EXPERIMENT -2

Aim

To design and implement a normalized academic database schema with tables for Departments and Courses, insert sample data, retrieve departments with more than two courses using subqueries, and control access using DCL in SQL.

Objective

1. Create normalized tables (3NF) for departments and courses.
2. Insert meaningful sample data.
3. Retrieve departments offering more than two courses using a subquery.
4. Implement access control by granting SELECT privileges using DCL.

Theory

Normalization is a process in database design to eliminate redundancy and ensure data integrity. 3NF (Third Normal Form) ensures that every non-prime attribute is non-transitively dependent on the primary key. SQL allows for data querying (via SELECT), and DCL (Data Control Language) provides control over database access.

Algorithm

Step 1: Design tables with appropriate keys and relationships.

Step 2: Create Departments and Courses tables using SQL DDL commands.

Step 3: Insert at least 5 departments and 10 courses ensuring proper foreign key relations.

Step 4: Write a subquery to fetch department names that offer more than two courses.

Step 5: Use GRANT command to assign SELECT privileges to a specific user on the Courses table.

SQL Queries

```
DROP TABLE IF EXISTS Courses;
DROP TABLE IF EXISTS Departments;
```

```
CREATE TABLE Departments (
    dept_id INT PRIMARY KEY,
    dept_name VARCHAR(50) UNIQUE NOT NULL
);

-
CREATE TABLE Courses (
    course_id INT PRIMARY KEY,
    course_name VARCHAR(100) NOT NULL,
    dept_id INT NOT NULL,
    FOREIGN KEY (dept_id) REFERENCES Departments(dept_id)
);

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INSERT INTO Departments (dept_id, dept_name) VALUES
(1, 'Computer Science'),
(2, 'Electrical'),
(3, 'Mechanical'),
(4, 'Civil'),
(5, 'Electronics');


INSERT INTO Courses (course_id, course_name, dept_id) VALUES
(101, 'DBMS', 1),
(102, 'Operating Systems', 1),
(103, 'Power Systems', 2),
(104, 'Digital Circuits', 2),
(105, 'Thermodynamics', 3),
(106, 'Fluid Mechanics', 3),
(107, 'Structural Engineering', 4),
(108, 'Surveying', 4),
(109, 'Embedded Systems', 5),
(110, 'VLSI Design', 5);


SELECT dept_name
FROM Departments
WHERE dept_id IN (
    SELECT dept_id
    FROM Courses
    GROUP BY dept_id
    HAVING COUNT(course_id) > 2
);


GRANT SELECT ON Courses TO viewer_user;
```
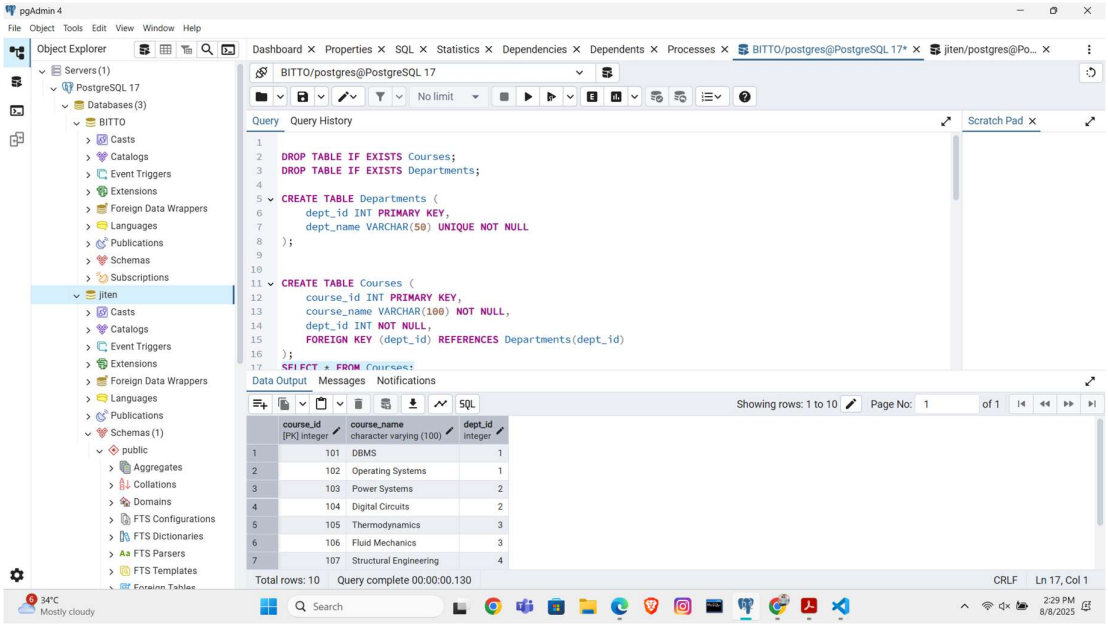
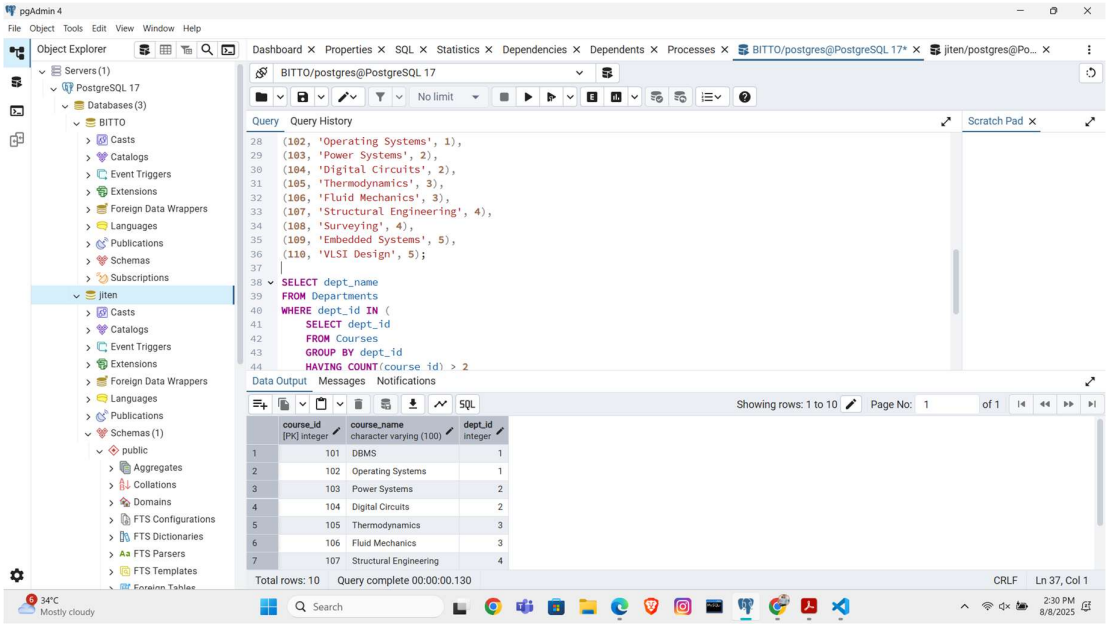

