Experiment-1

Experiment 1.1: Design and implementation of a Library Management System using PostgreSQL with DDL, DML and DCL commands.

Aim

The aim of this experiment is to design and implement a Library Management System database using PostgreSQL. The database is created using proper tables, primary keys, foreign keys and constraints. DML operations are performed and database security is implemented using roles and privileges.

Objective

The objective of this experiment is to gain practical knowledge of DDL, DML and DCL commands in PostgreSQL. It also helps in understanding how to create roles, grant permissions and revoke permissions to secure the database using role based access control.

Practical / Experiment Steps

1. Design the database structure for the Library Management System.
2. Create tables for books, members and issue records using DDL commands.
3. Apply primary keys, foreign keys and constraints to maintain data integrity.
4. Insert sample records into the tables using DML commands.
5. Update and delete records as required.
6. Create a database role named Librarian.
7. Grant required permissions like SELECT, INSERT and DELETE to the Librarian role.
8. Revoke permissions when needed to ensure database security.

Procedure of the Experiment

1. Start the system and log in to the computer.
2. Open pgAdmin and connect to PostgreSQL server.
3. Create a new database for the Library Management System.
4. Create tables such as Books, Members and Issue_Records using CREATE TABLE command.
5. Define primary keys and foreign keys while creating the tables.

6. Insert records into tables using INSERT command.

7. Update existing data using UPDATE command.

8. Delete unwanted records using DELETE command.

9. Create a role named Librarian with password using CREATE ROLE command.

10. Grant SELECT, INSERT and DELETE permissions to the Librarian role.

11. Revoke permissions using REVOKE command when required.

12. Execute all queries and verify the output.

CODE :

1. **ADMIN**

```
CREATE TABLE BOOKS(
    ID INT PRIMARY KEY,
    NAME VARCHAR(20) NOT NULL,
    AUTHOR VARCHAR(20) NOT NULL
)

INSERT INTO BOOKS VALUES(1,'HARRY POTTER','JK ROWLING');

ALTER TABLE BOOKS
ADD COUNT INT CHECK(COUNT>=1)

SELECT * FROM BOOKS

UPDATE BOOKS
SET COUNT=3
WHERE ID = 1

INSERT INTO BOOKS VALUES(2,'GAME OF THRONS','I DONT KNOW ',12);
CREATE TABLE LIBRARY_VISITOR_USER(
    USER_ID INT PRIMARY KEY,
    USER_NAME VARCHAR(20) NOT NULL,
    AGE INT CHECK(AGE>=17) NOT NULL,
    EMAIL_ID VARCHAR(20) UNIQUE NOT NULL
)
```

```
INSERT INTO LIBRARY_VISITOR_USER
VALUES(101,'ARYAN DAHIYA',18,'ARD@GMAIL.COM')

INSERT INTO LIBRARY_VISITOR_USER
VALUES(102,'RAMESH',19,'RMD@GMAIL.COM')

SELECT * FROM LIBRARY_VISITOR_USER

INSERT INTO LIBRARY_VISITOR_USER
VALUES(1,'RAM',19,'RAM@GMAIL.COM')

UPDATE LIBRARY_VISITOR_USER
SET USER_ID = 103
WHERE USER_ID =1

ALTER TABLE LIBRARY_VISITOR_USER
ALTER COLUMN EMAIL_ID TYPE VARCHAR(15);

CREATE TABLE BOOK_ISSUE(
    ISSUE_ID INT PRIMARY KEY ,
    BOOK_ID INT REFERENCES BOOKS(ID) NOT NULL,
    USER_ID INT REFERENCES LIBRARY_VISITOR_USER(USER_ID),
    ISSUE_DATE DATE NOT NULL DEFAULT CURRENT_DATE
)

INSERT INTO BOOK_ISSUE
VALUES(121,1,101,'2026-01-09')
SELECT * FROM BOOK_ISSU
CREATE ROLE LIBRARIAN
WITH LOGIN PASSWORD 'RAKESH101'
GRANT SELECT, INSERT, DELETE, UPDATE ON BOOKS TO LIBRARIAN
REVOKE  SELECT,INSERT,DELETE,INSERT,UPDATE ON BOOKS FROM LIBRANIAN
```

