

Experiment 1

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Subject Name: Technical Training

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1. Aim:

To design and implement a sample database system using DDL, DML, and DCL commands, including database creation, data manipulation, schema modification, and role-based access control to ensure data integrity and secure, read-only access for authorized users.

2. Objective:

To gain practical experience in implementing Data Definition Language (DDL), Data Manipulation Language (DML), and Data Control Language (DCL) operations in a real database environment. This will also include implementing role-based privileges to secure data.

3. Implementation/Code:

```
-- QUERY FROM postgres
-- DDL
-- DEPARTMENT TABLE
CREATE TABLE department(
department_id INT PRIMARY KEY,
department_name VARCHAR(20) NOT NULL UNIQUE,
salary FLOAT CHECK(salary>=0)
);

-- EMPLOYEE TABLE
CREATE TABLE employee(
```

```
employee_id INT PRIMARY KEY,  
employee_name VARCHAR(20) NOT NULL,  
department_id INT NOT NULL REFERENCES department(department_id),  
employee_contact VARCHAR(20),  
join_date DATE NOT NULL,  
end_date DATE CHECK(end_date>=join_date)  
);
```

```
ALTER TABLE employee ADD work_location VARCHAR(20);  
ALTER TABLE employee DROP work_location;  
ALTER TABLE employee ADD status VARCHAR(20) DEFAULT 'active';
```

```
-- PROJECT TABLE  
CREATE TABLE project(  
project_id INT PRIMARY KEY,  
project_name VARCHAR(20) NOT NULL UNIQUE,  
department_id INT NOT NULL REFERENCES department(department_id),  
start_date DATE NOT NULL,  
end_date DATE CHECK(end_date>=start_date)  
);
```

```
-- DML  
INSERT INTO department  
VALUES  
(101,'Manager',90000),  
(102,'HR',70000),  
(103,'EMPLOYEE',50000);
```

```
UPDATE department SET department_name='Employee' WHERE  
department_id=103;
```

```
INSERT INTO department  
VALUES
```



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```
(104,'DEVELOPER',-30000);
```

```
INSERT INTO department
```

```
VALUES
```

```
(104,'DEVELOPER',30000);
```

```
DELETE FROM department WHERE department_id=104;
```

```
INSERT INTO employee
```

```
VALUES
```

```
(1,'Rahul',101,8888888888,'2001-04-12','2010-07-13'),
```

```
(2,'Anuj',102,7777777777,'2003-06-10','2004-05-11'),
```

```
(3,'Aman',103,6666666666,'2006-05-20','2009-09-11'),
```

```
(4,'Naman',103,5555555555,'2006-06-25','2009-08-11'),
```

```
(5,'Karan',103,4444444444,'2006-03-12','2009-05-11');
```

```
DELETE FROM employee WHERE employee_id=3;
```

```
INSERT INTO project
```

```
VALUES
```

```
(11,'P1',103,'2025-08-14','2025-09-14'),
```

```
(12,'P2',103,'2025-08-14','2025-08-30');
```

```
-- DQL
```

```
SELECT * FROM department;
```

```
SELECT * FROM employee;
```

```
SELECT * FROM project;
```

```
-- DCL
```

```
CREATE ROLE reporting_user
```

```
LOGIN
```

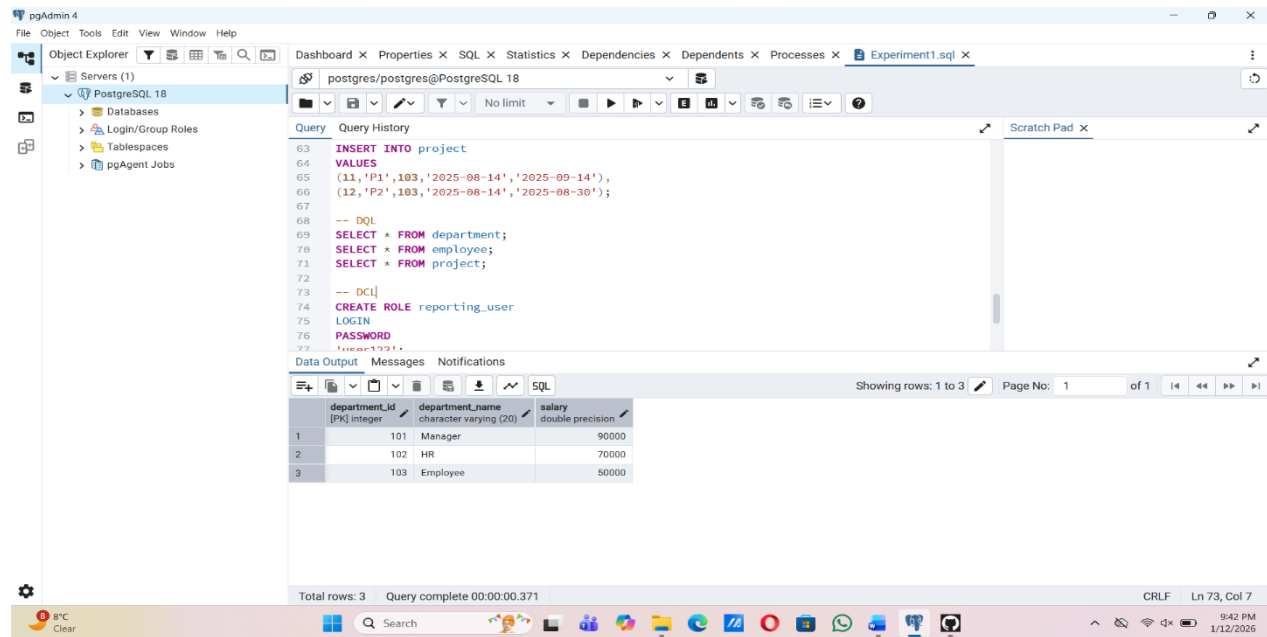
```
PASSWORD
```

```
'user123';
```

```
GRANT SELECT ON department TO reporting_user;  
REVOKE SELECT ON department FROM reporting_user;  
GRANT SELECT ON project TO reporting_user;  
REVOKE CREATE ON SCHEMA PUBLIC FROM reporting_user;
```

```
-- QUERY FROM reporting_user  
SELECT * FROM project;
```

4. Output:



The screenshot shows the pgAdmin 4 interface. The left pane displays the 'Servers' tree with 'PostgreSQL 18' selected. The main pane shows a SQL query in the 'Query' editor. The query is as follows:

```
63 INSERT INTO project  
64 VALUES  
65 (11, 'P1', 103, '2025-08-14', '2025-09-14'),  
66 (12, 'P2', 103, '2025-08-14', '2025-08-30');  
67  
68 -- DQL  
69 SELECT * FROM department;  
70 SELECT * FROM employee;  
71 SELECT * FROM project;  
72  
73 -- DCL  
74 CREATE ROLE reporting_user  
75 LOGIN  
76 PASSWORD  
77 'password1234';
```

The 'Data Output' pane shows the results of the query. It displays a table with 3 rows and 3 columns: department_id (PK integer), department_name (character varying (20)), and salary (double precision). The data is as follows:

department_id	department_name	salary
1	101 Manager	90000
2	102 HR	70000
3	103 Employee	50000

The status bar at the bottom indicates 'Total rows: 3' and 'Query complete 00:00:00.371'.

5. Learning Outcomes:

1. About query writing in PostgreSQL.
2. About various DDL, DML and DCL commands.
3. About the application of CHECK constraint.
4. About role-based privileges to secure data.