

DATABASE MANAGEMENT SYSTEMS

DATABASE:

- Database is an organized collection of structured information or data, typically stored electronically in a computer system.
- The data can then be easily accessed, managed, modified, updated, controlled, and organized.

DATABASE MANAGEMENT SYSTEM:

- Database management system is a software which is used to manage the database.
- For example: MySQL, Oracle, etc are a very popular commercial database which is used in different applications.
- DBMS provides an interface to perform various operations like database creation, storing data in it, updating data, creating a table in the database and a lot more.
- It provides protection and security to the database. In the case of multiple users, it also maintains data consistency.

CHARACTERISTICS OF DBMS:

- It uses a digital repository established on a server to store and manage the information.
- It can provide a clear and logical view of the process that manipulates data.
- DBMS contains automatic backup and recovery procedures.
- It contains ACID properties which maintain data in a healthy state in case of failure.

- It can reduce the complex relationship between data.
- It is used to support manipulation and processing of data.
- It is used to provide security of data.
- It can view the database from different viewpoints according to the requirements of the user.

NEED OF DBMS:

- Ease of accessing data
- Storage and management of data
- Easy and efficient file management
- Avoiding duplicates and redundancy
- Concurrent data accessing
- Database integrity

Databases provide centralized control of its operational data. Thus, with the help of a computerized database:

- Redundancy is controlled.
- Inconsistence can be avoided.
- Integrity of data is maintained.
- Data can be shared.
- Security restrictions can be applied.

RELATIONAL DATABASE:

- A relational database is a type of database that stores and provides access to data points that are related to one another.
- It is introduced by E.F Codd in 1962.
- The columns of the table hold attributes of the data, and each record usually has a value for each attribute, making it easy to establish the relationships.

Why is it called relational database?

- A relational database refers to a database that stores data in a structured format, using rows and columns.
- This makes it easy to locate and access specific values within the database.
- It is "relational" because the values within each table are related to each other.

RELATIONAL DATABASE MANAGEMENT SYSTEM:

- Relational database management system (RDBMS) is a common type of database that stores data in tables.
- It can be used in relation to other stored datasets. The data is often stored in many tables, also called 'relations'.
- These tables are divided into rows, also called records and columns (fields).
- Examples – MySql, SQLServer, DB2, Oracle etc

NAME	TELEPHONE	ADDRESS
Abhishek	123456879	New Delhi
Priya	9876541236	Mumbai
Sekhar	9937369727	Chennai

SCHEMA:

- It refers to the organization of data or skeleton structure that represents the logical flow of the entire database.
- The term "schema" refers to the organization of data as a blueprint of how the database is constructed.

ENTITY:

- An entity can be a real-world object, either animate or inanimate, that can be easily identifiable.
- For example, in a school database, students, teachers, classes, and courses offered can be considered as entities.
- All these entities have some attributes or properties that give them their identity.

RELATION:

- A relation (or a table) is a collection of data corresponding to the same kinds of entities in a database.
- A relation may contain data of all the books in a library, or data of all the items in a shop etc.
- A database contains one or more than one relations.
- For example – Maintaining book details for library and data for all items in a shop etc.

ROW/TUPLE/RECORD:

- A tuple corresponds to a row of a relation.
- A tuple contains data corresponding to an entity.
- The number of tuples in a relation is called the cardinality of the relation.

ATTRIBUTES:

- Attributes describe the characteristics or properties of an entity in a database table.
- An entity in a database table is defined with the 'fixed' set of attributes.
- In a relational database, we store data in the form of tables.
- The column header of the table represents the attributes.
- The number of attributes (columns) in a relation is called its **degree**.

DOMAIN:

- A domain (of a column) is a pool of values from which that column draws its actual values.
- For example, domain of the column Roll Number may be integers from 1 to 50.

KEYS:

- It is used to uniquely identify any record or row of data from the table. It is also used to establish and identify relationships between tables.

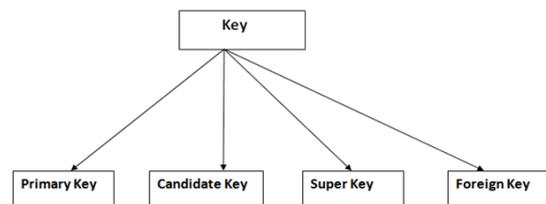
- **For example:**

In Student table, ID is used as a key because it is unique for each student.

In PERSON table, passport_number, license_number, SSN are keys since they are unique for each person.

STUDENT	PERSON
ID	PASSPORT NUMBER
NAME	LICENSE NUMBER
COURSE	SSN
ADDRESS	NAME
	ADDRESS
	CONTACT

TYPES OF KEYS:



Primary Key:

- The group of one or more columns used to uniquely identify each row of a relation is called its Primary Key.
- For example, in student table ID can be the primary key.
- A table cannot have more than one primary key.

Candidate Key:

- A field or combination of fields which can be used as a primary key of a relation is called a candidate key because it is one of the candidates available to be the primary key of the relation.
- A table may have multiple candidate keys.
- For example, in student table ID as well as the combination ID+Name+Address are the candidate keys.

Super Key:

- A superkey is a combination of columns that uniquely identifies any row within a relational database management system (RDBMS) table.
- A candidate key is a closely related concept where the superkey is reduced to the minimum number of columns required to uniquely identify each row.

Alternate Key:

- A table may have multiple candidate keys. One of these keys becomes the primary key of the table.
- All the remaining candidate keys are called alternate keys of the relation.

Foreign Key:

- A foreign key is the one that is used to link two tables together via the primary key.
- It means the columns of one table points to the primary key attribute of the other table.

CARTESIAN PRODUCT (of two table):

- It is a new table which contains the columns of both the given tables.
- The rows of the new table are obtained by pairing each row of the first table with each row of the second table.

