ANSI SQL - MYSQL

Agenda

➢RDBMS Fundamentals ,

➢Normal Forms & introduction to Oracle,

➢DB Design

➢DML Statements,

➢Data Retrieval ,

➢Restriction and Sorting,

➢Single row functions ,

➢Multiple row & Group Functions

RDBMS Fundamentals

➢ **RDBMS** stands for relational database management system.

➢ A relational model can be represented as a table of rows and columns.

➢ A relational database has following major components:
   1. Table
   2. Record or Tuple
   3. Field or Column name or Attribute
   4. Domain
   5. Instance
   6. Schema
   7. Keys

Table

➢A table is a collection of data represented in rows and columns. Each table has a name in database. For example, the following table "STUDENT" stores the information of students in database.

ID	NAME	CLASS	MARK	SEX
1	John Deo	Four	75	female
2	Max Ruin	Three	85	male
3	Arnold	Three	55	male
4	Krish Star	Four	60	female
5	John Mike	Four	60	female
6	Alex John	Four	55	male
7	My John Rob	Fifth	78	male
8	Asruid	Five	85	male
9	Tes Qry	Six	78	male
10	Big John	Four	55	female

Normal Forms
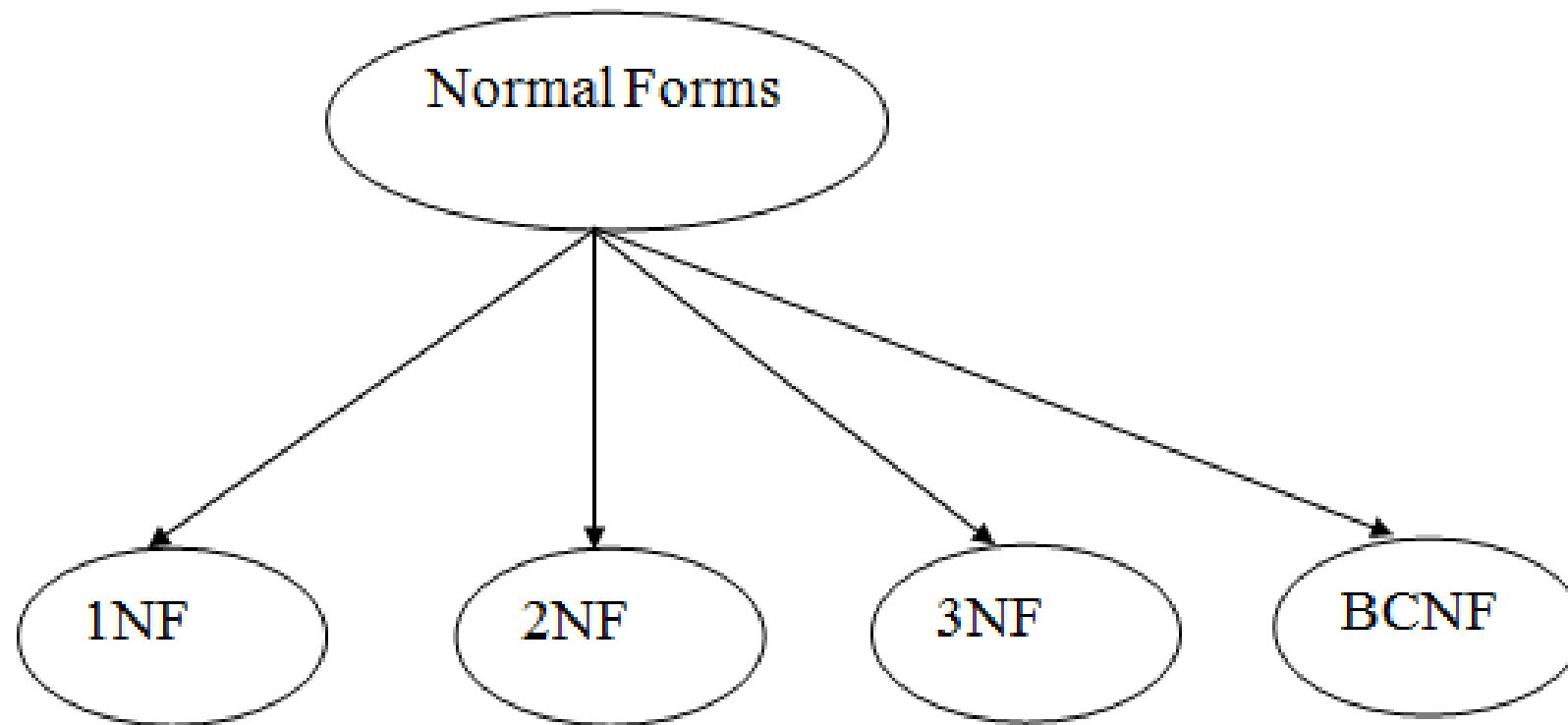
First Normal Form (1NF)

