Student Name: Dibyanshu Kumar **UID: 24BAI71026**
Branch: AIT-CSE (AIML) **Section/Group: 24AIT_KRG2**
Semester: 4
Subject Name: Database Management System

Experiment

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_ISSUE



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

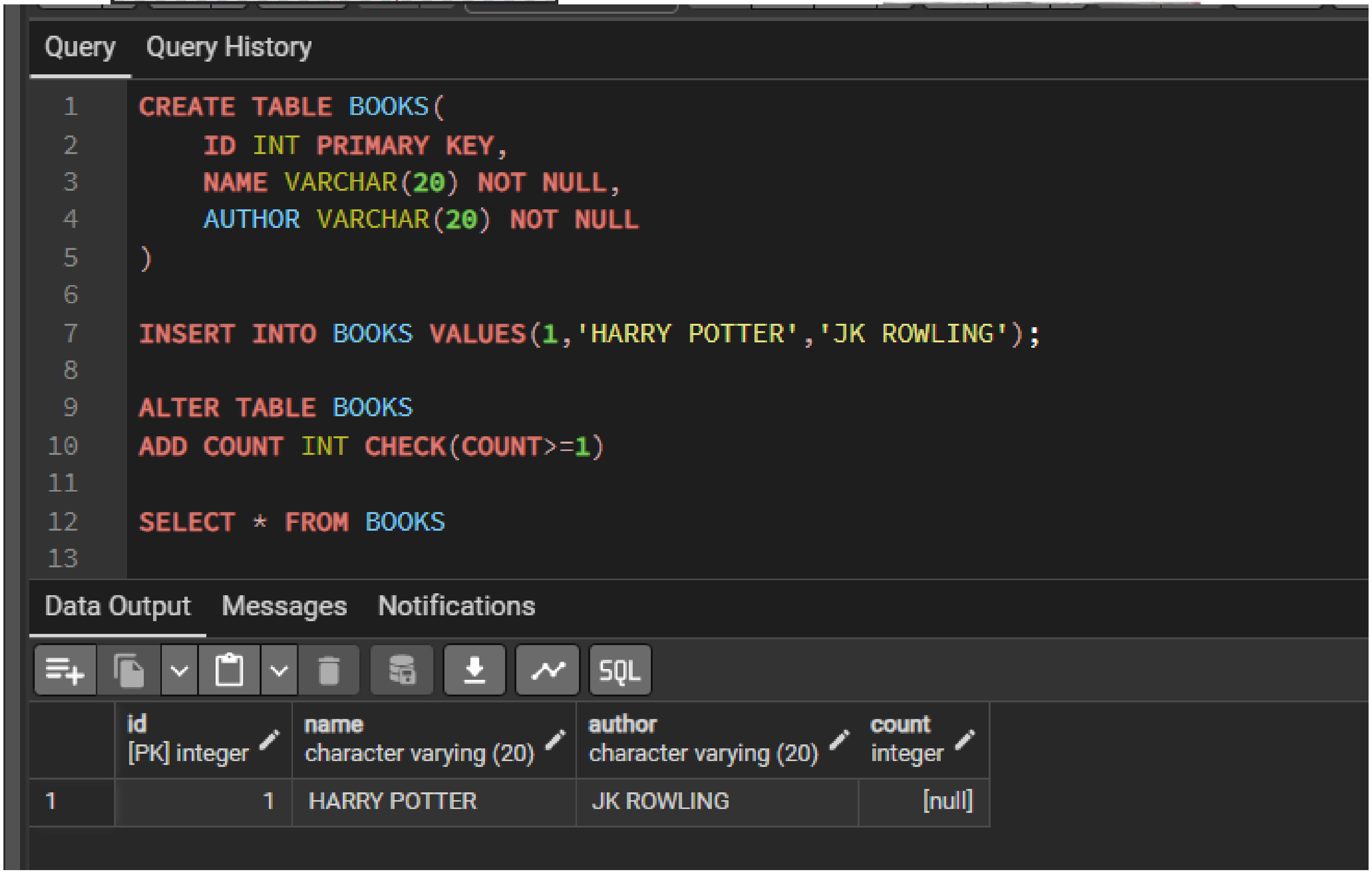
```
    SELECT * FROM books;
