LAB:1

Introduction to SQL

SQL Overview

SQL is a language of database, it includes database creation, deletion, fetching rows and modifying rows etc.SQL is an ANSI (American National Standards Institute) standard, but there are many different versions of the SQL language.

What is SQL?
SQL is Structured Query Language, which is a computer language for storing, manipulating and retrieving data stored in relational database.

SQL is the standard language for Relation Database System. All relational database management systems like MySQL, MS Access, Oracle, Sybase, Informix, postgres and SQL Server use SQL as standard database language.

Also, they are using different dialects, such as:

- MS SQL Server using T-SQL,
- Oracle using PL/SQL,
- MS Access version of SQL is called JET SQL (native format) etc.

Why SQL?

- Allows users to access data in relational database management systems.
- Allows users to describe the data.
- Allows users to define the data in database and manipulate that data.
- Allows to embed within other languages using SQL modules, libraries & pre -compilers.
- Allows users to create and drop databases and tables.
- Allows users to create view, stored procedure, functions in a database.
- Allows users to set permissions on tables, procedures and views

History:

- 1970 -- Dr. E. F. "Ted" of IBM is known as the father of relational databases. He described a relational model for databases.
- 1974 -- Structured Query Language appeared.
- 1978 -- IBM worked to develop Codd's ideas and released a product named System/R.

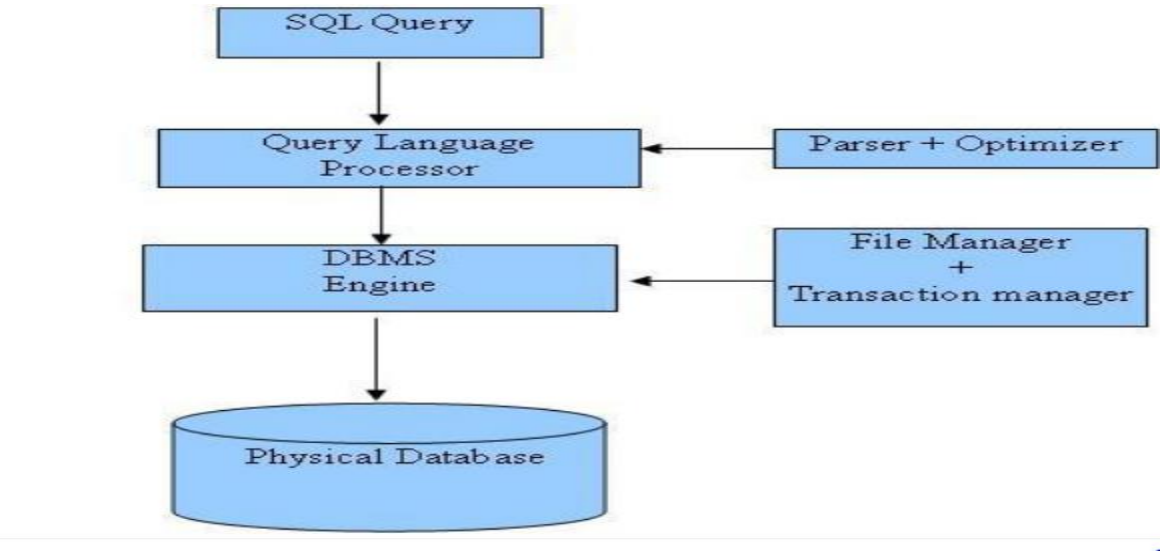
 1986 -- IBM developed the first prototype of relational database and standardized by ANSI. The first relational database was released by Relational Software and its later becoming Oracle.

SQL Process:

When you are executing an SQL command for any RDBMS, the system determines the best way to carry out your request and SQL engine figures out how to interpret the task.

There are various components included in the process. These components are Query Dispatcher, Optimization Engines, Classic Query Engine and SQL Query Engine, etc. Classic query engine handles all non-SQL queries, but SQL query engine won't handle logical files.

Following is a simple diagram showing SQL Architecture:



SQL Commands:

The standard SQL commands to interact with relational databases are CREATE, SELECT, INSERT, UPDATE, DELETE and DROP. These commands can be classified into groups based on their nature:

DDL - Data Definition Language:

Command	Description
CREATE	Creates a new table, a view of a table, or other object in database
ALTER	Modifies an existing database object, such as a table.
DROP	Deletes an entire table, a view of a table or other object in the database.

