



BCA



Semester - 5th



Relational Database Management System

Notes - 1

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Introduction & Features: Concept of RDBMS

Concept of RDBMS

RDBMS stands for Relational Database Management System.

It is a software system used to store, manage, and retrieve data in the form of tables (relations).

Each table is made up of rows (records) and columns (fields).

Data is related to each other through keys (like primary key and foreign key).

Example:

A “Student” table can have columns like RollNo, Name, Course, Marks.

A “Course” table can have CourseID, CourseName.

These two tables can be linked using CourseID – this relation forms the “Relational Model.”

Features of RDBMS

Data stored in tables:

All information is stored in rows and columns.

Data independence:

Changes in data structure do not affect the entire system.

Data integrity:

Ensures correctness and accuracy of data using keys and constraints.

Data security:

Access to data is controlled using privileges and permissions.

Reduced data redundancy:

Avoids duplicate data by normalizing the database.

Data consistency:

Maintains uniform data throughout all related tables.

Support for SQL:

RDBMS supports Structured Query Language (SQL) for data manipulation.

Relationships between tables:

Tables are related using primary and foreign keys.

● Examples of RDBMS software: Oracle, MySQL, SQL Server, PostgreSQL, MS Access.

Properties of RDBMS

RDBMS follows some important properties that make it reliable and efficient. These are often called the ACID properties:

A – Atomicity

Each transaction is treated as a single unit.

Either all operations are done or none are done.

👉 Example: If you transfer money between two accounts, either both debit and credit happen, or none happen.

C – Consistency

After a transaction, the database remains in a valid and consistent state.

👉 Example: The total balance before and after a transaction should be the same.

I – Isolation

Each transaction is executed independently without interference from others.

👉 Example: Two people booking the same seat simultaneously are handled separately.

D – Durability

Once a transaction is committed, the changes are permanent, even if the system crashes.

CODD's Commandments (12 Rules of Dr. E.F. Codd)

Dr. E.F. Codd, the father of the relational model, gave 12 rules to define what a true RDBMS should follow.

Here's a simple version:

Information Rule:

Data should be stored in tables (relations).

Guaranteed Access Rule:

Every data item should be accessible using table name, column name, and primary key.

Systematic Treatment of NULL Values:

NULL represents missing or unknown values and must be treated properly.

Dynamic Online Catalog:

Database structure should be stored in tables and accessible using SQL.

Comprehensive Data Sub-language Rule:

The system must support at least one language (like SQL) for all operations.

View Updating Rule:

All views that can be updated must be automatically updated.

High-level Insert, Update, Delete:

Data manipulation should be possible using SQL commands.

Physical Data Independence:

Changing storage structure should not affect the user.

Logical Data Independence:

Changing logical structure (like adding new fields) should not affect applications.

Integrity Independence:

Integrity constraints should be stored in the database, not in application programs.

Distribution Independence:

The system should work properly even if the database is distributed across different locations.

Non-subversion Rule:

Security rules should not be bypassed through low-level access methods.

SQL Plus

SQL* or SQL Plus is an Oracle command-line tool used to interact with Oracle databases.

It allows users to execute SQL (Structured Query Language) and PL/SQL commands easily.

It's used to create, update, delete, and retrieve data, as well as manage database users.

Features of SQL Plus:

Executes SQL and PL/SQL commands.

Displays query results in tabular format.

Can save SQL scripts and run them later.

Provides formatting options for better report generation.

Allows connecting, disconnecting, and managing multiple databases.

● Example Commands in SQL Plus:

```
SQL> CONNECT system/password;
```

```
SQL> SELECT * FROM student;
```

```
SQL> INSERT INTO student VALUES (101, 'Rahul', 'BCA', 78);
```

```
SQL> EXIT;
```

Data Manipulations in RDBMS

Data manipulation refers to operations performed on data using DML (Data Manipulation Language) commands in SQL.

These are used to insert, update, delete, and retrieve records from tables.

Main DML Commands:

1. **SELECT** – retrieves data from tables.

```
sql|
```

```
SELECT * FROM student;
```

2. **INSERT** – adds new data to a table.

```
sql|
```

```
INSERT INTO student (rollno, name, course, marks)  
VALUES (101, 'Ravi', 'BCA', 85);
```

3. **UPDATE** – modifies existing data.

```
sql|
```

```
UPDATE student SET marks = 90 WHERE rollno = 101;
```

4. **DELETE** – removes data from a table.

```
sql|
```

```
DELETE FROM student WHERE rollno = 101;
```

Oracle Data Types

Oracle supports various data types for storing different kinds of values.

Here's a simple list:

Data Type	Description	Example
CHAR(size)	Fixed-length character	'A', 'Yes'
VARCHAR2(size)	Variable-length	'BCA Student'
NUMBER(p,s)	Numeric values (p =	123.45
DATE	Stores date and time	'06-NOV-2025'
LONG	Variable-length	Description text
CLOB	Character Large Object	Essay text
BLOB	Binary Large Object	Image file
RAW / LONG RAW	Binary data in raw	Stored password hash

In Short:

RDBMS = Table-based system for managing relational data.

Properties (ACID) = Ensures reliability and accuracy.