➢For a table to be in the First Normal Form, it should follow the following 4 rules:

    1.It should only have single(atomic) valued attributes/columns.

    2.Values stored in a column should be of the same domain

    3.All the columns in a table should have unique names.

    4.And the order in which data is stored, does not matter.

➢If a relation contain composite or multi-valued attribute, it violates first normal form or a relation is in first normal form if it does not contain any composite or multi-valued attribute. A relation is in first normal form if every attribute in that relation is **singled valued attribute**.

- Example

STUD_NO	STUD_NAME	STUD_PHONE	STUD_STATE	STUD_COUNTRY
1	RAM	9716271721, 9871717178	HARYANA	INDIA
2	RAM	9898297281	PUNJAB	INDIA
3	SURESH		PUNJAB	INDIA

Table 1

Conversion to first normal form

STUD_NO	STUD_NAME	STUD_PHONE	STUD_STATE	STUD_COUNTRY
1	RAM	9716271721	HARYANA	INDIA
1	RAM	9871717178	HARYANA	INDIA
2	RAM	9898297281	PUNJAB	INDIA
3	SURESH		PUNJAB	INDIA

Table 2

- Example:-

```
ID    Name    Courses
------------------------
1     A       c1, c2
2     E       c3
3     M       C2, c3
```

--> to 1NF-->

```
ID    Name    Course
------------------------
1     A       c1
1     A       c2
2     E       c3
3     M       c2
3     M       c3
```

Course	Content
Programming	Java, c++
Web	HTML, PHP, ASP

Course	Content
Programming	Java
Programming	c++
Web	HTML
Web	PHP
Web	ASP

Second Normal Form

➢The entity should be considered already in 1NF, and all attributes within the entity should depend solely on the unique identifier of the entity.

➢To be in second normal form, a relation must be in first normal form and relation must not contain any partial dependency. A relation is in 2NF if it has **No Partial Dependency,** i.e., no non-prime attribute (attributes which are not part of any candidate key) is dependent on any proper subset of any candidate key of the table.

➢**Partial Dependency –** If the proper subset of candidate key determines non-prime attribute, it is called partial dependency.
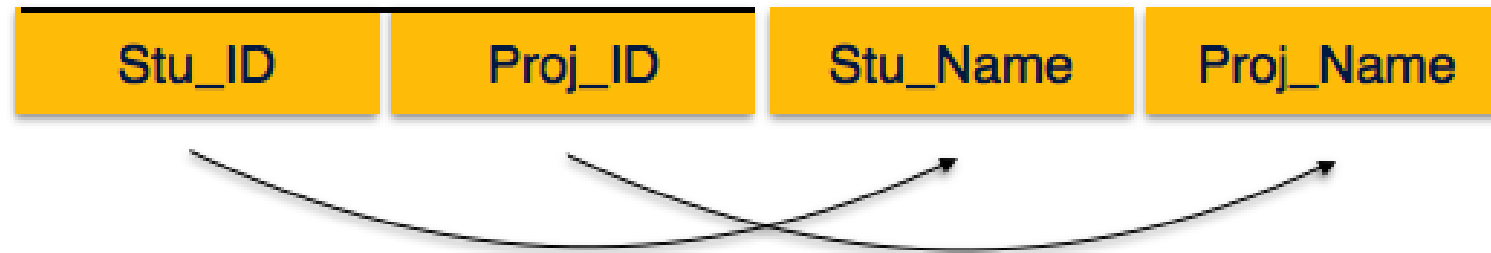
➢For a table to be in the Second Normal Form,