DML - Data Manipulation Language:

Command	Description
INSERT	Creates a record
UPDATE	Modifies records
DELETE	Deletes records

DCL - Data Control Language:

Command	Description
GRANT	Gives a privilege to user
REVOKE	Takes back privileges granted from user

DQL - Data Query Language:

Command	Description
SELECT	Retrieves certain records from one or more tables

What is RDBMS?

RDBMS stands for Relational Database Management System. RDBMS is the basis for SQL and for all modern database systems like MS SQL Server, IBM DB2, Oracle, MySQL, and Microsoft Access.

A Relational database management system (RDBMS) is a database management system (DBMS) that is based on the relational model as introduced by E. F. Codd.

What is table?

The data0 in RDBMS is stored in database objects called tables. The table is a collection of related data entries and it consists of columns and rows.

Remember, a table is the most common and simplest form of data storage in a relational database. Following is the example of a CUSTOMERS table:

```
+----+----------+-----+-----------+----------+
| ID | NAME     | AGE | ADDRESS   | SALARY   |
+----+----------+-----+-----------+----------+
|  1 | Ramesh   |  32 | Ahmedabad |  2000.00 |
|  2 | Khilan   |  25 | Delhi     |  1500.00 |
|  3 | kaushik  |  23 | Kota      |  2000.00 |
|  4 | Chaitali |  25 | Mumbai    |  6500.00 |
|  5 | Hardik   |  27 | Bhopal    |  8500.00 |
|  6 | Komal    |  22 | MP        |  4500.00 |
|  7 | Muffy    |  24 | Indore    | 10000.00 |
+----+----------+-----+-----------+----------+
```

What is field?

Every table is broken up into smaller entities called fields. The fields in the CUSTOMERS table consist of ID, NAME, AGE, ADDRESS and SALARY.

A field is a column in a table that is designed to maintain specific information about every record in the table.

What is record or row?

A record, also called a row of data, is each individual entry that exists in a table. For example , there are 7 records in the above CUSTOMERS table. Following is a single row of data or record in the CUSTOMERS table:

```
+----+----------+-----+-----------+----------+
|  1 | Ramesh   |  32 | Ahmedabad |  2000.00 |
+----+----------+-----+-----------+----------+
```

A record is a horizontal entity in a table.

What is column?

A column is a vertical entity in a table that contains all information associated with a specific field in a table.For example, a column in the CUSTOMERS table is ADDRESS, which represents location description and would consist of the following:

```
+------------+
| ADDRESS    |
+------------+
| Ahmedabad  |
| Delhi      |
| Kota       |
| Mumbai     |
| Bhopal     |
| MP         |
| Indore     |
+----+-------+
```

SQL Data Types

SQL data type is an attribute that specifies type of data of any object. Each column, variable and expression has related data type in SQL.

You would use these data types while creating your tables. You would choose a particular data type for a table column based on your requirement.

SQL Server offers six categories of data types for your use:

Exact Numeric Data Types

DATA TYPE	FROM	TO
Bigint	-9,223,372,036,854,775,808	9,223,372,036,854,775,807
Int	-2,147,483,648	2,147,483,647
Smallint	-32,768	32,767
Tinyint	0	255
Bit	0	1
Decimal	-10^38 +1	10^38 -1
Numeric	-10^38 +1	10^38 -1
Money	-922,337,203,685,477.5808	+922,337,203,685,477.5807
Smallmoney	-214,748.3648	+214,748.3647

Approximate Numeric Data Types:

DATA TYPE	FROM	TO
Float	-1.79E + 308	1.79E + 308
Real	-3.40E + 38	3.40E + 38

Date and Time Data Types:

DATA TYPE	FROM	TO
Datetime	Jan 1, 1753	Dec 31, 9999
Smalldatetime	Jan 1, 1900	Jun 6, 2079
Date	Stores a date like June 30, 1991	
Time	Stores a time of day like 12:30 P.M.	

Character Strings Data Types:

DATA TYPE	FROM	TO
Char	Char	Maximum length of 8,000 characters.(Fixed length non-Unicode characters)
Varchar	Varchar	Maximum of 8,000 characters.(Variable-length non-Unicode data).
varchar(max)	varchar(max)	Maximum length of 231characters, Variable-length non-Unicode data (SQL Server 2005 only).
Text	text	Variable-length non-Unicode data with a maximum length of 2,147,483,647 characters.

