Experiment 1

Student Name: Nikhil Kumar
UID: 25MCI10036
Branch: MCA (AI/ML)
Section/Group: 25MAM-1(A)
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1. Aim of the Session:

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. Objectives:

After completing this practical, the student will be able to:

- Understand the use of DDL commands to create and modify database structures.
- Perform DML operations such as INSERT, UPDATE, DELETE, and SELECT.
- Implement relationships using primary and foreign keys.
- Apply DCL commands to manage roles and privileges.
- Analyze input and output of SQL queries in a real database environment.

3. Practical / Experiment steps:

- Design the database schema for Department, Employee, and Project tables.
- Create tables using appropriate constraints.

- Insert sample records into tables.
- Perform update and delete operations.
- Retrieve data using SELECT queries.
- Create a role and grant/revoke privileges.
- Alter and drop database objects.

4. Procedure of the Experiment:

i. **Start the system and log in to the computer.**
ii. **Open PostgreSQL software.**
iii. **Create database exp1.**
iv. **Create tables using DDL commands.**

Create table Department

```
CREATE TABLE Department (

   dept_id int PRIMARY KEY,

   dept_name VARCHAR(50) UNIQUE NOT NULL,

   location VARCHAR(50) NOT NULL

);
```

Create table Employee

```
CREATE TABLE Employee (

   emp_id int PRIMARY KEY,

   emp_name VARCHAR(50) NOT NULL,

   email VARCHAR(50) UNIQUE NOT NULL,

   salary int CHECK (salary > 0),

   dept_id int,

   CONSTRAINT fk_dept FOREIGN KEY (dept_id)

   REFERENCES Department(dept_id) );
```

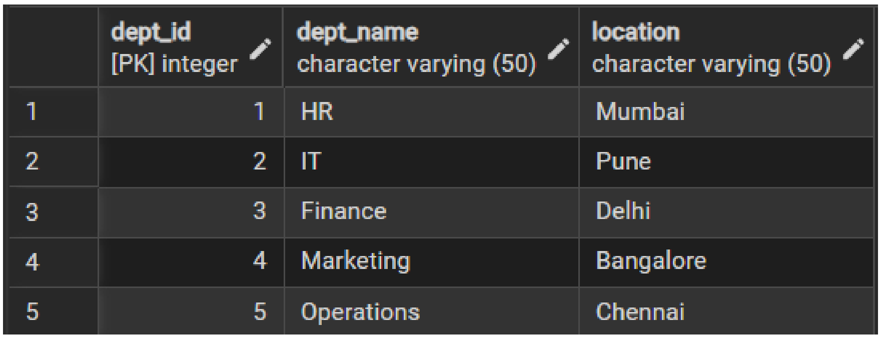
Create table Project

```
CREATE TABLE Project (
    project_id int PRIMARY KEY,
    project_name VARCHAR(50) NOT NULL,
    dept_id int,
    CONSTRAINT fk_project_dept FOREIGN KEY (dept_id)
    REFERENCES Department(dept_id)
);
```

v. Insert records using DML commands

Insert into Department

```
INSERT INTO Department VALUES (1, 'HR', 'Mumbai');
INSERT INTO Department VALUES (2, 'IT', 'Pune');
INSERT INTO Department VALUES (3, 'Finance', 'Delhi');
INSERT INTO Department VALUES (4, 'Marketing', 'Bangalore');
INSERT INTO Department VALUES (5, 'Operations', 'Chennai');
```



	dept_id [PK] integer	dept_name character varying (50)	location character varying (50)
1	1	HR	Mumbai
2	2	IT	Pune
3	3	Finance	Delhi
4	4	Marketing	Bangalore
5	5	Operations	Chennai

