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Subject Name: Technical Training – I Lab	**Subject Code**: 25CAP-652

Experiment No: 1

1. **Aim of the practical:**
   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. **S/W Requirement:** Oracle Database Express Edition and PGAdmin.

3. **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.

4. **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.

5. **Procedure of the Practical**

   (i) Start the system and log in to the computer.
   (ii) Open PostgreSQL software.

(iii) create database tpp;
(iv) Create tables using DDL commands.

Code :

Creation of tables:

```
CREATE TABLE Department (
    Dept_ID INT PRIMARY KEY,
    Dept_Name VARCHAR(50) UNIQUE NOT NULL,
    Location VARCHAR(50) NOT NULL
);
CREATE TABLE Employee (
    Emp_ID INT PRIMARY KEY,
    Emp_Name VARCHAR(50) NOT NULL,
    Salary INT CHECK (Salary > 0),
    Dept_ID INT REFERENCES Department(Dept_ID),
    Email VARCHAR(100) UNIQUE );

CREATE TABLE Project (
    Project_ID INT PRIMARY KEY,
    Project_Name VARCHAR(50) NOT NULL,
    Budget INT CHECK (Budget >= 10000),
    Dept_ID INT REFERENCES Department(Dept_ID)

);
```

Inserting values into tables:

```
INSERT INTO Department VALUES
(1, 'HR', 'Mumbai'),
(2, 'IT', 'Pune'),
(3, 'Finance', 'Delhi');

INSERT INTO Employee VALUES
(101, 'Alice', 50000, 2, 'alice@org.com'),
(102, 'Bob', 45000, 1, 'bob@org.com'),
(103, 'Charlie', 60000, 2, 'charlie@org.com');

INSERT INTO Project VALUES
(201, 'Payroll System', 200000, 1),
(202, 'Web Application', 500000, 2);
```

Viewing tables:

```
SELECT * FROM Department;
SELECT * FROM Employee;
SELECT * FROM Project;
```

Updating table Employee:

```
UPDATE Employee
SET Salary = 55000
WHERE Emp_ID = 101;
```

Deleting from table:

```
DELETE FROM Department
WHERE Dept_ID = 3;
```

Creating role:

```
CREATE ROLE Analyst
With LOGIN PASSWORD 'analyst111'
```

Grant permissions:

```
GRANT SELECT ON Department TO Analyst;
GRANT SELECT ON Employee TO Analyst;
GRANT SELECT ON Project TO Analyst;
```

Revoke permissions:

```
REVOKE CREATE ON DATABASE tpp FROM Analyst;
```

Altering table:

```
ALTER TABLE Employee
ADD Phone_No VARCHAR(15);

ALTER TABLE Employee
ALTER COLUMN Emp_Name TYPE VARCHAR(100);
```

Deleting table:

```
DROP TABLE Project;
```

6. Output:

Department table:

	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

Employee table:

	emp_id [PK] integer	emp_name character varying (50)	salary integer	dept_id integer	email character varying (100)
1	101	Alice	50000	2	alice@org.com
2	102	Bob	45000	1	bob@org.com
3	103	Charlie	60000	2	charlie@org.com

Project table:

	project_id [PK] integer	project_name character varying (50)	budget integer	dept_id integer
1	201	Payroll System	200000	1
2	202	Web Application	500000	2

After update query:

	emp_id [PK] integer	emp_name character varying (50)	salary integer	dept_id integer	email character varying (100)
1	102	Bob	45000	1	bob@org.com
2	103	Charlie	60000	2	charlie@org.com
3	101	Alice	55000	2	alice@org.com

After deleting from table:

	dept_id [PK] integer	dept_name character varying (50)	location character varying (50)
1	1	HR	Mumbai
2	2	IT	Pune

After alter query:

	emp_id [PK] integer	emp_name character varying (100)	salary integer	dept_id integer	email character varying (100)	phone_no character varying (15)
1	102	Bob	45000	1	bob@org.com	[null]
2	103	Charlie	60000	2	charlie@org.com	[null]
3	101	Alice	55000	2	alice@org.com	[null]

Revoke permissions:

```
ERROR:  permission denied for schema public
LINE 1: create table manager
                     ^

SQL state: 42501
Character: 14
```

7. I/O Analysis (Input / Output)

Input:

- Department, Employee, and Project tables creation queries.
- Records inserted into all tables using INSERT commands
- Update query to modify employee department
- Delete queries to remove project and employee records
- Role creation and privilege assignment queries
- ALTER and DROP table commands

Output:

- Department, Employee, and Project tables created successfully
- Records inserted, updated, and deleted correctly
- Referential integrity maintained between tables
- Data displayed correctly using SELECT queries
- Role-based access verified using GRANT and REVOKE
- Table structure modified and project table dropped successfully

Screenshots of obtained results are attached.

8. Learning Outcomes:

- Understand how to design a relational database using multiple tables with proper relationships.
- Learn to apply constraints to maintain data integrity and consistency.
- Perform basic data manipulation operations such as INSERT, UPDATE, and DELETE.
- Implement database security by managing users, roles, and access privileges