Differences Between Database Management System (DBMS) and Relational Database Management System (RBMS)

Definition Of SQL (Structured Query Language):

Structured Query Language (SQL) is **a programming language that is typically used in relational database or data stream management systems**.

- **Four Categories of SQL command**

- Data Definition Language (DDL): This include CREATE (tables, view, objects, etc.), Alter, and Drop (Delete).
- Data Manipulation Language (DML)**:** SELECT, INSERT, UPDATE, DELETE of records within tables.
- Data Control Language (DCL): Grant and/or provoke user's privileges.

- Data Indexing: To create Indexes and Delete Indexes.

Normalization

Designing your database model is dependent on how your database will be used. OLTP systems are designed around a relatively standardized process called normalization. After you have completed the tasks of entity discovery or identifying the logical data entities in your system, the normalization rules provide guidelines for fine-tuning your data model to optimize performance, maintenance, and querying capabilities. Having said that, complete normalization is not always the best solution for your database. OLAP systems and some OLTP application requirements often result in a denormalized database or at least a denormalized segment. In OLAP solutions that typically contain mass amounts of historical data, the denormalized structure, including multiple copies of data and derived columns, can significantly increase

analysis performance and justify its violation of normalization rules. The choice of complete normalization is always dependent on how your database will be used: Normalization is a process of organizing the tables in a database into efficient, logical structures in order to eliminate redundant data and increase integrity. The physical results of normalizing a database are a greater number of smaller tables that are related to each other. Although there are up to seven normalization rules, called forms, the first three forms of normalization are the most significant and commonly used. The remaining normal forms are primarily academic. The primary normal forms are:

- First normal form (1NF) Eliminate repeating groups and nonatomic attributes (or fields that contain multiple values).
- Second normal form (2NF) Eliminate partial dependencies.
- Third normal form (3NF) Eliminate non-key dependencies and derived columns. In order for the tables in your database to comply with the 1NF:
- Fourth normal: if it is in 3NF with no multi-valued dependency.
- Fifth normal : if it is 4NF and does not contain any join dependency, joining should be lossless

Data normalization is the process of reorganizing data within a database so that users can utilize it for further queries and analysis. Simply put, it is the process of developing clean data. This includes eliminating redundant and unstructured data and making the data appear similar across all records and fields.

Keys in SQL Before moving on to the different forms of data normalization, you need to first understand the concept of keys in SQL. A key can be a single column or a combination of columns that uniquely identify the rows (or tuples) in the table. It also helps to identify duplicate information and establish relationships between different tables. Here are the most common type of keys:

➢ Primary key - A single column used to uniquely identify a table

➢ Composite key - A set of columns used to uniquely identify the rows in a table

➢ Foreign key - A key that references the primary key of another table

Database Management System:

are software systems used to store, retrieve, and run queries on data. A DBMS serves as an interface between an end-user and a database, allowing users to create, read, update, and delete data in the database.

DBMS manage the data, the database engine, and the database schema, allowing for data to be manipulated or extracted by users and other programs. This helps provide data security, data integrity, concurrency, and uniform data administration procedures.

DBMS optimizes the organization of data by following a database schema design technique called normalization, which splits a large table into smaller tables when any of its attributes have redundancy in values. DBMS offer many benefits over traditional file systems, including flexibility and a more complex backup system.

Database management systems can be classified based on a variety of criteria such as the data model, the database distribution, or user numbers. The most widely used types of DBMS software are relational, distributed, hierarchical, object-oriented, and network.

Examples of DBMS's include **MySQL, PostgreSQL, Microsoft SQL Server, Oracle Database, and Microsoft Access**.

Types of DBMS

The types of DBMS based on data model are as follows –

- Relational database.
- Object oriented database.
- Hierarchical database.

- Network database.

Relation Database

A relational database management system (RDBMS) is a system where data is organized in two-dimensional tables using rows and columns.

This is one of the most popular data models which is used in industries. It is based on SQL.

