

Experiment 1.1

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Experiment 1.1: Database System Implementation using DDL, DML, and DCL Commands

1. AIM

To design and implement a sample database system using DDL, DML, and DCL commands, ensuring data integrity through constraints and providing secure, read-only access using role-based privileges.

2. OBJECTIVE

- To create database tables using DDL commands with appropriate constraints
 - To insert, update, and delete records using DML commands
 - To modify database schema using ALTER statements
 - To implement role-based access control using DCL commands
-

3. SOFTWARE REQUIREMENTS

To perform this experiment, the following software is required:

1. Operating System

- Windows 10 / 11, Linux, or macOS

2. Database Management System (DBMS)

- PostgreSQL (version 12 or higher)

3. SQL Client / Interface

- pgAdmin 4 (for PostgreSQL)

OR

- Command Line Interface (psql)

4. PROCEDURE FOR EXPERIMENT

1. Table Creation (DDL Commands)

```
1 CREATE TABLE department (  
2     id INT PRIMARY KEY,  
3     name VARCHAR(50) NOT NULL UNIQUE,  
4     description VARCHAR(100),  
5     created_at DATE DEFAULT CURRENT_DATE  
6 );  
8 CREATE TABLE project (  
9     id INT PRIMARY KEY,  
10    name VARCHAR(50) NOT NULL,  
11    due_date DATE NOT NULL,  
12    budget DECIMAL(10,2),  
13    status VARCHAR(20) CHECK (status IN ('Planned', 'Ongoing', 'Completed')),  
14    dept_id INT,  
15    FOREIGN KEY (dept_id) REFERENCES department(id)  
16 );  
19 CREATE TABLE employee (  
20     id INT PRIMARY KEY,  
21     name VARCHAR(50) NOT NULL,  
22     age INT CHECK (age >= 18),  
23     salary DECIMAL(10,2),  
24     mobile VARCHAR(20) UNIQUE NOT NULL,  
25     email VARCHAR(50) UNIQUE,  
26     designation VARCHAR(50),  
27     hire_date DATE DEFAULT CURRENT_DATE,  
28     dept_id INT,  
29     FOREIGN KEY (dept_id) REFERENCES department(id)  
30 );
```

2. Data Manipulation (DML Commands)

```
32 INSERT INTO department (id, name, description) VALUES
33 (1, 'HR', 'Human Resources'),
34 (2, 'IT', 'Information Technology'),
35 (3, 'Finance', 'Finance and Accounting');
36
37 INSERT INTO project (id, name, due_date, budget, status, dept_id) VALUES
38 (101, 'Recruitment Drive', '2026-03-31', 50000, 'Ongoing', 1),
39 (102, 'ERP System', '2026-06-30', 250000, 'Planned', 2),
40 (103, 'Annual Audit', '2026-01-31', 75000, 'Completed', 3);
41
42 INSERT INTO employee (id, name, age, salary, mobile, email, designation, dept_id) VALUES
43 (1, 'Alice Johnson', 28, 45000, '9876543210', 'alice@company.com', 'HR Executive', 1),
44 (2, 'Bob Smith', 32, 65000, '9876543211', 'bob@company.com', 'Software Engineer', 2),
45 (3, 'Charlie Brown', 40, 70000, '9876543212', 'charlie@company.com', 'Accountant', 3);
```

```
47 DELETE FROM employee
48 WHERE id = 1;
49
50 UPDATE employee
51 SET name = 'Bob'
52 WHERE id = 2;
```

3. Schema Modification (DDL Command)

```
53
54 ALTER TABLE department ADD total_employees INT;
55
```

5. Access Control (DCL Commands)

```
56 CREATE ROLE reporting_user
57 LOGIN
58 PASSWORD 'report123';
59
60 GRANT SELECT ON department TO reporting_user;
61 GRANT SELECT ON project TO reporting_user;
62 GRANT SELECT ON employee TO reporting_user;
63
64 GRANT USAGE ON SCHEMA public TO reporting_user;
65
66 REVOKE INSERT, UPDATE, DELETE ON department FROM reporting_user;
67 REVOKE INSERT, UPDATE, DELETE ON employee FROM reporting_user;
68 REVOKE INSERT, UPDATE, DELETE ON project FROM reporting_user;
```

6. LEARNING OUTCOMES

- Understood the use of DDL commands to create and modify database schemas
- Gained experience with DML commands for inserting, updating, and deleting data
- Learned to enforce data integrity using primary key, foreign key, check, and unique constraints
- Implemented role-based security using DCL commands
- Ensured secure, read-only access for authorized users