Insert into Employee

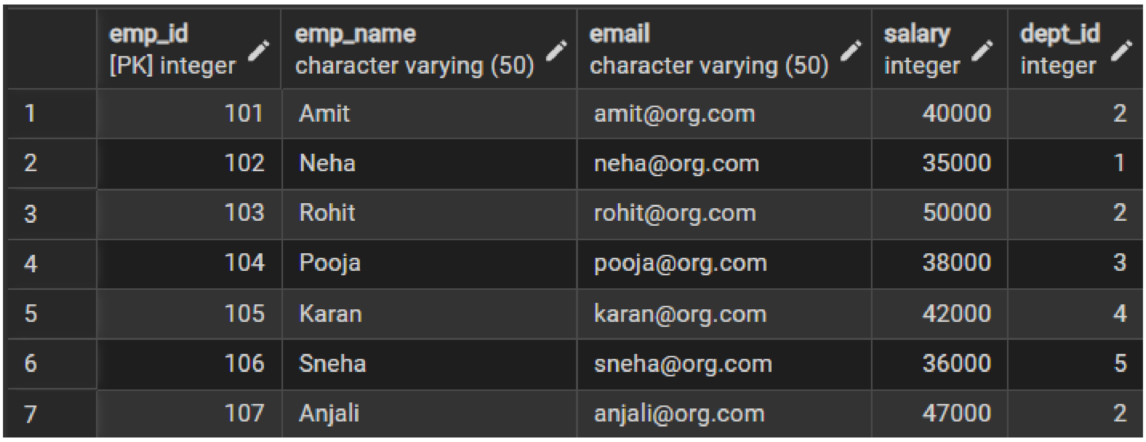
```
INSERT INTO Employee VALUES (101, 'Amit', 'amit@org.com', 40000, 2);
INSERT INTO Employee VALUES (102, 'Neha', 'neha@org.com', 35000, 1);
INSERT INTO Employee VALUES (103, 'Rohit', 'rohit@org.com', 50000, 2);
```

INSERT INTO Employee VALUES (104, 'Pooja', 'pooja@org.com', 38000, 3);

INSERT INTO Employee VALUES (105, 'Karan', 'karan@org.com', 42000, 4);

INSERT INTO Employee VALUES (106, 'Sneha', 'sneha@org.com', 36000, 5);

INSERT INTO Employee VALUES (107, 'Anjali', 'anjali@org.com', 47000, 2);



	emp_id [PK] integer	emp_name character varying (50)	email character varying (50)	salary integer	dept_id integer
1	101	Amit	amit@org.com	40000	2
2	102	Neha	neha@org.com	35000	1
3	103	Rohit	rohit@org.com	50000	2
4	104	Pooja	pooja@org.com	38000	3
5	105	Karan	karan@org.com	42000	4
6	106	Sneha	sneha@org.com	36000	5
7	107	Anjali	anjali@org.com	47000	2

Insert into Project

INSERT INTO Project VALUES (201, 'Payroll System', 1);

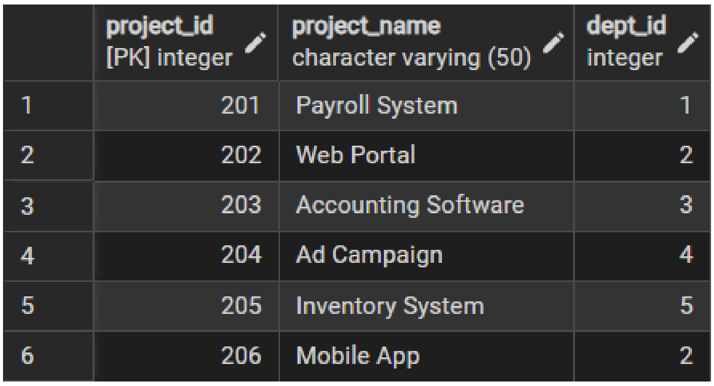
INSERT INTO Project VALUES (202, 'Web Portal', 2);

INSERT INTO Project VALUES (203, 'Accounting Software', 3);

INSERT INTO Project VALUES (204, 'Ad Campaign', 4);

INSERT INTO Project VALUES (205, 'Inventory System', 5);

INSERT INTO Project VALUES (206, 'Mobile App', 2);