Every table in a database has a key field which uniquely identifies each record.

This type of system is the most widely used DBMS.

Relational database management system software is available for personal computers, workstation and large mainframe systems.

For example – Oracle Database, MySQL, Microsoft SQL Server etc.

Std ID	Name	City
201	Bob	Hyderabad
204	Lucky	Chennai
205	Pinky	Bangalore

In the above student table Std ID, Name and city are called as attributes and their values. Std ID is a primary key attribute which uniquely identifies each record in the student table.

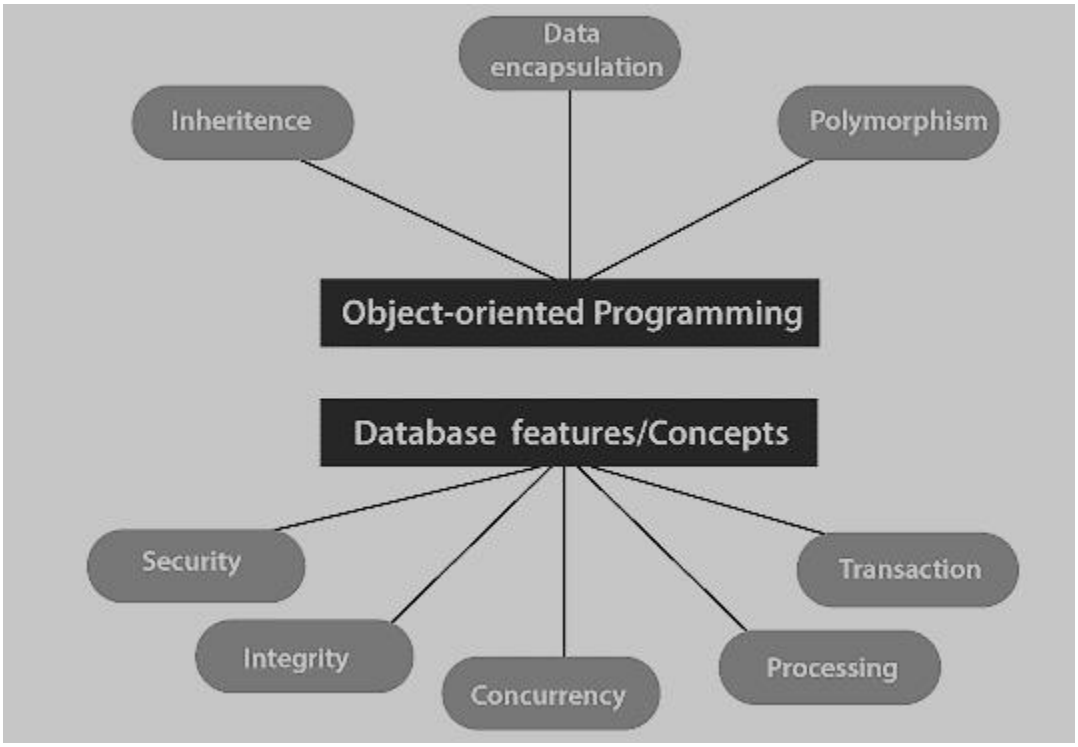
Object Oriented Database

It is a system where information or data is represented in the form of objects which is used in object-oriented programming.

- It is a combination of relational database concepts and object-oriented principles.
- Relational database concepts are concurrency control, transactions, etc.
- OOPs principles are data encapsulation, inheritance, and polymorphism.
- It requires less code and is easy to maintain.

For example – Object DB software.