    select * from book_issue;
    select * from LIBRARY_VISITOR_USER;
```

```
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:

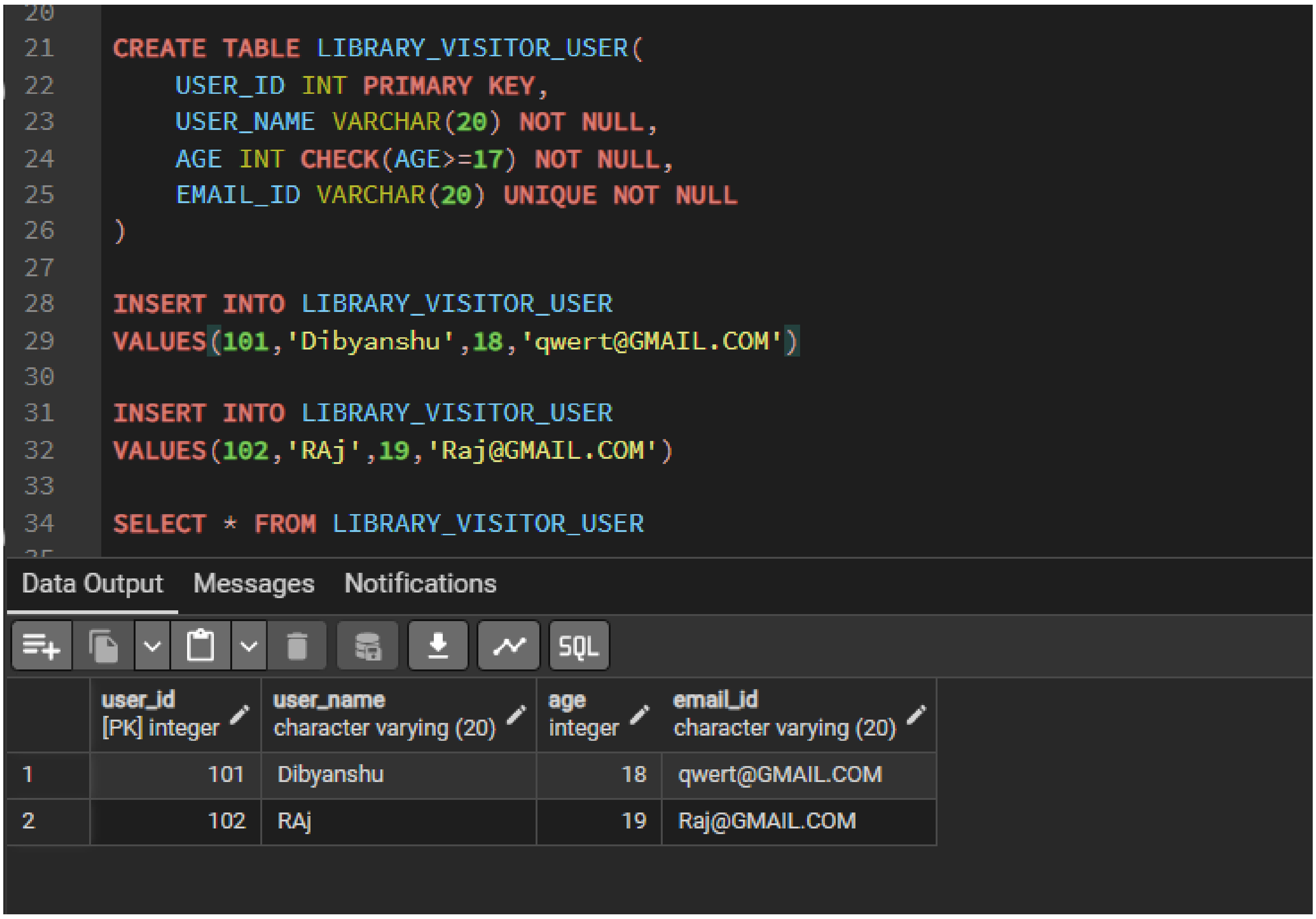
1. Understood the basics of **relational database design** using tables, keys, and relationships.
2. Learned to apply **primary key and foreign key constraints** to maintain data integrity.