Unicode Character Strings Data Types:

DATA TYPE	Description
Nchar	Maximum length of 4,000 characters.(Fixed length Unicode)
Nvarchar	Maximum length of 4,000 characters.(Variable length Unicode)
nvarchar(max)	Maximum length of 231characters (SQL Server 2005 only).(Variable length Unicode)
Ntext	Maximum length of 1,073,741,823 characters. (Variable length Unicode)

Binary Data Types:

DATA TYPE	Description
Binary	Maximum length of 8,000 bytes(Fixed-length binary data)
Varbinary	Maximum length of 8,000 bytes.(Variable length binary data)
varbinary(max)	Maximum length of 231 bytes (SQL Server 2005 only). (Variable length Binary data)
Image	Maximum length of 2,147,483,647 bytes. (Variable length Binary Data)

Misc Data Types:

DATA TYPE	Description
sql_variant	Stores values of various SQL Server-supported data types, except text, ntext, and timestamp.
timestamp	Stores a database-wide unique number that gets updated every time a row gets updated
uniqueidentifier	Stores a globally unique identifier (GUID)
xml	Stores XML data. You can store xml instances in a column or a variable (SQL Server 2005 only).
cursor	Reference to a cursor object
table	Stores a result set for later processing

SQL CREATE Database

The SQL CREATE DATABASE statement is used to create new SQL database.

Syntax:

CREATE DATABASE DatabaseName;

Always database name should be unique within the RDBMS.

Example:

If you want to create new database <testDB>, then CREATE DATABASE statement would be as follows:

```
SQL> CREATE DATABASE testDB;
```

DROP or DELETE Database

The SQL DROP DATABASE statement is used to drop an existing database in SQL schema.

Syntax:

```
DROP DATABASE DatabaseName;
```

Example:

If you want to delete an existing database <testDB>, then DROP DATABASE statement would be as follows:

```
SQL> DROP DATABASE testDB;
```

NOTE: Be careful before using this operation because by deleting an existing database would result in loss of complete information stored in the database.

Make sure you have admin privilege before dropping any database.

SQL CREATE Table

Creating a basic table involves naming the table and defining its columns and each column's data type.

The SQL CREATE TABLE statement is used to create a new table.

Syntax:

```
CREATE TABLE table_name(
   column1 datatype,
   column2 datatype,
   column3 datatype,
   .....
   columnN datatype,
   PRIMARY KEY( one or more columns )
);
```

CREATE TABLE is the keyword telling the database system what you want to do. In this case, you want to create a new table. The unique name or identifier for the table follows the CREATE TABLE statement.Then in brackets comes the list defining each column in the table and what sort of data type it is. The syntax becomes clearer with an example below.

A copy of an existing table can be created using a combination of the CREATE TABLE statement and the SELECT statement. You can check complete details at Create Table Using another Table.

Create Table Using another Table (Note: it may not work in MS Sql server)

A copy of an existing table can be created using a combination of the CREATE TABLE statement and the SELECT statement.

The new table has the same column definitions. All columns or specific columns can be selected.

When you create a new table using existing table, new table would be populated using existing values in the old table.

Syntax:

```
CREATE TABLE NEW_TABLE_NAME AS
   SELECT [ column1, column2...columnN ]
   FROM EXISTING_TABLE_NAME
   [ WHERE ]
```

Example:

Following is an example, which would create a table SALARY using CUSTOMERS table and having fields customer ID and customer SALARY:

```
SQL> CREATE TABLE SALARY AS
   SELECT ID, SALARY
   FROM CUSTOMERS;
```

SQL DROP or DELETE Table

The SQL DROP TABLE statement is used to remove a table definition and all data, indexes, triggers, constraints, and permission specifications for that table.

NOTE: You have to be careful while using this command because once a table is deleted then all the information available in the table would also be lost forever. Syntax:

```
DROP TABLE table_name;
```

SQL INSERT Query

The SQL INSERT INTO Statement is used to add new rows of data to a table in the database.
Syntax:

```
INSERT INTO TABLE_NAME (column1, column2, column3,...columnN)]
VALUES (value1, value2, value3,...valueN);
```

Here, column1, column2,...columnN are the names of the columns in the table into which you want to insert data. You may not need to specify the column(s) name in the SQL query if you are adding values for all the columns of the table. But make sure the order of the values is in the same order as the columns in the table.