1. It should be in the First Normal form.

2. And, it should not have Partial Dependency.

STUD_NO	COURSE_NO	COURSE_FEE
1	C1	1000
2	C2	1500
1	C4	2000
4	C3	1000
4	C1	1000
2	C5	2000

2nf

Table 1		Table 2	
STUD_NO	COURSE_NO	COURSE_NO	COURSE_FEE
1	C1	C1	1000
2	C2	C2	1500
1	C4	C3	1000
4	C3	C4	2000
4	C1	C5	2000
2	C5		

Student_Project

Stu_ID	Proj_ID	Stu_Name	Proj_Name

|| 2nf

Student

Stu_ID	Stu_Name	Proj_ID

Project

Proj_ID	Proj_Name
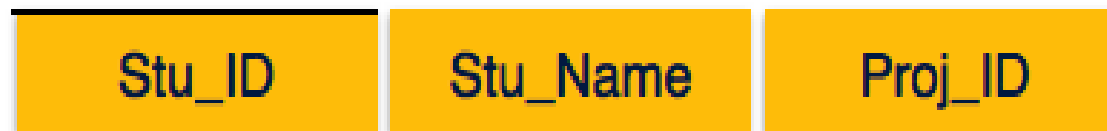
Third Normal Form (3NF)

➢A table is said to be in the Third Normal Form when,
- It is in the Second Normal form.
- And, it doesn't have Transitive Dependency.

EMP_ID	EMP_NAME	EMP_ZIP	EMP_STATE	EMP_CITY
222	Harry	201010	UP	Noida
333	Stephan	02228	US	Boston
444	Lan	60007	US	Chicago
555	Katharine	06389	UK	Norwich
666	John	462007	MP	Bhopal

To 3NF

EMPLOYEE table:

EMP_ID	EMP_NAME	EMP_ZIP
222	Harry	201010
333	Stephan	02228
444	Lan	60007
555	Katharine	06389
666	John	462007

EMPLOYEE_ZIP table:

EMP_ZIP	EMP_STATE	EMP_CITY
201010	UP	Noida
02228	US	Boston
60007	US	Chicago
06389	UK	Norwich
462007	MP	Bhopal

Boyce Codd normal form (BCNF)

➢BCNF is the advance version of 3NF. It is stricter than 3NF.

➢A table is in BCNF if every functional dependency X → Y, X is the super key of the table.

➢For a table to satisfy the Boyce-Codd Normal Form, it should satisfy the following two conditions:

    1. It should be in the **Third Normal Form**.

    2. And, for any dependency A → B, A should be a **super key**.

➢Boyce-Codd Normal Form (BCNF) is one of the forms of database normalization. A database table is in BCNF if and only if there are no non-trivial functional dependencies of attributes on anything other than a superset of a candidate key.

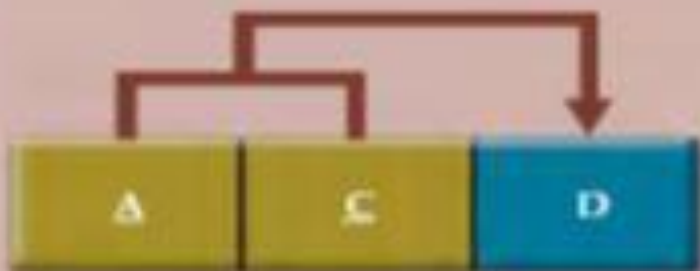➢BCNF is also sometimes referred to as 3.5NF, or 3.5 Normal Form.