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NORMALIZATION:

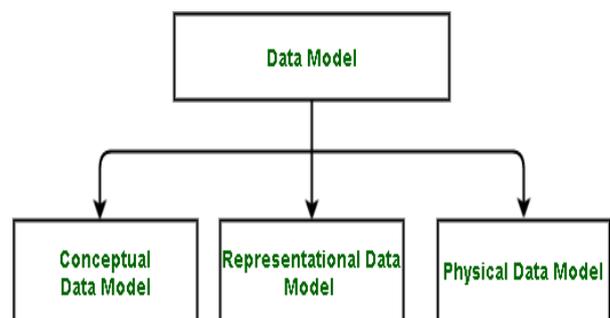
- Normalization is the process of minimizing redundancy from a relation or set of relations.
- Redundancy in relation may cause insertion, deletion, and update anomalies.
- It helps to minimize the redundancy in relations. Normal forms are used to eliminate or reduce redundancy in database tables.

Need for Normalization:

- To structure the data
- To permit the simple retrieval of data in response to queries or reports.
- Simplify maintenance of data through update, delete and insert operations.
- To reduce the need to restructure or reorganize the data when new application requirement arises.

DATA MODELS:

- Conceptual data model
- Logical data model/ Representational data model
- Physical data model



Conceptual Data Model:

- Conceptual data model, describes the database at a very high level.
- It is useful to understand the needs or requirements of the database.

Logical data model/ Representational data model:

- This type of data model is used to represent only the logical part of the database and does not represent the physical structure of the databases.
- The representational data model allows us to focus primarily, on the design part of the database.
- A popular representational model is Relational model.

Physical data model:

- All data in a database is stored physically on a secondary storage device such as discs and tapes.
- This is stored in the form of files, records and certain other data structures.
- It has all the information of the format in which the files are present and the structure of the databases, presence of external data structures and their relation to each other.

STRUCTURED QUERY LANGUAGE:

- SQL is a language specifically oriented around relational databases.
- It is a non-procedural language and requires us to specify what is to be done as opposed to how to do it.
- SQL offers us various commands using which you create and manage relational databases.
- SQL is a non case-sensitive language. It means that commands can be entered using uppercase letter, lowercase letters, or a combination of these two. For SQL all these mean the same.

- Each command in SQL is terminated by a semi-colon(;).
- A statement may spread into multiple lines. It will be terminated only when a semi-colon appears.

These commands are classified into following classes depending on their purpose:

- **Data Definition Language (DDL):** It consists of those commands that create, modify, and remove objects (tables, indexes, views and so on) in the database.
- **Data Manipulation Language (DML):** It consists of those commands that are used to retrieve, manipulate and update the data present in tables.
- **Data Control Language (DCL):** It consists of those commands that determine whether a user is permitted to perform a particular action.

- **To create database:**

```
CREATE DATABASE;
```

- **To create table:**

```
CREATE TABLE <Table Name>  
(<Column1> <data_type1> Not Null,  
<Column2><data_type2> Not  
Null,.....<Column n><data_type3>  
Not Null);
```

- **To describe Table:**

DESCRIBE <Table Name>;

Or

DESC <Table Name>;

- **To insert records into Table:**

INSERT INTO<TABLENAME>

VALUES

(<value1>,<value2>....<value..n>);

- **To display records from Table:**

SELECT * FROM <TABLENAME>;

- **To display particular records from Table:**

SELECT COLUMN1,COLUMN2...

FROM<TABLENAME>;

- **To modify the structure of the Table:**

➤ ALTER TABLE <table_name>
ADD (newcolumnname datatype
(size), newcolumnname datatype
(size),...);

➤ ALTER TABLE ITEMS Drop
profit;

The above command will drop the
column "Profit" from the ITEMS
table

➤ You can change the column
definition by using alter command.

ALTER TABLE ITEMS MODIFY
item_desc varchar(30);

This command will modify the
existing structure of the table.

- **To Update table:**

UPDATE <table_name> SET
field1=new-value1, field2=new-
value2;

Or

UPDATE <table_name> SET
field1=new-value1, field2=new-
value2 [WHERE Clause];

- **To delete records from table:**

DELETE FROM <tablename>;

Or

DELETE FROM <tablename>
WHERE search_condition;

- **To Drop table:**

DROP <table_name>;

CHECK YOURSELF

1. Which of the following provides the ability to query information from the database?
 - A. DML(Data Manipulation Language)
 - B. DDL(Data Definition Language)
 - C. Query
 - D. Relational Schema
2. What is a database?
 - A. Organized collection of information that cannot be accessed, updated and managed

- B. Collection of data or information without organizing
 - C. Organized collection of data or information that can be accessed, updated and managed
 - D. Organized collection of data that cannot be updated
3. Which of the following is a function of the DBMS?
- A. Storing data
 - B. Providing multi-users access control
 - C. Data Integrity
 - D. All of the above
4. In which of the following formats data is stored in DBMS.
- A. Image
 - B. Text
 - C. Table
 - D. Graph
5. Which one of the following given statements possibly contains the error?
- A. `Select * from emp where empid=10003;`
 - B. `Select empid from emp where empid=10006;`
 - C. `Select empid from emp;`
 - D. `Select empid where empid=1009 and lastname='Miller';`

STRETCH YOURSELF

1. Briefly explain about DBMS and need of DBMS?
2. What are the different models available in DBMS?
3. What do you mean SQL?
4. Differentiate between candidate key and primary key?
5. What do you mean by Normalization?

ANSWERS

Answers to Check Yourself:

1. A (Data Manipulation Language)
2. C
3. D
4. C
5. D (from word is missing in the above query)