

## SQL QUERY NOTES (DBMS)

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### 1. Introduction to SQL

SQL (Structured Query Language) is a standard language used to store, retrieve, manipulate, and manage data in a relational database.

SQL was developed by IBM and later standardized by ANSI and ISO.

SQL is used in databases such as:

- MySQL
  - Oracle
  - PostgreSQL
  - SQL Server
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### 2. Features of SQL

- Easy to learn and use
  - Works with relational databases
  - Supports data definition and data manipulation
  - Provides security and access control
  - Supports transaction management
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### 3. Categories of SQL Commands

SQL commands are divided into five main categories:

1. DDL – Data Definition Language
  2. DML – Data Manipulation Language
  3. DQL – Data Query Language
  4. DCL – Data Control Language
  5. TCL – Transaction Control Language
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### 4. Data Definition Language (DDL)

DDL commands are used to define and modify database structure.

#### 4.1 CREATE

Used to create database objects like tables.

```
CREATE TABLE Student (  
    RollNo INT PRIMARY KEY,  
    Name VARCHAR(50),  
    Department VARCHAR(30),  
    Age INT  
);
```

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#### 4.2 ALTER

Used to modify an existing table.

```
ALTER TABLE Student ADD Email VARCHAR(50);
```

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#### 4.3 DROP

Deletes table permanently.

```
DROP TABLE Student;
```

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#### 4.4 TRUNCATE

Deletes all records but keeps table structure.

```
TRUNCATE TABLE Student;
```

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### 5. Data Manipulation Language (DML)

DML commands are used to manipulate data inside tables.

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#### 5.1 INSERT

Used to insert records.

```
INSERT INTO Student VALUES (1, 'Amit', 'CSE', 20);
```

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#### 5.2 UPDATE

Used to modify existing records.

```
UPDATE Student SET Age = 21 WHERE RollNo = 1;
```

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#### 5.3 DELETE

Used to delete records.

```
DELETE FROM Student WHERE RollNo = 1;
```

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## 6. Data Query Language (DQL)

DQL is mainly used for retrieving data.

### 6.1 SELECT Statement

```
SELECT * FROM Student;
```

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### 6.2 WHERE Clause

Used to apply conditions.

```
SELECT * FROM Student WHERE Department = 'CSE';
```

---

### 6.3 ORDER BY

Sorts records.

```
SELECT * FROM Student ORDER BY Age DESC;
```

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### 6.4 DISTINCT

Removes duplicate values.

```
SELECT DISTINCT Department FROM Student;
```

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## 7. Aggregate Functions

Aggregate functions operate on multiple rows and return a single value.

### Function Description

**COUNT()** Counts rows

**SUM()** Calculates total

**AVG()** Calculates average

**MAX()** Finds maximum

**MIN()** Finds minimum

```
SELECT COUNT(*) FROM Student;
```

```
SELECT AVG(Age) FROM Student;
```

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## **8. GROUP BY and HAVING**

### **GROUP BY**

Groups rows with same values.

```
SELECT Department, COUNT(*)  
FROM Student  
GROUP BY Department;
```

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### **HAVING**

Used with GROUP BY to filter groups.

```
SELECT Department, COUNT(*)  
FROM Student  
GROUP BY Department  
HAVING COUNT(*) > 5;
```

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## **9. SQL Joins**

Joins are used to combine data from multiple tables.

### **9.1 INNER JOIN**

Returns matching records.

```
SELECT Student.Name, Course.CourseName  
FROM Student  
INNER JOIN Course  
ON Student.RollNo = Course.RollNo;
```

---

### **9.2 LEFT JOIN**

Returns all records from left table.

```
SELECT * FROM Student  
LEFT JOIN Course  
ON Student.RollNo = Course.RollNo;
```

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### **9.3 RIGHT JOIN**

Returns all records from right table.

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#### 9.4 FULL JOIN

Returns all matching and non-matching records.

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#### 10. Subqueries

A subquery is a query inside another query.

**SELECT** Name

**FROM** Student

**WHERE** Age > (SELECT AVG(Age) FROM Student);

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#### 11. Constraints in SQL

Constraints ensure data integrity.

Constraint	Description
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PRIMARY KEY	Unique + Not Null
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FOREIGN KEY	References another table
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UNIQUE	Unique values
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NOT NULL	No NULL values
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CHECK	Condition-based
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DEFAULT	Default value
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#### 12. Data Control Language (DCL)

DCL controls access to data.

**GRANT**

**GRANT** SELECT ON Student TO user1;

**REVOKE**

**REVOKE** SELECT ON Student FROM user1;

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#### 13. Transaction Control Language (TCL)

Used to manage transactions.

## **COMMIT**

Saves changes permanently.

**COMMIT;**

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## **ROLLBACK**

Undo changes.

**ROLLBACK;**

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## **SAVEPOINT**

Creates a restore point.

**SAVEPOINT sp1;**

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## **14. Advantages of SQL**

- Easy syntax
  - Portable across databases
  - Secure data access
  - Handles large data efficiently
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## **15. Conclusion**

SQL is a powerful language used to interact with relational databases.

By using SQL queries, users can efficiently create, retrieve, update, and manage data.

Understanding SQL is essential for:

- Database administrators
- Backend developers
- Data analysts