the database table.

After the database schema has been specified and the database has been created, the data can be manipulated using a set of procedures that are expressed by DML.

By Data Manipulation we mean:

- Insertion of new information into the database
- Retrieval of information stored in a database
- Deletion of information from the database
- Modification of data stored in the database

The DML is basically of two types:

- 1) Procedural DML: Requires a user to specify what data is needed and how to get it.
- 2) Non-Procedural DML: Requires a user to specify what data is needed without specifying how to get it.

SQL commands that come under Data Manipulation Language are:

- Insert: Inserts data into a table.
- Update: Updates the existing data within a table.
- Delete: Deletes all records from a table, but not the space occupied by them.

DATA CONTROL LANGUAGE:

A Data Control Language (DCL) is a programming language used to control the access of data stored in a database. It is used for controlling privileges in the database (Authorization). The privileges are required for performing all the database operations such as creating sequences, views of tables, etc.

SQL commands that come under Data Control Language are:

- Grant: Grants permission to one or more users to perform specific tasks.
- Revoke: Withdraws the access permission given by the Grant statement.

TRANSACTIONAL CONTROL LANGUAGE:

Transactional control language (TCL) commands are used to manage transactions in the database. These are used to manage the changes made to the data in a table by DML statements.

SQL commands that come under Transactional Control Language are:

- Commit: Saves any transaction into the database permanently.
- Roll back: Restores the database to the last commit state.
- Save point: Temporarily saves a transaction so that you can rollback.

DATA QUERY LANGUAGE:

The Data Query Language consists of commands used to query or retrieve data from a database.

One such SQL command in Data Query Language is:

- Select: It displays the records from the table.