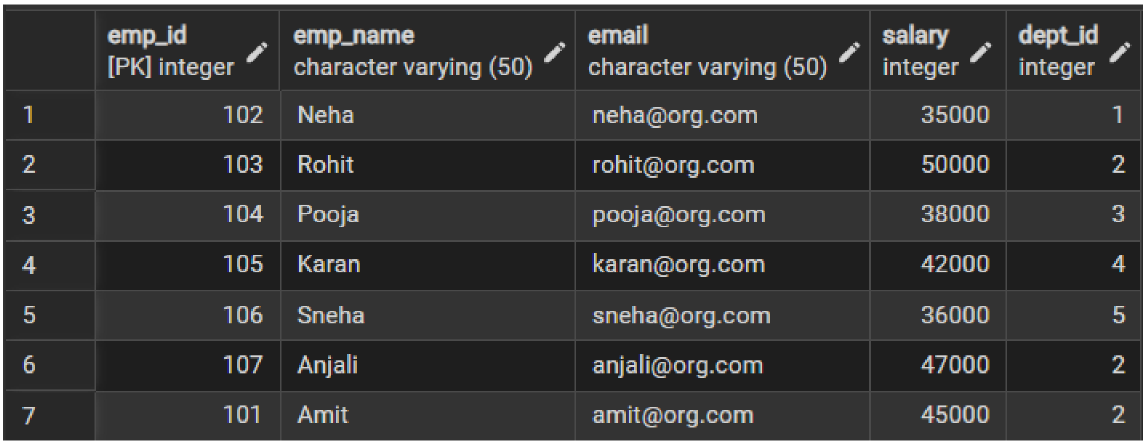
	project_id [PK] integer	project_name character varying (50)	dept_id integer
1	201	Payroll System	1
2	202	Web Portal	2
3	203	Accounting Software	3
4	204	Ad Campaign	4
5	205	Inventory System	5
6	206	Mobile App	2

vi. Update and delete records

UPDATE Employee

SET salary = 45000

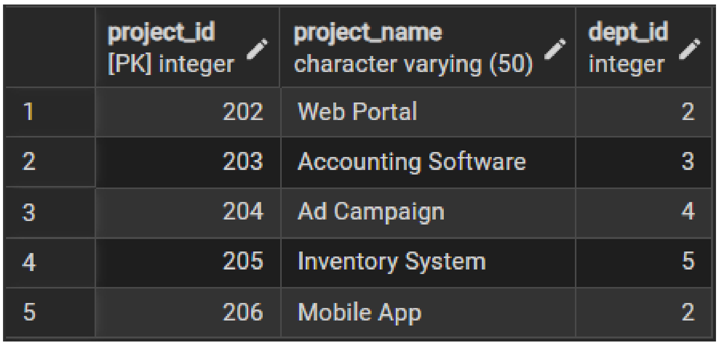
WHERE emp_id = 101;



	emp_id [PK] integer	emp_name character varying (50)	email character varying (50)	salary integer	dept_id integer
1	102	Neha	neha@org.com	35000	1
2	103	Rohit	rohit@org.com	50000	2
3	104	Pooja	pooja@org.com	38000	3
4	105	Karan	karan@org.com	42000	4
5	106	Sneha	sneha@org.com	36000	5
6	107	Anjali	anjali@org.com	47000	2
7	101	Amit	amit@org.com	45000	2

DELETE FROM Project

WHERE project_id = 201;



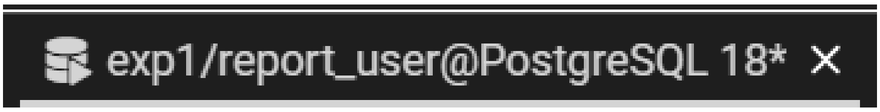
	project_id [PK] integer	project_name character varying (50)	dept_id integer
1	202	Web Portal	2
2	203	Accounting Software	3
3	204	Ad Campaign	4
4	205	Inventory System	5
5	206	Mobile App	2

vii. Create role and assign privileges.

CREATE ROLE report_user LOGIN PASSWORD 'report123';

GRANT CONNECT ON DATABASE exp1 TO report_user;

GRANT USAGE ON SCHEMA public TO report_user;



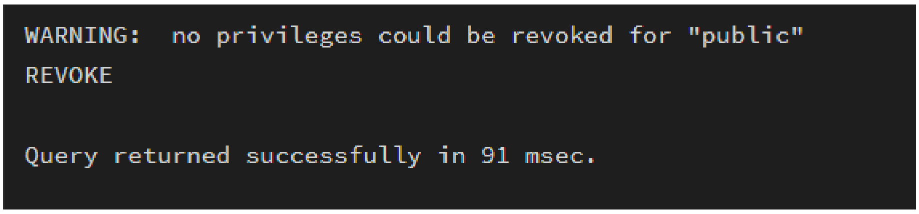
exp1/report_user@PostgreSQL 18* ×

GRANT SELECT ON Department TO report_user;

GRANT SELECT ON Employee TO report_user;

GRANT SELECT ON Project TO report_user;

REVOKE CREATE ON SCHEMA public FROM report_user;



