SQL - RDBMS CONCEPTS

What is RDBMS?

RDBMS stands for **R**elational **D**atabase **M**anagement **S**ystem. 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 data 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    |
+----+------+
```

What is NULL value?

A NULL value in a table is a value in a field that appears to be blank, which means a field with a NULL value is a field with no value.

It is very important to understand that a NULL value is different than a zero value or a field that contains spaces. A field with a NULL value is one that has been left blank during record creation.

SQL Constraints:

Constraints are the rules enforced on data columns on table. These are used to limit the type of data that can go into a table. This ensures the accuracy and reliability of the data in the database.

Constraints could be column level or table level. Column level constraints are applied only to one column where as table level constraints are applied to the whole table.

Following are commonly used constraints available in SQL:

- NOT NULL Constraint: Ensures that a column cannot have NULL value.

- DEFAULT Constraint: Provides a default value for a column when none is specified.

- UNIQUE Constraint: Ensures that all values in a column are different.

- PRIMARY Key: Uniquely identified each rows/records in a database table.

- FOREIGN Key: Uniquely identified a rows/records in any another database table.

- CHECK Constraint: The CHECK constraint ensures that all values in a column satisfy certain conditions.

- INDEX: Use to create and retrieve data from the database very quickly.

Data Integrity:

The following categories of the data integrity exist with each RDBMS:

- **Entity Integrity:** There are no duplicate rows in a table.

- **Domain Integrity:** Enforces valid entries for a given column by restricting the type, the format, or the range of values.

- **Referential integrity:** Rows cannot be deleted, which are used by other records.

- **User-Defined Integrity:** Enforces some specific business rules that do not fall into entity, domain or referential integrity.

Database Normalization

Database normalization is the process of efficiently organizing data in a database. There are two reasons of the normalization process:

- Eliminating redundant data, for example, storing the same data in more than one tables.

- Ensuring data dependencies make sense.

Both of these are worthy goals as they reduce the amount of space a database consumes and ensure that data is logically stored. Normalization consists of a series of guidelines that help guide you in creating a good database structure.

Normalization guidelines are divided into normal forms; think of form as the format or the way a database structure is laid out. The aim of normal forms is to organize the database structure so that it complies with the rules of first normal form, then second normal form, and finally third normal form.

It's your choice to take it further and go to fourth normal form, fifth normal form, and so on, but generally speaking, third normal form is enough.

- First Normal Form $1NF$

- Second Normal Form $2NF$

- Third Normal Form $3NF$

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