- Example:-
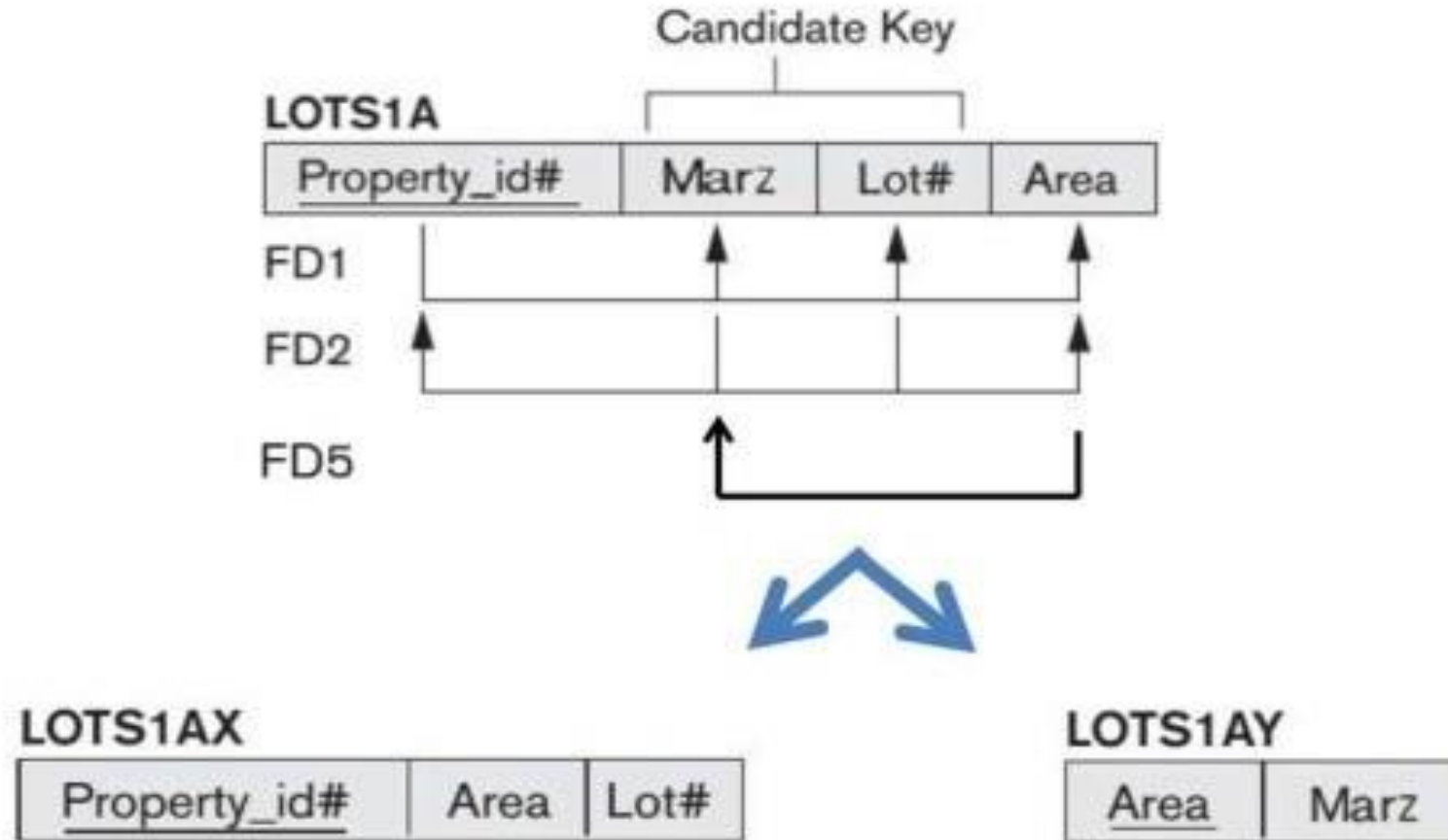
3NF, but not BCNF

1NF

Partial dependency

3NF and BCNF

3NF and BCNF

Introduction to Oracle

➢ Oracle database is a relational database management system. It is known as Oracle database, OracleDB or simply Oracle. It is produced and marketed by Oracle Corporation.

➢ Oracle database is the first database designed for enterprise grid computing. The enterprise grid computing provides the most flexible and cost effective way to manage information and applications.

➢ An Oracle **database** is a collection of data treated as a unit. The purpose of a database is to store and retrieve related information.

➢A database server is the key to solving the problems of information management. In general, a **server** reliably manages a large amount of data in a multiuser environment so that many users can concurrently access the same data.

➢All this is accomplished while delivering high performance.

➢A database server also prevents unauthorized access and provides efficient solutions for failure recovery.

➢Oracle Database is the first database designed for enterprise grid computing, the most flexible and cost effective way to manage information and applications.

➢Enterprise grid computing creates large pools of industry-standard, modular storage and servers. With this architecture, each new system can be rapidly provisioned from the pool of components.