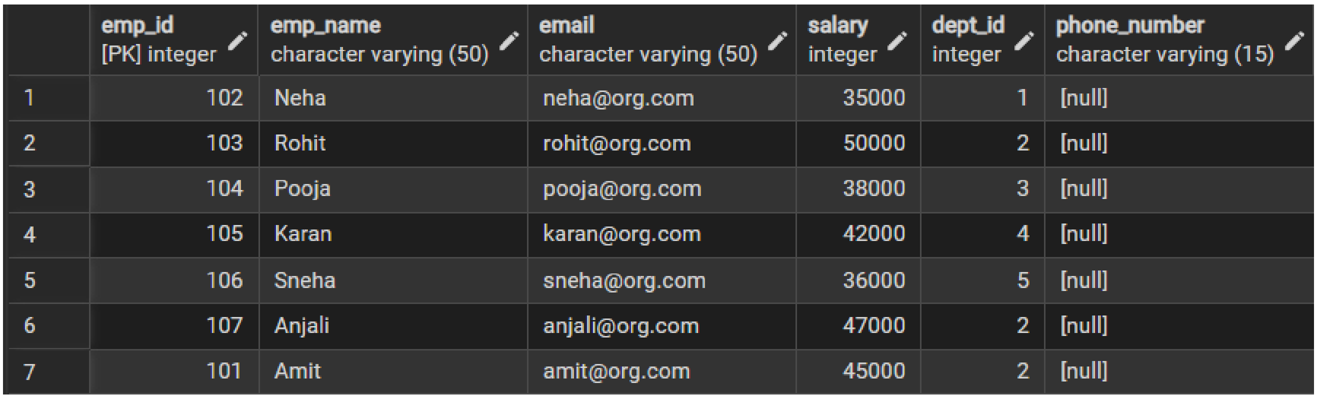
```
WARNING:  no privileges could be revoked for "public"
REVOKE

Query returned successfully in 91 msec.
```

viii. Alter and drop table.

ALTER TABLE Employee

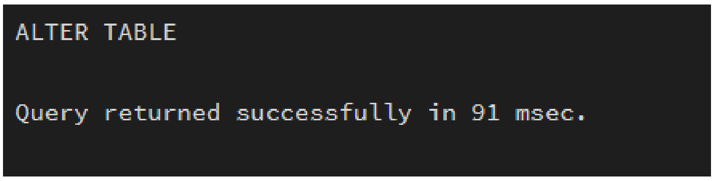
ADD phone_number VARCHAR(15);



	emp_id [PK] integer	emp_name character varying (50)	email character varying (50)	salary integer	dept_id integer	phone_number character varying (15)
1	102	Neha	neha@org.com	35000	1	[null]
2	103	Rohit	rohit@org.com	50000	2	[null]
3	104	Pooja	pooja@org.com	38000	3	[null]
4	105	Karan	karan@org.com	42000	4	[null]
5	106	Sneha	sneha@org.com	36000	5	[null]
6	107	Anjali	anjali@org.com	47000	2	[null]
7	101	Amit	amit@org.com	45000	2	[null]

ALTER TABLE Employee

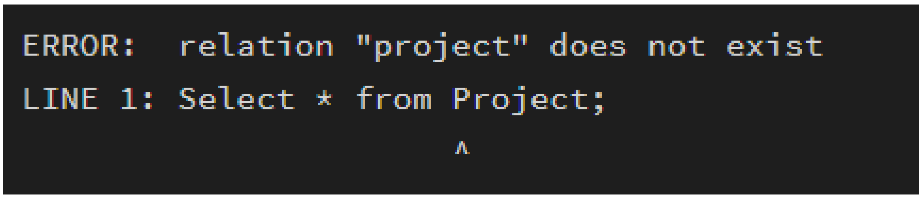
ALTER COLUMN emp_name TYPE VARCHAR(100);



```
ALTER TABLE

Query returned successfully in 91 msec.
```

DROP TABLE Project;



```
ERROR:  relation "project" does not exist
LINE 1: Select * from Project;
                      ^
```

5. Learning Outcomes (What I have learned):

- Create database tables using DDL commands with appropriate constraints to ensure data integrity.
- Perform DML operations such as INSERT, UPDATE, and DELETE on database records.
- Establish relationships between tables using PRIMARY KEY and FOREIGN KEY constraints.
- Implement role-based access control using DCL commands to provide secure, read-only access.
- Modify and manage database schemas using ALTER TABLE and DROP TABLE commands.