The object oriented database is represented in diagram format below −



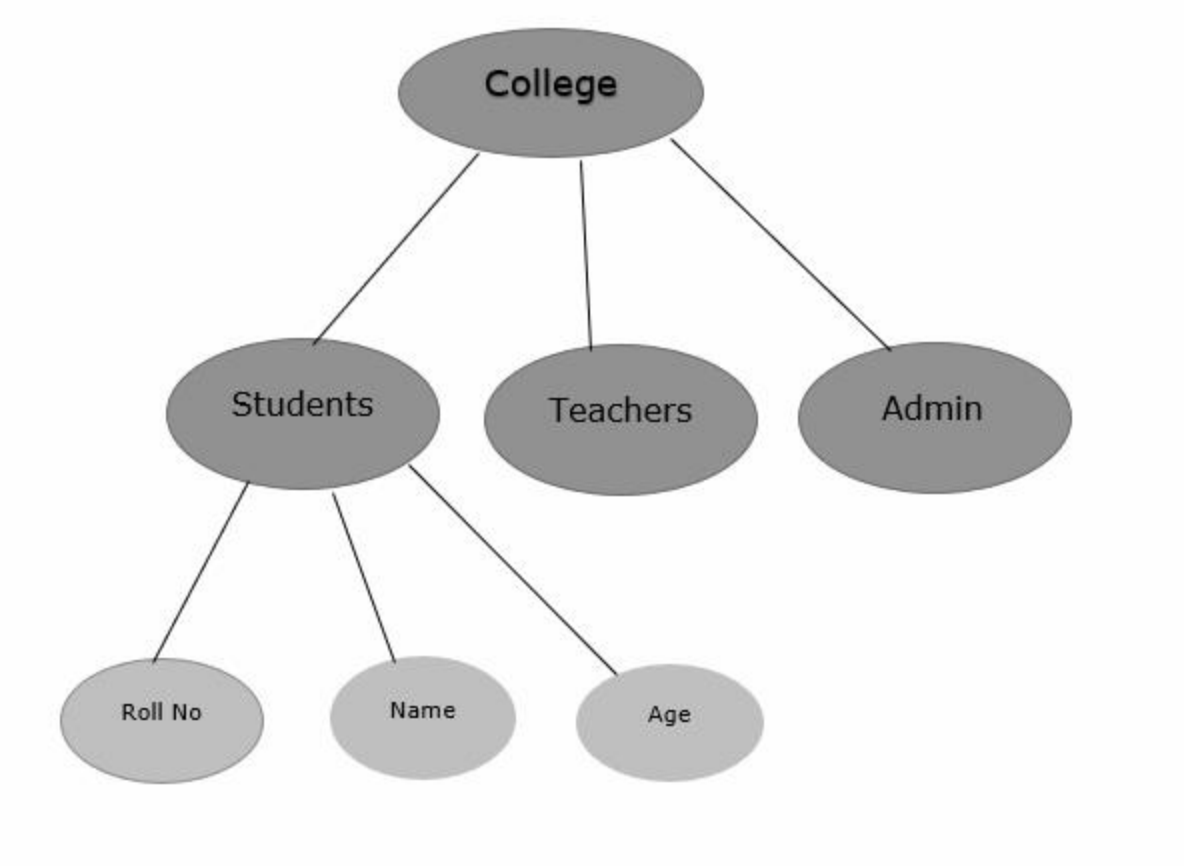
Hierarchical Database

It is a system where the data elements have a one to many relationship (1: N). Here data is organized like a tree which is similar to a folder structure in your computer system.

- The hierarchy starts from the root node, connecting all the child nodes to the parent node.
- It is used in industry on mainframe platforms.

For example− IMS(IBM), Windows registry (Microsoft).

