

UNIT-3 : Relational Database Management System (RDBMS)

Database - A database is an organized collection of data. For example:- In a stationary shop, detailed records of the materials available in the shop is database. Similarly in a computerized system, we need to maintain several files, we would use database programs such as Microsoft Access, OpenOffice.org Base, and MySQL. These database programs are used to organize the data as per our needs in the computer system.

Database Management System (DBMS) - A database management system is a software package with computer programs that controls the creation, maintenance and use of a database. A DBMS allows different user application programs to concurrently access the same database. Some of the DBMSs are Oracle, IBM DB2, Microsoft SQL server, Microsoft Access, PostgreSQL, MySQL, FoxPro and SQLite.

Advantages of Database

Reduces Data Redundancy : no chance of encountering duplicated data

Sharing of Data : the users of the database can share the data among themselves

Data Integrity : Data integrity means that the data is accurate and consistent in the database

Data Security : Only authorized users are allowed to access the database and their identity is authenticated using a username and password

Privacy : The privacy rule in a database states that only the authorized users can access a database according to its privacy constraints

Backup and Recovery : Database Management System automatically takes care of backup and recovery.

Data Consistency : Data Consistency means there should be multiple mismatching copies of the same data.

Data can be organized into two types:-

Flat File: Data is stored in a single table. Usually suitable for less amount of data.

Relational: Data is stored in multiple tables and the tables are linked using a common field. Relational is suitable for medium to large amount of data.

Database Servers - Database servers are dedicated computers that hold the actual databases and run only the DBMS and related software. Databases on the database servers are accessed through command line or graphic user interface tools referred to as **Frontends**; database servers are referred to as **Back-ends**. Such type of data access is referred to as Client-server model.

RDBMS:- A relational database management system (RDBMS) is a database management system that is based on the relational model. In the relational model of a database, all data is represented in terms of **tuples (rows)**, grouped into **relations (tables)**. A database organized in terms the relational model is a relational database.

Database Concepts:- Database contains objects that are used for storing and managing information.

1. **Item** : - Item is about which information is stored in the database.
2. **Field**:- Each question that we ask about our item is a **Field**.
3. **Record**:- Record is a set of information (made up of fields) stored in your database about one of the items.
4. **Value**:- Value is the actual text or numerical amount or data that you put in while adding information to your database.

For example, Database : Employee

Emp_Code	Emp_Name	Emp_Addresses	Emp_Designatio	Emp_ContactNo	Emp_Salary
E001	ABC	Meerut	Manager	9876543210	Rs.50000

Item : Employee

Field : Emp_Code , Emp_Name , Emp_Address , Emp_Designation ,Emp_ContactNo , Emp_Salary

Record :

E001	ABC	Meerut	Manager	987654321	Rs. 50,000
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Value : E001 , ABC , Meerut , Manager , 9876543210 , Rs. 50,000

5. **Key Field :-** Key Field is a value in a Field that uniquely identifies the record. Eg. E001 which is unique to every employee.

Important Question :- How data is organized in a RDBMS ?

Ans :- In RDBMS, data is organized in the form of inter linked tables.

TABLE :- A table is a set of data elements that is organized using a model of vertical columns and horizontal rows. Each row is identified by a unique key index or the key field.

COLUMNS OR FIELD :- A column is a set of data values of a particular simple type, one for each row of the table. For eg. Emp_Code , Emp_Name , Emp_Address etc.

ROWS OR RECORDS OR TUPLES :- A row represents a single, data items in a table. Each row in a table represents a set of related data, and every row in the table has the same structure.

DATA TYPES :- Datatypes are used to identify the type of data we are going to store in the database.

Categories of data types:- Data types can be broadly classified into five categories:-

- 1.** Numeric Types
- 2.** Alphanumeric Types
- 3.** Binary Types
- 4.** Date Time
- 5.** Other variable Types

NUMERIC TYPES:- They are used for describing numeric values like mobile number, age, etc.