The SQL INSERT INTO syntax would be as follows:

```
INSERT INTO TABLE_NAME VALUES (value1,value2,value3,...valueN);
```

Example:

Following statements would create two records in CUSTOMERS table:

```
INSERT INTO CUSTOMERS (ID,NAME,AGE,ADDRESS,SALARY)
VALUES (1, 'Ramesh', 32, 'Ahmedabad', 2000.00 );

INSERT INTO CUSTOMERS (ID,NAME,AGE,ADDRESS,SALARY)
VALUES (2, 'Khilan', 25, 'Delhi', 1500.00 );
```

Populate one table using another table:

You can populate data into a table through select statement over another table provided another table has a set of fields, which are required to populate first table. Here is the syntax:

```
INSERT INTO first_table_name [(column1, column2, ... columnN)]
   SELECT column1, column2, ...columnN
   FROM second_table_name
   [WHERE condition];
```

SQL SELECT Query

SQL SELECT Statement is used to fetch the data from a database table which returns data in the form of

result table. These result tables are called result-sets.

Syntax:

```
SELECT column1, column2, columnN FROM table_name;
```

Here, column1, column2...are the fields of a table whose values you want to fetch. If you want to fetch all the fields available in the field, then you can use the following syntax:

```
SELECT * FROM table_name;
```

Example:

Consider the CUSTOMERS table having the following records:

ID	NAME	AGE	ADDRESS	SALARY
1	Ramesh	32	Ahmedabad	2000.00
2	Khilan	25	Delhi	1500.00
3	kaushik	23	Kota	2000.00
4	Chaitali	25	Mumbai	6500.00
5	Hardik	27	Bhopal	8500.00
6	Komal	22	MP	4500.00
7	Muffy	24	Indore	10000.00

Following is an example, which would fetch ID, Name and Salary fields of the customers available in CUSTOMERS table:

```
SQL> SELECT ID, NAME, SALARY FROM CUSTOMERS;
```

ID	NAME	SALARY
1	Ramesh	2000.00
2	Khilan	1500.00
3	kaushik	2000.00
4	Chaitali	6500.00
5	Hardik	8500.00
6	Komal	4500.00
7	Muffy	10000.00

SELECT INTO Statement

The SQL Server (Transact-SQL) SELECT INTO statement is used to create a table from an existing table by copying the existing table's columns.

It is important to note that when creating a table in this way, the new table will be populated with the records from the existing table (based on the SELECT Statement).

Syntax

SELECT expressions
INTO new_table
FROM tables
WHERE conditions;

The ALTER TABLE Statement

The ALTER TABLE statement is used to add, delete, or modify columns in an existing table.

Syntax

To add a column in a table, use the following syntax:
ALTER TABLE table_name
ADD column_name datatype

To delete a column in a table, use the following (notice that some database systems don't allow deleting a column):

syntax
ALTER TABLE table_name
DROP COLUMN column_name

To change the data type of a column in a table, use the following :Syntax:

SQL Server / MS Access:
ALTER TABLE table_name
ALTER COLUMN column_name datatype

My SQL / Oracle (prior version 10G):
ALTER TABLE table_name
MODIFY COLUMN column_name datatype

Oracle 10G and later:
ALTER TABLE table_name
MODIFY column_name datatype

```
To rename the column table:
Syntax :
sp_rename 'table_name.old_column_name', 'new_column_name', 'COLUMN';

To rename existing table:
sp_rename 'old_table_name', 'new_table_name';
```

LAB TASK:

Create a database named ‘HCOE’ and create tables as following shcema:

Student(ID,Name,RN,Batch)

Teacher(TID,Name, Faculty)

1. Insert any five records in each table
2. Display all records.
3. Display only *ID* and *Name* from student table.
4. Display *Name* and *faculty* from Teacher table.
5. Remove ‘*RN’* attribute from student relation.
6. Add ‘*salary’* attribute to teacher relation.
7. Copy *ID* and *name* attribute to new relation ‘*info_student’*.
8. Delete all contents from *info_student* relation