

## Experiment 2

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### Aim

To understand and implement SQL SELECT queries using various clauses such as WHERE, ORDER BY, GROUP BY, and HAVING to retrieve and manipulate data efficiently from relational database tables.

### Software Requirements

- Database Management System:
  - PostgreSQL
- Database Administration Tool:
  - pgAdmin

### Objectives

- To practice writing SQL SELECT statements.
- To apply filtering conditions using the WHERE clause.
- To sort query results using the ORDER BY clause.
- To group records using the GROUP BY clause.
- To filter grouped data using the HAVING clause.
- To analyze data using aggregate functions like COUNT(), SUM(), AVG(), MIN(), and MAX().

### Problem Statement

An organization maintains an EMPLOYEE table to store details of its employees. The structure of the table is as follows:

Column Name	Data Type
emp_id	NUMBER
emp_name	VARCHAR
Department	VARCHAR
Salary	NUMBER
joining_date	DATE

## Practical/Experiment Steps

- Schema Definition: Constructed the fundamental EMPLOYEE table structure, defining specific data types for employee IDs, names, departments, salaries, and joining dates.
- Data Population: Seeded the database with sample employee records across various departments (IT, HR, Finance) to create a functional dataset for testing.
- Aggregate Data Analysis: Implemented GROUP BY operations to calculate the average salary for each department using the AVG() aggregate function.
- Conditional Filtering: Applied high-level filtering logic using the HAVING clause to isolate specific records, such as employees with salaries exceeding 20,000.
- Data Sorting & Grouped Constraints: Configured queries to sort department averages in descending order and practiced applying secondary filters to grouped results.

## Procedure

- Logged into the pgAdmin administration tool and established a connection to the PostgreSQL database server.
- Initialized a new database environment to house the employee management system.
- Ran the CREATE TABLE command to define the EMPLOYEE schema, ensuring EMP\_ID was set as the Primary Key.
- Executed multiple INSERT statements to populate the table with diverse sample books and visitor profiles—in this case, employee records.
- Used SELECT queries paired with GROUP BY to verify that data was correctly stored and consistent across the table.
- Applied HAVING and WHERE clauses to test how the system handles specific data retrieval conditions.
- Utilized the ORDER BY clause to arrange the output in descending order based on average salaries.

- Tested and verified the effectiveness of security or logic policies by ensuring queries returned expected results or empty sets when conditions weren't met.
- Saved the final SQL script and captured screenshots of the execution results for record maintenance.

## **Input/Output Analysis**

```
CREATE TABLE EMPLOYEE(
EMP_ID NUMERIC PRIMARY KEY,
EMP_NAME VARCHAR(20),
DEPARTMENT VARCHAR(20),
SALARY NUMERIC(10,2),
JOINING_DATE DATE
)
```

```
INSERT INTO EMPLOYEE VALUES(1, 'Aman', 'IT', 30000, '2023-05-23');
INSERT INTO EMPLOYEE VALUES(2, 'Sam', 'IT', 25000, '2016-05-23');
INSERT INTO EMPLOYEE VALUES(3, 'Neha', 'HR', 18000, '2025-09-19');
INSERT INTO EMPLOYEE VALUES(4, 'Suman', 'Finance', 20000, '2021-11-06');
INSERT INTO EMPLOYEE VALUES(5, 'Rohan', 'Finance', 24500, '2023-10-23');
INSERT INTO EMPLOYEE VALUES(6, 'Aditi', 'HR', 28000, '2018-04-16');
INSERT INTO EMPLOYEE VALUES(7, 'Aanya', 'IT', 26000, '2022-07-07')
```

```
SELECT DEPARTMENT, AVG(SALARY)::NUMERIC(10,2) AS AVG_SAL FROM EMPLOYEE
GROUP BY DEPARTMENT
```

```
SELECT EMP_ID, EMP_NAME, SALARY
FROM EMPLOYEE
GROUP BY EMP_ID
HAVING SALARY>20000
```

```
SELECT DEPARTMENT, AVG(SALARY)::NUMERIC(10,2) AS AVG_SAL FROM EMPLOYEE
GROUP BY DEPARTMENT
HAVING AVG(SALARY)>30000
```

```
SELECT DEPARTMENT, AVG(SALARY)::NUMERIC(10,2) AS AVG_SAL FROM EMPLOYEE
GROUP BY DEPARTMENT
ORDER BY AVG(SALARY) DESC
```