The different types of numeric data types available are-

- | | |
|-----------------------------|------------|
| 1. Boolean (Yes / No) | 6. Numeric |
| 2. TinyInt (Tiny Integer) | 7. Decimal |
| 3. SmallInt (Small Integer) | 8. Real |
| 4. Integer | 9. Float |
| 5. BigInt (Big Integer) | 10. Double |

ALPHANUMERIC TYPES:-

The list of different datatypes available in alphanumeric types are

- | | |
|-----------------------|--|
| 1. LongVarChar (Memo) | (Long Text) |
| 2. Char | (Text-fix) (Small Text) |
| 3. VarChar | (Text) (Text of specified Length) |
| 4. VarChar_IgnoreCase | (Text) (Comparisons are not casesensitive) |

BINARY TYPES:-

Binary types are used for storing data in binary formats. It can be used for storing photos, music files or (in general file of any format) etc.

The list of different datatypes available in Binary types are :-

1. LongVarBinary (Image)
2. Binary (Binary (fix))
3. VarBinary (Binary)

DATE TIME:-

Date time data types are used for describing date and time values for the field used in the table of a database. It can be used for storing information such as date of birth, date of admission etc.

The list of different data types available in Date Time type are :-

1. Date (Stores month, day and year information)
2. Time (Store hour , minute and second information)
3. Timestamp (Stores date and time information)

PRIMARY KEY:- A primary key is a unique value that identifies a row in a table. These keys are also indexed in the database, making it faster for the database to search a record.

FOREIGN KEY:- The foreign key identifies a column or set of columns in one (referencing) table that refers to a column or set of columns in another (referenced) table.

Note:- The “one” side of a relation is always the parent, and provides the PK(Primary Key) Attributes to be copied. The “many” side of a relation is always the child, into which the FK(Foreign Key) attributes are copied.

Memorize it : one, parent, PK (Primary Key) ; many, child , FK(Foreign Key)

There are two types of languages:-

1. DDL (Data Definition Language)
2. DML (Data Manipulation Language)

DATA DEFINITION / DESCRIPTION LANGUAGE:- It is a standard for commands that define the different structures in a database. DDL statements create, modify and remove database objects such as tables, indexes and users.

Common DDL Statements are:-

1. **Create** :- Used to create database objects.
2. **Alter** :- Used to modify database objects.
3. **Drop** :- Used to delete database objects.

DATA MANIPULATION LANGUAGE:- It is a standard for commands that enables users to access and manipulate data in a database.

Common DML Statements are:-

1. **SELECT** :- Used for retrieval of information from the database.
2. **INSERT** :- Used for insertion of new information into the database.
3. **DELETE** :- Used for deletion of information in the database.
4. **UPDATE** :- Used for modification of information in the database.

Types of DML:-

1. **Procedural**:- The user specifies what data is needed and how to get it.
2. **Non Procedural** :- The user only specifies what data is needed.

Note:- A popular data manipulation language is SQL (Structured Query Language.)

In this article on SQL Commands, I am going to consider the below database as an example, to show you how to write commands.

Employee_Info

EmployeeID	EmployeeName	Emergency ContactName	PhoneNumber	Address	City	Country
01	Shanaya	Abhinay	9898765612	Oberoi Street 23	Mumbai	India
02	Anay	Soumya	9432156783	Marathalli House No 23	Delhi	India
03	Preeti	Rohan	9764234519	Queens Road 45	Bangalore	India

CREATE : To create Table **CREATE**

TABLE Employee_Info

DROP : To Delete **DROP DATABASE Employee**(complete information present in the database will be lost)

DROP TABLE TableName(complete information present in the table will be lost)

TRUNCATE Table Employee_Info (your information will be lost, but not the table)

ALTER : This statement is used to add, delete, modify columns in an existing table

ALTER TABLE Employee_Info ADD BloodGroup varchar(255);

INSERT : This statement is used to insert new records into the table.

INSERT INTO Employee_Info

VALUES ('02', 'Anay', 'Soumya', '9432156783', 'Marathalli House No 23', 'Delhi', 'India');

UPDATE : This statement is used to modify the records already present in the table

UPDATE Employee_Info

SET EmployeeName = 'Aahana', City = 'Ahmedabad' WHERE EmployeeID = 1;

DELETE : This statement is used to delete the existing records in a table

DELETE FROM Employee_Info WHERE EmployeeName = 'Preeti';

SELECT : This statement is used to select data from a database and the data returned is stored in a result table, called the **result-set**.

SELECT EmployeeID, EmployeeName FROM Employee_Info;

(*) is used to select all from the table **SELECT * FROM** Employee_Info;