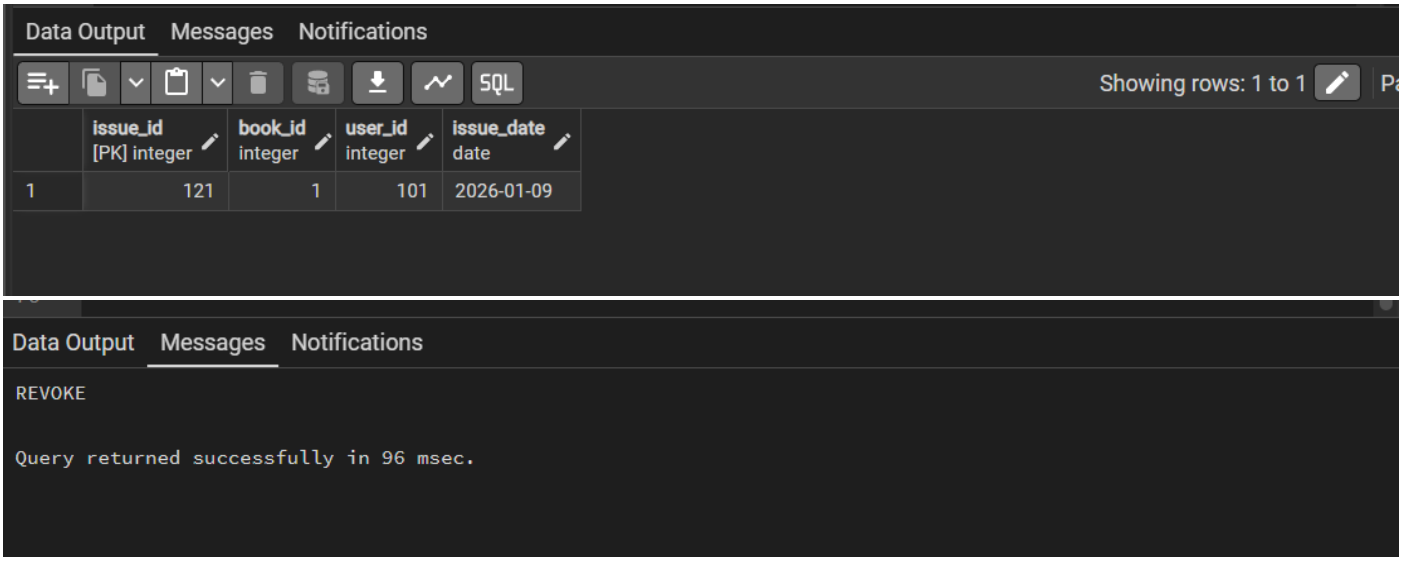
2. LIBRARIAN

```
SELECT * FROM books;
select * from book_issue;
select * from LIBRARY_VISITOR_USER;

INSERT INTO books VALUES(110,'ABCD','CLANS',2);
INSERT INTO books VALUES(150,'THE LORD','HRM',7);

DELETE FROM books
WHERE ID=150;

SELECT * FROM book_issue;
SELECT * FROM LIBRARY_VISITOR_USER;
```

Learning Outcomes:

1. Understood the basics of **relational database design** using tables, keys, and relationships.
2. Learned to apply **primary key and foreign key constraints** to maintain data integrity.
3. Gained hands-on experience with **INSERT, UPDATE, and DELETE** operations safely.
4. Understood how **roles and privileges** control access to database objects.
5. Learned to use **GRANT and REVOKE** for implementing **read-only users**.
6. Practiced **ALTER TABLE and DROP TABLE** for managing database changes.

SCREENSHOTS



Data Output | Messages | Notifications

```
GRANT

Query returned successfully in 122 msec.
```

Data Output | Messages | Notifications

	user_id [PK] integer	user_name character varying (20)	age integer	email_id character varying (15)
1	101	ARYAN	18	ARD@GMAIL.COM
2	102	RAMESH	19	RMD@GMAIL.COM
3	103	RAM	19	RAM@GMAIL.COM

Data Output | Messages | Notifications

	issue_id [PK] integer	book_id integer	user_id integer	issue_date date
1	121	1	101	2026-01-09

Query | Query History

```sql
SELECT * FROM books;
select * from book_issue;
select * from LIBRARY_VISITOR_USER;

INSERT INTO books VALUES(110,'ABCD','CLANS',2);
INSERT INTO books VALUES(150,'THE LORD','HRM',7);

DELETE FROM books
WHERE ID=150;

SELECT * FROM book_issue;
SELECT * FROM library_visitor;
```

SQL

	id [PK] integer	name character varying (20)	author character varying (20)	count integer
1	1	HARRY POTTER	JK ROWLING	3
2	2	GAME OF THRONS	I DONT KNOW	12
3	3	ABCD	ABCDF	[null]
4	110	ABCD	CLANS	2
5	150	THE LORD	HRM	7