RDBMS

RDBMS stands for Relational Database Management System. RDBMS data is structured in database tables, fields and records. Each RDBMS table consists of database table rows. Each database table row consists of one or more database table fields. **RDBMS** is based on the relational model as invented by E. F. Codd, of IBM's San Jose Research Laboratory.The most popular RDBMS are MS SQL Server, DB2, Oracle and MySQL

Codd’s 12 Rules

These rules can be applied on any database system that manages stored data using only its relational capabilities. This is a foundation rule, which acts as a base for all the other rules.

Rule 1: Information Rule

The data stored in a database, may it be user data or metadata, must be a value of some table cell. Everything in a database must be stored in a **table format.**

Rule 2: Guaranteed Access Rule

Every single data element (value) is guaranteed to be accessible logically with a combination of table-name, primary-key (row value), and attribute-name (column value). No other means, such as pointers, can be used to access data

Rule 3: Systematic Treatment of NULL Values

The NULL values in a database must be given a systematic and uniform treatment. This is a very important rule because a NULL can be interpreted as one the following – data is missing, data is not known, or data is not applicable

Rule 4: Active Online Catalog

The structure description of the entire database must be stored in an online catalog, known as **data dictionary**, which can be accessed by authorized users. Users can use the same query language to access the catalog which they use to access the database itself.

Rule 5: Comprehensive Data Sub-Language Rule

A database can only be accessed using a language having linear syntax that supports data definition, data manipulation, and transaction management operations. This language can be used directly or by means of some application. If the database allows access to data without any help of this language, then it is considered as a violation.

Rule 6: View Updating Rule

All the views of a database, which can theoretically be updated, must also be updatable by the system.

Rule 7: High-Level Insert, Update, and Delete Rule

A database must support high-level insertion, updation, and deletion. This must not be limited to a single row, that is, it must also support union, intersection and minus operations to yield sets of data records.

Rule 8: Physical Data Independence

The data stored in a database must be independent of the applications that access the database. Any change in the physical structure of a database must not have any impact on how the data is being accessed by external applications.

Rule 9: Logical Data Independence

The logical data in a database must be independent of its user's view (application). Any change in logical data must not affect the applications using it. For example, if two tables are merged or one is split into two different tables, there should be no impact or change on the user application. This is one of the most difficult rule to apply.

Rule 10: Integrity Independence

Integrity constraints must be specified separately from application programs and stored in the catalog. it must be possible to change such constraints as and when appropriate without unnecessarily affecting existing applications.

Rule 11: Distribution Independence

The end-user must not be able to see that the data is distributed over various locations. Users should always get the impression that the data is located at one site only. This rule has been regarded as the foundation of distributed database systems.

Rule 12: Non-Subversion Rule

If a system has an interface that provides access to low-level records, then the interface must not be able to subvert the system and bypass security and integrity constraints

e.g. :- Let's say you define a non-null constraint on a column. Can you bypass the RDBMS to insert a null in that column? If so, you've violated that rule

Difference between DBMS and RDBMS

DBMS	RDBMS
1) DBMS applications store **data as file**.	RDBMS applications store **data in a tabular form**
2) In DBMS, data is generally stored in either a hierarchical form or a navigational form.	In RDBMS, the tables have an identifier called primary key and the data values are stored in the form of tables.
3) **Normalization is not** present in DBMS.	**Normalization is** present in RDBMS.
4) DBMS uses file system to store data, so there will be **no relation between the tables**.	in RDBMS, data values are stored in the form of tables, so a **relationship** between these data values will be stored in the form of a table as well.
5) DBMS has to provide some uniform methods to access the stored information.	RDBMS system supports a tabular structure of the data and a relationship between them to access the stored information.

6) **DBMS does not support distributed database.**	**RDBMS supports distributed database.**
7) DBMS is meant to be for small organization and **deal with small data**. it supports **single user**.	RDBMS is designed to **handle large amount of data**. it supports **multiple users**.
8) Examples of DBMS are file systems, **xml** etc.	Example of RDBMS are **mysql**, **postgre**, **sql server**, **oracle** etc.

Components of DBMS

A database system is composed of four components

1) Data
2) Hardware
3) Software
4) Users

which coordinate with each other to form an effective database system.

(1) **DATA :-** It is very important component of the database system. Most of the organizations generate, store and process large amount of data. The data acts as a bridge between the machine parts i.e. hardware and software and the users which directly access it or access it through some application programs. Data may be of different types.

(a) **User data** :- It consists of table(s) of data called relation(s) where Column(s) are called fields of attributes and rows are called Records for tables. A relation must be structured properly.

(b) **Metadata** :- A description of the structure of the database is known as metadata. It basically means “data about data”. System Tables store the Metadata which includes :-

- Number of tables and tables name
- Number of fields and fields name
- Primary key fields

(2) Hardware :- The hardware consists of secondary storage devices such as magnetic disks (Hard Disk), optical disks (CD-ROM) ,on which data is stored together with the Input/Output devices (mouse, keyboard, printers), main memory

etc, which are used for storing and retrieving the data in a fast and efficient manner. Since database can range from those of a single user with a desktop computer to those on mainframe computers with thousands of users, therefore proper care should be taken for choosing appropriate hardware devices for a required database.

(3) Software :- Software part consists of DBMS which acts as a bridge between the user and the database or in other words, software that interacts with the users, application programs, and database and files system of a particular storage media (hard disk, magnetic tapes , etc) , to insert, update, delete and retrieve data. For performing these operations such as insertion, deletion and updation we can either use the Query Languages like SQL or application program such as Visual basics.

(4) Users :- Users are those persons who need the information from the database to carry out their primary business responsibilities i.e. Personnel , Staff, Clerical, Managers and Executives etc. On the basis of the job and requirements made by them , they are provided access to the database totally or partially.

The various types of users which can access the database are :-

(a) Database Administrators (DBA)
(b) Database Designers
(c) End Users
(d) Application Programmer

Database Administrator :- He/ She is a person who is responsible for the environmental aspects of a database. DBA is a person or group of persons who implements the policies of an organization. He is responsible for authorizing access monitoring database use, providing satisfactory response time, backup and recovery of the system failure. DBA has all the powers of database.

Database Designer :- He performs the duty to identify the data stored and also choose the database structure. he is also responsible to find out the relationship between the data, the constraints imposed on that data and for choosing database structure to store the data.

End Users :- End Users are those users who interact with the database through application program.

Application Programmer :- These are the professional users, who are responsible for writing the application program. The application program could be written in general purpose language such as COBOL , C.