➢There is no need for peak workloads, because capacity can be easily added or reallocated from the resource pools as needed.
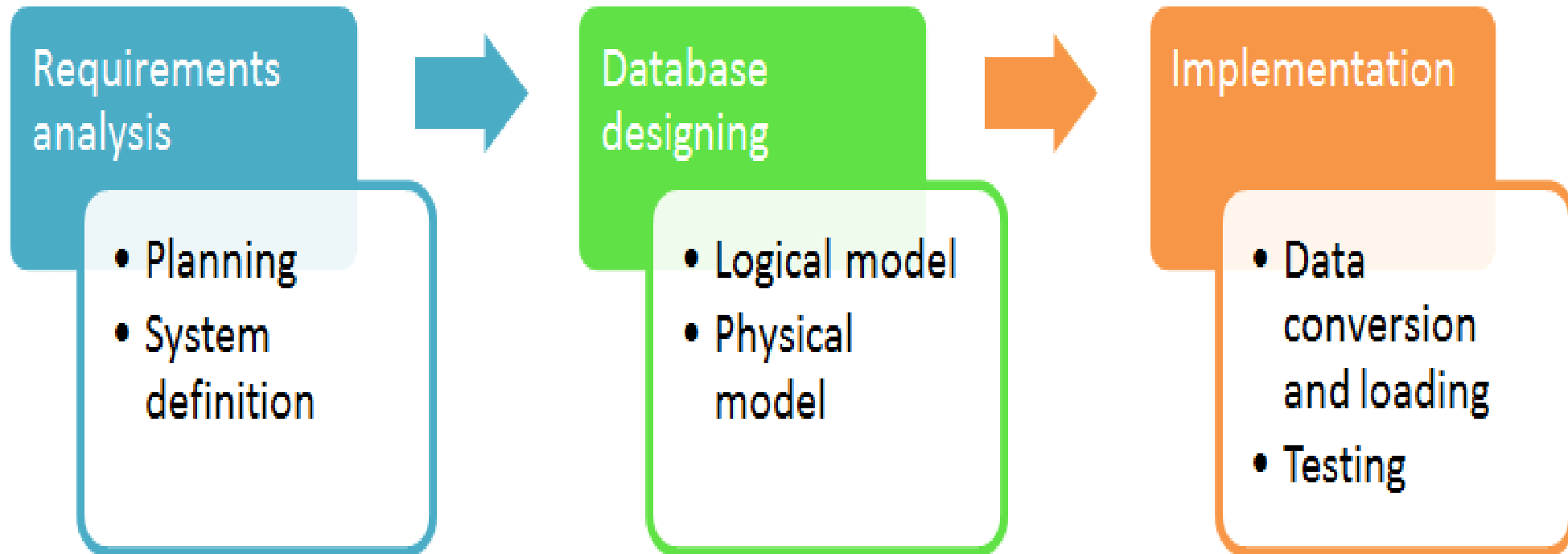
DB Design

➤ A database refers to the collection of data (files and records) which is stored and can be manipulated using a software named Database Management Systems.

➤ **Database Design** is a collection of processes that facilitate the designing, development, implementation and maintenance of enterprise data management systems.

➤ Properly designed database are easy to maintain, improves data consistency and are cost effective in terms of disk storage space.

➤ The database designer decides how the data elements correlate and what data must be stored.

➤ The main objectives of database designing are to produce logical and physical designs models of the proposed database system.

➢ The logical model concentrates on the data requirements and the data to be stored independent of physical considerations. It does not concern itself with how the data will be stored or where it will be stored physically.

➢ The physical data design model involves translating the logical design of the database onto physical media using hardware resources and software systems such as database management systems (DBMS).

Why Database Design is Important ?

➢it helps produce database systems
   1.That meet the requirements of the users
   2.Have high performance.

➢Database designing is crucial to **high performance** database system.

➢Note , the genius of a database is in its design . Data operations using SQL is relatively simple

Database development life cycle

Requirements analysis
- Planning
- System definition

Database designing
- Logical model
- Physical model

Implementation
- Data conversion and loading
- Testing

➢**Requirements analysis**

- **Planning** - This stages concerns with planning of entire Database Development Life Cycle It takes into consideration the Information Systems strategy of the organization.

- **System definition** - This stage defines the scope and boundaries of the proposed database system.

➢**Database designing**

- **Logical model** - This stage is concerned with developing a database model based on requirements. The entire design is on paper without any physical implementations or specific DBMS considerations.

- **Physical model** - This stage implements the logical model of the database taking into account the DBMS and physical implementation factors.

➢**Implementation**
- **Data conversion and loading** - this stage is concerned with importing and converting data from the old system into the new database.
- **Testing** - this stage is concerned with the identification of errors in the newly implemented system .It checks the database against requirement specifications.