Codd's Rules = Standards for a perfect RDBMS.

SQL Plus = Oracle tool to execute SQL/PLSQL commands.

DML = Used to manage table data (SELECT, INSERT, UPDATE, DELETE).

Oracle Data Types = Define the kind of values stored in columns.

Table

What is a Table?

A table is the basic unit of storage in RDBMS.

It stores data in the form of rows (records) and columns (fields).

Each column has a specific data type (like NUMBER, VARCHAR2, DATE, etc).

Each row represents one complete record.

Example:

RollNo	Name	Course	Marks
101	Ravi	BCA	85
102	Neha	BCA	90

Creation of Table

We create a table using the CREATE TABLE command.

It defines the structure of the table – i.e., column names, data types, and constraints.

Syntax:

```
CREATE TABLE table_name (
    column1 datatype(size),
    column2 datatype(size),
    column3 datatype(size),
    ...
);
```

Example:

```
CREATE TABLE student (
    rollno NUMBER(5) PRIMARY KEY,
    name VARCHAR2(30),
    course VARCHAR2(10),
    marks NUMBER(5)
);
```

✓ This creates a table named student with four columns.

Insertion of Data (INSERT Command)

The INSERT command is used to add new records (rows) into a table.

Syntax:

```
INSERT INTO table_name (column1, column2, ...)
VALUES (value1, value2, ...);
```

Example:

```
INSERT INTO student (rollno, name, course, marks)
VALUES (101, 'Ravi', 'BCA', 85);
```

👉 This adds one record into the student table.

Updation of Data (UPDATE Command)

The UPDATE command is used to modify existing data in a table.

Syntax:

```
UPDATE table_name  
SET column_name = new_value  
WHERE condition;
```

Example:

```
UPDATE student  
SET marks = 90  
WHERE rollno = 101;
```

👉 This changes Ravi's marks to 90.

⚠ Note: Always use WHERE condition, otherwise all records will be updated.

Deletion of Data (DELETE Command)

The DELETE command removes records (rows) from a table, not the table itself.

Syntax:

```
DELETE FROM table_name  
WHERE condition;
```

Example:

```
DELETE FROM student WHERE rollno = 101;
```

👉 This removes Ravi's record from the student table.

⚠️ If you don't use a WHERE condition:

```
DELETE FROM student;
```

It will delete all rows from the table but keep the table structure.

Modification of Table Structure (ALTER Command)

The ALTER TABLE command is used to change the structure of an existing table – like adding, modifying, or deleting columns.

(a) Add a new column:

```
ALTER TABLE student ADD email VARCHAR2(40);
```

(b) Modify an existing column:

```
ALTER TABLE student MODIFY marks NUMBER(3);
```

(c) Rename a column:

```
ALTER TABLE student RENAME COLUMN name TO fullname;
```

(d) Drop (delete) a column:

```
ALTER TABLE student DROP COLUMN email;
```

Removing / Deleting / Dropping Tables

There are three levels of removing data or structure in SQL:

Command	Purpose	Effect
DELETE	Deletes specific rows	Keeps table structure
TRUNCATE	Deletes all rows	Keeps table, resets
DROP	Deletes entire table	Removes data +

Examples:

DELETE Command

```
DELETE FROM student WHERE course = 'BCA';
```

TRUNCATE Command

```
TRUNCATE TABLE student;
```

👉 All data deleted permanently, but the table remains.

DROP Command

```
DROP TABLE student;
```

👉 Removes the table completely from the database.

SELECT Command

The SELECT command is used to retrieve data from a table.

Syntax:

```
SELECT column1, column2, ...
FROM table_name
WHERE condition;
```

Examples:

Display all columns and rows:

```
SELECT * FROM student;
```

Display specific columns:

```
SELECT name, marks FROM student;
```

Display with condition:

```
SELECT * FROM student WHERE marks > 80;
```

Display with sorting:

SELECT * FROM student ORDER BY marks DESC;

Using DISTINCT (unique values):

SELECT DISTINCT course FROM student;

 **In Short Summary (for quick revision):**

Operation	Command	Purpose / Example
Create Table	CREATE TABLE	Defines table structure
Insert Data	INSERT INTO	Adds new record
Update Data	UPDATE	Changes existing data
Delete Data	DELETE	Removes records
Modify Structure	ALTER TABLE	Add/modify/drop
Remove All Rows	TRUNCATE	Deletes all data
Remove Table	DROP TABLE	Deletes table structure
Retrieve Data	SELECT	Displays data

Practice Questions

1. What is RDBMS? Explain its main features.
2. Explain the ACID properties of RDBMS with examples.
3. Write and explain Dr. E.F. Codd's 12 Rules for RDBMS.
4. What is SQL Plus? Write its features and uses.
5. Explain Data Manipulation Language (DML) commands in SQL with examples.
6. What are Oracle Data Types? List and describe the commonly used data types.
7. Explain how to create a table in SQL with proper syntax and example.
8. Write SQL commands for inserting, updating, and deleting records in a table.
9. What is the difference between DELETE, TRUNCATE, and DROP commands?
10. Explain the SELECT command in SQL with examples of WHERE and ORDER BY clauses.

Check the answer in the Practice Questions section on our website.



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Thank You