OUTPUT-


pgAdmin 4
File Object Tools Edit View Window Help
Object Explorer
Dashboard Properties SQL Statistics Dependencies Dependents Processes BITTO/postgres@PostgreSQL 17* jiten/postgres@Po...
BITTO/postgres@PostgreSQL 17
No limit
Query Query History
Scratch Pad
DROP TABLE IF EXISTS Courses;
DROP TABLE IF EXISTS Departments;
CREATE TABLE Departments (
dept_id INT PRIMARY KEY,
dept_name VARCHAR(50) UNIQUE NOT NULL
);
CREATE TABLE Courses (
course_id INT PRIMARY KEY,
course_name VARCHAR(100) NOT NULL,
dept_id INT NOT NULL,
FOREIGN KEY (dept_id) REFERENCES Departments(dept_id)
);
SELECT * FROM Courses;
Data Output Messages Notifications
Showing rows: 1 to 10 Page No: 1 of 1
course_id [PK] integer
course_name character varying (100)
dept_id integer
101 DBMS 1
102 Operating Systems 1
103 Power Systems 2
104 Digital Circuits 2
105 Thermodynamics 3
106 Fluid Mechanics 3
107 Structural Engineering 4
Total rows: 10 Query complete 00:00:00.130
CRLF Ln 17, Col 1
34°C Mostly cloudy
Search
2:29 PM 8/8/2025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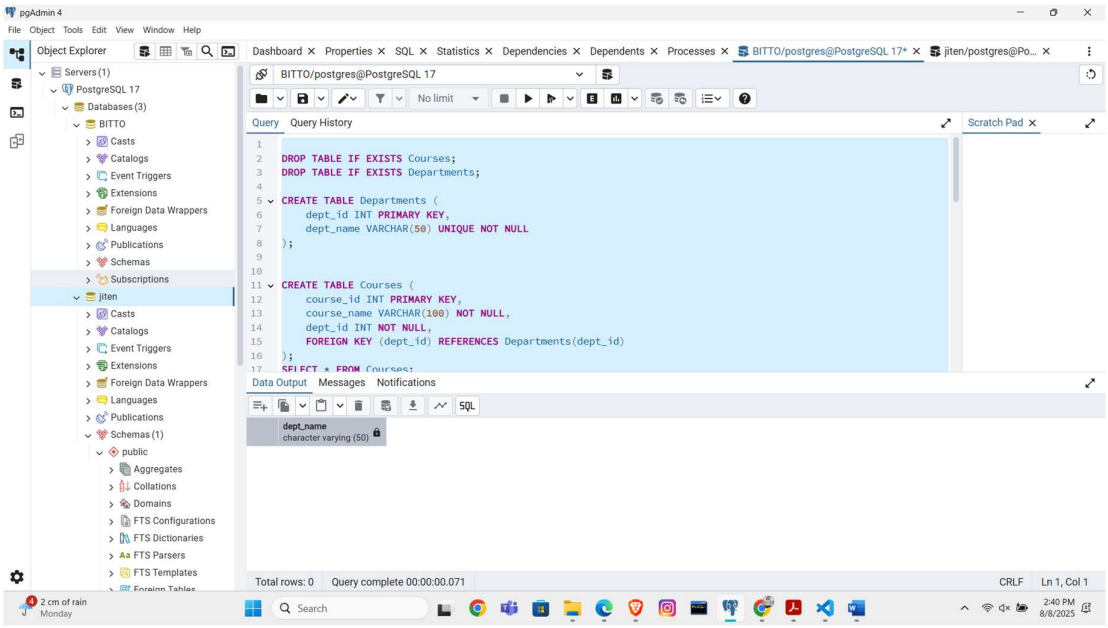
Dashboard Properties SQL Statistics Dependencies Dependents Processes BITTO/postgres@PostgreSQL 17* jiten/postgres@Po...
BITTO/postgres@PostgreSQL 17
No limit
Query Query History
Scratch Pad
(102, 'Operating Systems', 1),
(103, 'Power Systems', 2),
(104, 'Digital Circuits', 2),
(105, 'Thermodynamics', 3),
(106, 'Fluid Mechanics', 3),
(107, 'Structural Engineering', 4),
(108, 'Surveying', 4),
(109, 'Embedded Systems', 5),
(110, 'VLSI Design', 5);
SELECT dept_name
FROM Departments
WHERE dept_id IN (
SELECT dept_id
FROM Courses
GROUP BY dept_id
HAVING COUNT(course_id) > 2
Data Output Messages Notifications
Showing rows: 1 to 10 Page No: 1 of 1
course_id [PK] integer
course_name character varying (100)
dept_id integer
101 DBMS 1
102 Operating Systems 1
103 Power Systems 2
104 Digital Circuits 2
105 Thermodynamics 3
106 Fluid Mechanics 3
107 Structural Engineering 4
Total rows: 10 Query complete 00:00:00.130
CRLF Ln 37, Col 1
34°C Mostly cloudy
Search
2:30 PM 8/8/2025



Learning Outcomes

1. Ability to design normalized tables in 3NF.
2. Skill to populate and maintain relational data using SQL.
3. Capability to write subqueries for complex data retrieval.
4. Understanding of access control mechanisms in SQL using DCL.