➢Two Types of Database Techniques
1. Normalization
2. ER Modelling

Types of SQL Commands

➢ There are five types of SQL commands: DDL, DML, DCL, TCL, and DQL.

- Data Definition Language (DDL)
- Data Manipulation Language
- Data Control Language
- Transaction Control Language
- Data Query Language

Data Retrieval

➢ Data retrieval means obtaining data from a database management system such as ODBMS. In this case, it is considered that data is represented in a structured way, and there is no ambiguity in data.

➢ In order to retrieve the desired data the user present a set of criteria by a query.

➢ In databases, data retrieval is the process of identifying and extracting data from a database, based on a query provided by the user or application.

➢ It enables the fetching of data from a database in order to display it on a monitor and/or use within an application.

Retrieving Information from a Table

➤DRL/DSL stands for Data Retrieval Language/Data Selection Language.

➤It is a set commands which are used to retrieve data from database server.

➤It manipulates the data in database for display purpose like aggregate function.

➤In DRL/DSL, for accessing the data it uses the DML command that is SELECT.

➤The SELECT command allows database users to retrieve the specific information they desire from an operational database.

- Selecting All Data
- Selecting Particular Rows
- Selecting Particular Columns
- Sorting Rows
- Date Calculations
- Working with NULL Values
- Pattern Matching
- Counting Rows
- Using More Than one Table

➢The SELECT statement is used to pull information from a table. The general form of the statement is:-

      SELECT what_to_select

      FROM which_table

      WHERE conditions_to_satisfy;

➢what_to_select indicates what you want to see.

➢This can be a list of columns, or * to indicate "all columns." which_table indicates the table from which you want to retrieve data.

➢ The WHERE clause is optional. If it is present, conditions_to_satisfy specifies one or more conditions that rows must satisfy to qualify for retrieval.

Clause	Description
FROM	It is used for selecting a table name in a database.
WHERE	It specifies which rows to retrieve.
GROUP BY	It is used to arrange the data into groups.
HAVING	It selects among the groups defined by the GROUP BY clause.
ORDER BY	It specifies an order in which to return the rows.
AS	It provides an alias which can be used to temporarily rename tables or columns.

➢Basic Syntax of Select statement:-

SELECT [DISTINCT | ALL] {* | select_list}

FROM {table_name [alias] | view_name}

   [{table_name [alias] | view_name}]...

[WHERE condition]

[GROUP BY condition_list]

[HAVING condition]

[ORDER BY {column_name | column_# [ASC | DESC] } ...

Restriction and sorting

➢Specific rows can be selected by adding a WHERE clause to a SELECT query. As a matter of fact, the WHERE clause appears just after the FROM clause in SELECT query hierarchy.

➢The SQL ORDER BY clause is used to sort the records in the result set for a SELECT statement.

    SELECT expressions
    FROM tables
    [WHERE conditions]
    ORDER BY expression [ASC | DESC];

Single row functions

➤Oracle SQL supplies a rich library of in-built functions which can be employed for various tasks.

➤The essential capabilities of a functions can be the case conversion of strings, in-string or substring operations, mathematical computations on numeric data, and date operations on date type values.

➤SQL Functions optionally take arguments from the user and mandatorily return a value.

➤On a broader category, there are two types of functions :-

- **Single Row functions** - Single row functions are the one who work on single row and return one output per row. For example, length and case conversion functions are single row functions.
- **Multiple Row functions** - Multiple row functions work upon group of rows and return one result for the complete set of rows. They are also known as Group Functions.

➢Single row functions can be character functions, numeric functions, date functions, and conversion functions. Note that these functions are used to manipulate data items.

➢These functions require one or more input arguments and operate on each row, thereby returning one output value for each row.

➢Argument can be a column, literal or an expression.

➢Single row functions can be used in SELECT statement, WHERE and ORDER BY clause.

➢ Single row functions can be –
- General functions
- Case Conversion functions
- Character functions
- Date functions
- Number functions

➢ Lets Practice…..

Multiple row & Group Functions

➢Multiple row function is also called as group function or it is also called as aggregate function.

➢Group function operate on set of rows to give one result per group.

➢Types of Group Function :-
      1.AVG
      2.COUNT
      3.MAX
      4.MIN
      5.SUM
      6.GROUP BY
      7.HAVING

Thanks......