

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

SQL Input Queries

```
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

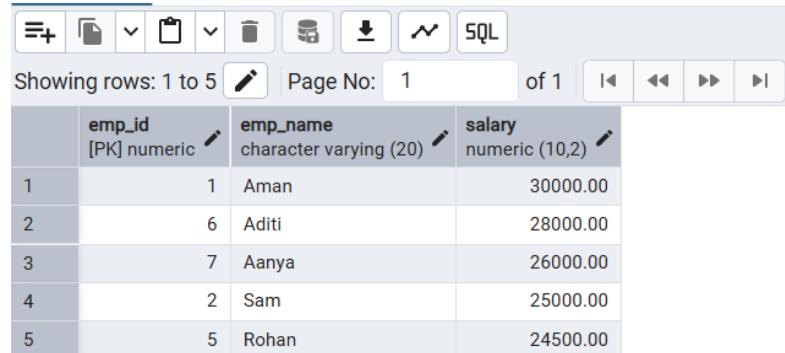
Data Output [Messages](#) Notifications

INSERT 0 1

Query returned successfully in 110 msec.

Employees with salaries greater than 20,000

Data Output [Messages](#) Notifications

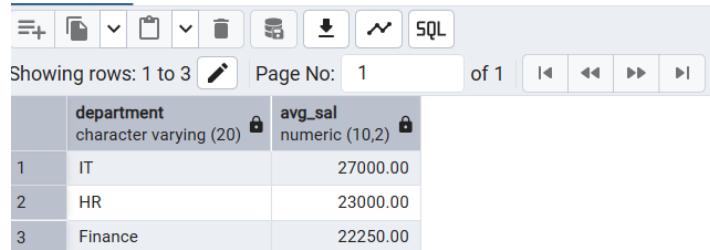


The screenshot shows a database interface with a toolbar at the top containing various icons for file operations like new, open, save, and search, along with a SQL button. Below the toolbar, a message bar says "Showing rows: 1 to 5" and "Page No: 1 of 1". A navigation bar with arrows is also present. The main area displays a table with 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

Data Output [Messages](#) Notifications



The screenshot shows a database interface with a toolbar at the top containing various icons for file operations like new, open, save, and search, along with a SQL button. Below the toolbar, a message bar says "Showing rows: 1 to 3" and "Page No: 1 of 1". A navigation bar with arrows is also present. The main area displays a table with 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

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 Data Output, Messages, Notifications, and various file operations like Open, Save, Print, and Export. Below the toolbar is a status bar showing "Showing rows: 1 to 3" and "Page No: 1 of 1". The main area displays a table with three rows. The columns are labeled "department" and "avg_sal". The data is as follows:

	department	avg_sal
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

The screenshot shows a database interface with a toolbar at the top containing icons for Data Output, Messages, Notifications, and various file operations like Open, Save, Print, and Export. Below the toolbar is a status bar showing "Showing rows: 1 to 3" and "Page No: 1 of 1". The main area displays a table with one row. The columns are labeled "department" and "avg_sal". The data is as follows:

	department	avg_sal

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.