3. Gained hands-on experience with **INSERT, UPDATE, and DELETE** operations safely.
4. Understood how **roles 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



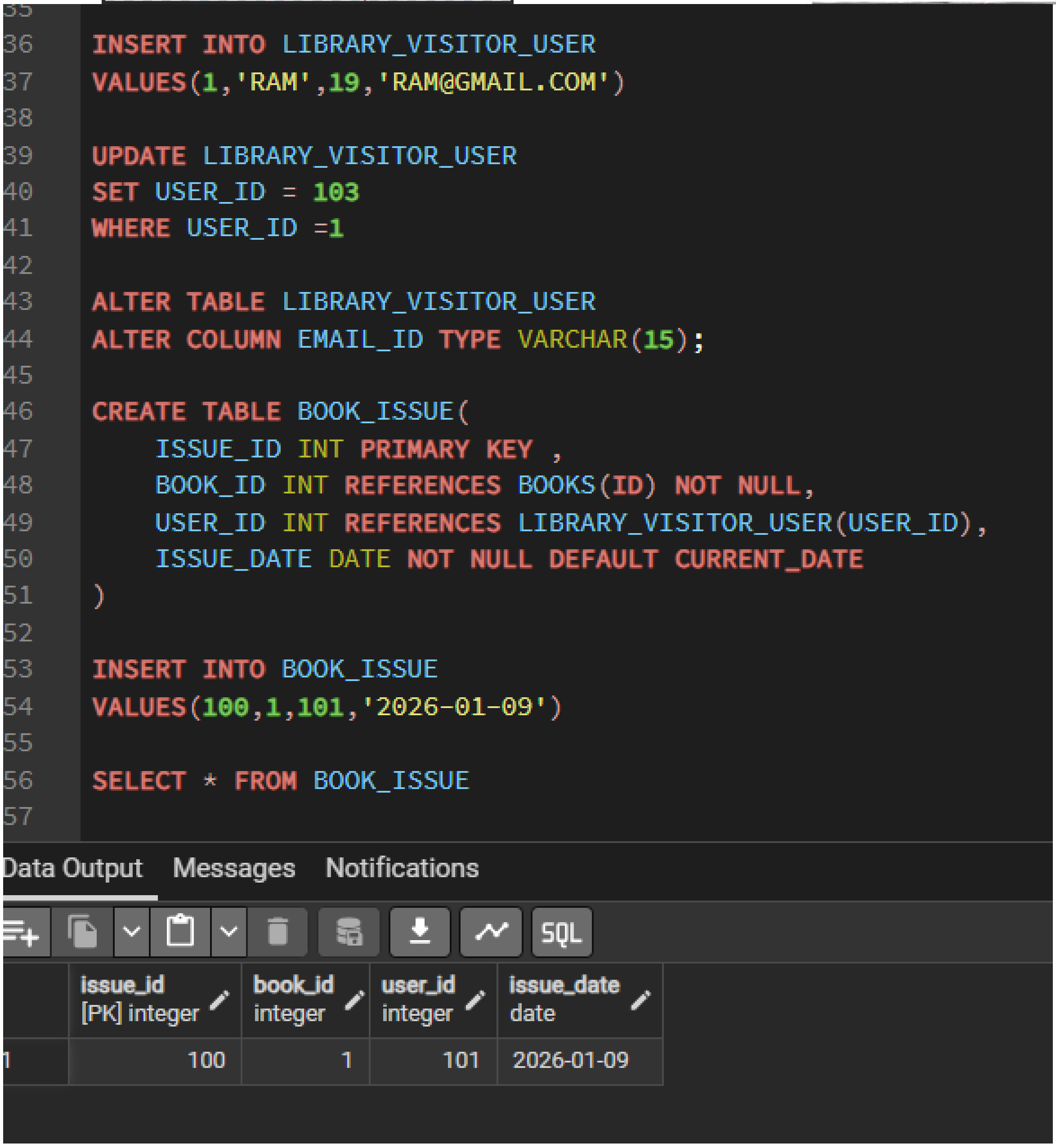
```
CREATE TABLE BOOKS(
    ID INT PRIMARY KEY,
    NAME VARCHAR(20) NOT NULL,
    AUTHOR VARCHAR(20) NOT NULL
)