An example of a hierarchical database is given below −



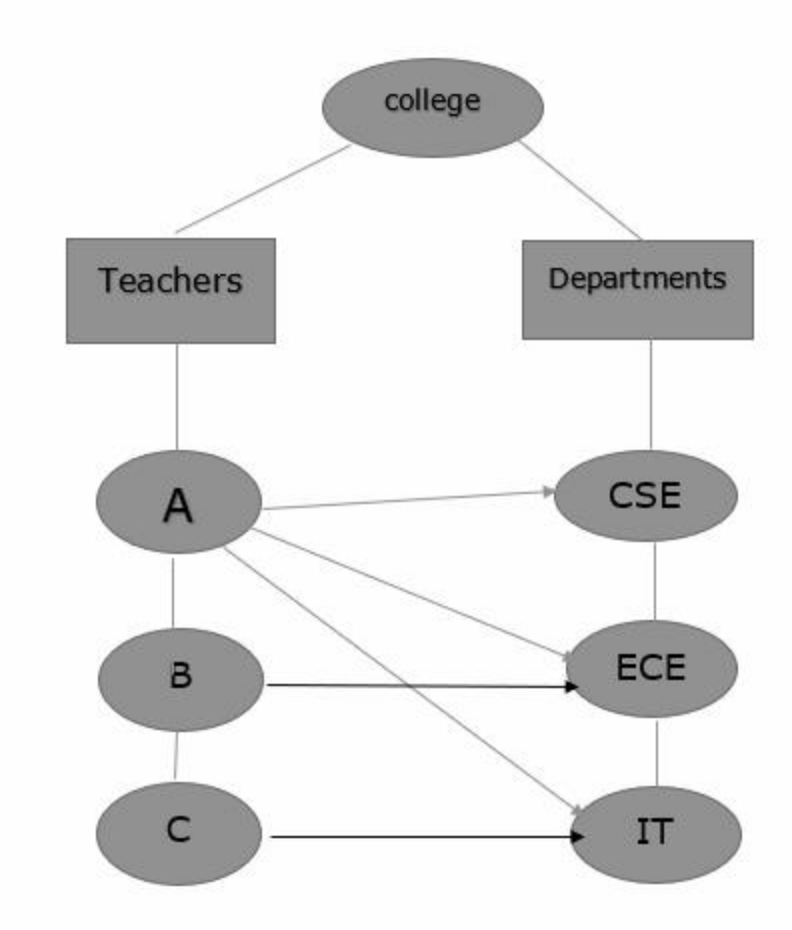
Network database

A Network database management system is a system where the data elements maintain one to one relationship (1: 1) or many to many relationship (N: N).

It also has a hierarchical structure, but the data is organized like a graph and it is allowed to have more than one parent for one child record.

Example

Teachers can teach in multiple departments. This is shown below –



Differences between DBMS and RBMS

RDBMS	DBMS
Data stored is in table format	Data stored is in the file format
Multiple data elements are accessible together	Individual access of data elements
Data in the form of a table are linked together	No connection between data
Normalisation is not achievable	There is normalisation
Support distributed database	No support for distributed database
Data is stored in a large amount	Data stored is a small quantity
Here, redundancy of data is reduced with the help of key and indexes in RDBMS	Data redundancy is common
RDBMS supports multiple users	DBMS supports a single user

It features multiple layers of security while handling data	There is only low security while handling data
The software and hardware requirements are higher	The software and hardware requirements are low
Oracle, SQL Server.	XML, Microsoft Access.

Advantages of DBMS

There are several clear benefits of employing a database management system. The merits of a database management system over a flat-file management system are manifold.

A summary of the few advantages is provided below.

Significantly strengthened data exchange: The database management system (DBMS) facilitates the formation of an environment in which end users have better exposure to even more better-managed data.

In DBMS, data may be exchanged across authorized database users. Each user has individual access privileges to the database. The database is readily available to the admin. He has the power to add users to the database.

End users can immediately respond to changes in their environment with this kind of access.

Evolved Data protection: The increased the number of people that have access to the data, the higher the likelihood of a data security compromise. Companies spend plenty of time, money and effort, and resources to make sure that their data is being used correctly in the first place.

Disadvantages of DBMS

There are certain limitations to using a database management system. Some of these have been discussed:

Hardware and software expenditures: We require a high-speed CPU and a huge working memory to perform the DBMS software, which necessarily involves the acquisition of pretty expensive hardware.

The investment of maintaining the hardware, software, and employees required to run and operate a database system may be particularly significant. When database systems are installed, issues such as training, licensing, and regulatory compliance are sometimes underestimated.