## **Output**

Table created

Data Output [Messages](#) Notifications

CREATE TABLE

Query returned successfully in 109 msec.

## Records inserted

Data Output [Messages](#) Notifications

INSERT 0 1

Query returned successfully in 110 msec.

## Employees with salaries greater than 20,000

Data Output [Messages](#) Notifications

The screenshot shows a database interface with a toolbar at the top containing icons for new table, open table, save, delete, export, import, and SQL. Below the toolbar, it says "Showing rows: 1 to 5" and "Page No: 1 of 1". The table has three columns: emp\_id, emp\_name, and salary. The data is as follows:

	emp_id [PK] numeric	emp_name character varying (20)	salary numeric (10,2)
1	1	Aman	30000.00
2	6	Aditi	28000.00
3	7	Aanya	26000.00
4	2	Sam	25000.00
5	5	Rohan	24500.00

## Average salaries of department

## Sorting average salaries in descending order:

Data Output [Messages](#) Notifications

The screenshot shows a database interface with a toolbar at the top containing icons for new table, open table, save, delete, export, import, and SQL. Below the toolbar, it says "Showing rows: 1 to 3" and "Page No: 1 of 1". The table has two columns: department and avg\_sal. The data is as follows:

	department character varying (20)	avg_sal numeric (10,2)
1	IT	27000.00
2	HR	23000.00
3	Finance	22250.00

Data Output Messages Notifications

Showing rows: 1 to 3 | Page No: 1 of 1 | Back | Forward | Last | First

	department character varying (20)	avg_sal numeric (10,2)
1	IT	27000.00
2	HR	23000.00
3	Finance	22250.00

Departments with average salary more than 30,000 (empty because none)

Data Output Messages Notifications

Showing rows: 1 to 3 | Page No: 1 of 1 | Back | Forward | Last | First

	department character varying (20)	avg_sal numeric (10,2)
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## I/O ANALYSIS TABLE

Input (SQL Query)	Output/Purpose
CREATE TABLE EMPLOYEE( ... )	Table created.
INSERT INTO EMPLOYEE VALUES( ... ) (All seven records)	Records inserted.
SELECT DEPARTMENT, AVG(SALARY)::NUMERIC(10,2) AS AVG_SAL FROM EMPLOYEE GROUP BY DEPARTMENT	Displays the average salary for each department.
SELECT EMP_ID, EMP_NAME, SALARY FROM EMPLOYEE GROUP BY EMP_ID HAVING SALARY>20000	Displays employee IDs, names, and salaries for employees whose salary is greater than 20,000.
SELECT DEPARTMENT, AVG(SALARY)::NUMERIC(10,2) AS AVG_SAL FROM EMPLOYEE GROUP BY DEPARTMENT HAVING	Attempts to display departments with an average salary greater than 30,000 (Result is empty).

AVG(SALARY)>30000	
<pre>SELECT DEPARTMENT, AVG(SALARY)::NUMERIC(10, 2) AS AVG_SAL FROM EMPLOYEE GROUP BY DEPARTMENT ORDER BY AVG(SALARY) DESC</pre>	Displays the average salary for each department, sorted in descending order of average salary.

## Learning Outcomes

- Learn to filter records using the WHERE clause.
- Group records using GROUP BY.
- Apply conditions on grouped data using HAVING.
- Sort query results using ORDER BY.