Experiment 1

Title

Design and Implementation of a Library Management System using SQL

Aim of the Session

To design and implement a Library Management System using SQL by creating relational database tables with appropriate constraints and performing data manipulation and data control operations to manage and secure library data efficiently.

Objective of the Session

- Understand database design for real-world applications

- Create tables using primary keys and foreign keys

- Maintain data integrity using constraints

- Perform DML operations such as INSERT, UPDATE, and DELETE

- Implement database security using roles and privileges (DCL)

Practical / Experiment Steps

- Create tables for **Books**, **Members**, and **Book_Issue**

- Define **Primary Key** and **Foreign Key** constraints

- Insert sample records into the tables

- Perform **UPDATE** and **DELETE** operations

- Create a role named **Librarian**

- Grant and revoke permissions using role-based access control

- Verify results using **SELECT** queries

Procedure of the Experiment

1. Start the system and log in to the computer.

2. Open the PostgreSQL environment using **pgAdmin**.

3. Create or select the required database.

4. Write SQL commands to create tables with appropriate constraints.

5. Insert records into tables using INSERT statements.

6. Execute UPDATE commands to modify existing records.

7. Execute DELETE commands to remove records safely.

8. Create a role named **Librarian** with login privileges.

9. Grant SELECT, INSERT, and DELETE permissions to the role.

10. Revoke permissions to test role-based access control.

11. Execute SELECT queries to verify correctness of data.

12. Save the work and take screenshots for record.

I/O Analysis (Input / Output Analysis)

Input Provided

- SQL commands for:

    o Creating tables (Books, Members, Book_Issue)

    o Defining primary key and foreign key constraints

    o Inserting sample records

    o UPDATE and DELETE operations

    o Role creation and privilege management

Output Generated

- Tables created successfully with constraints

- Records inserted and displayed correctly

- Member and book details updated successfully

- Records deleted while maintaining referential integrity

- Librarian role created successfully

- Permissions granted and revoked correctly

Data Output   Messages   Notifications

CREATE TABLE

Query returned successfully in 77 msec.

	book_id [PK] numeric	book_name character varying (100)	book_author character varying (50)	date_of_issue date
1	1000	HARRY POTTER	JK ROWLING	2026-10-12
2	1001	MAGIC	ANNIE HATHAWAY	2022-10-11
3	1002	ATOMIC HABITS	ABC	2020-10-11

	member_uid 🔒 numeric	book_id 🔒 numeric	date_of_issue 🔒 date
1	202	1000	2025-06-12
2	203	1000	2025-09-18
3	204	1001	2024-10-20

Learning Outcome

From this practical I learnt:

- How to design a relational database schema

- Usage of **primary keys** and **foreign keys**

- Importance of **data integrity and constraints**

- Execution of **DML operations** (INSERT, UPDATE, DELETE)

- Implementation of **role-based database security** using DCL commands

- Hands-on experience with PostgreSQL database management