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

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

SELECT * FROM BOOKS
```

	id [PK] integer	name character varying (20)	author character varying (20)	count integer
1	1	HARRY POTTER	JK ROWLING	[null]



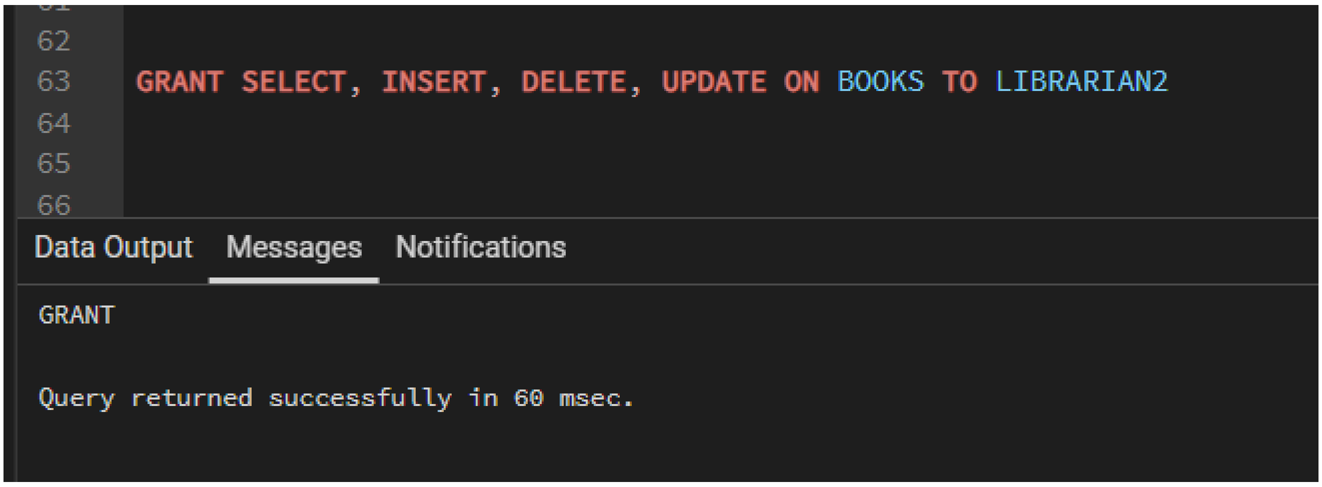
```
CREATE TABLE LIBRARY_VISITOR_USER(
    USER_ID INT PRIMARY KEY,
    USER_NAME VARCHAR(20) NOT NULL,
    AGE INT CHECK(AGE>=17) NOT NULL,
    EMAIL_ID VARCHAR(20) UNIQUE NOT NULL
)

INSERT INTO LIBRARY_VISITOR_USER
VALUES(101,'Dibyanshu',18,'qwert@GMAIL.COM')

INSERT INTO LIBRARY_VISITOR_USER
VALUES(102,'RAj',19,'Raj@GMAIL.COM')

SELECT * FROM LIBRARY_VISITOR_USER
```

	user_id [PK] integer	user_name character varying (20)	age integer	email_id character varying (20)
1	101	Dibyanshu	18	qwert@GMAIL.COM
2	102	RAj	19	Raj@GMAIL.COM



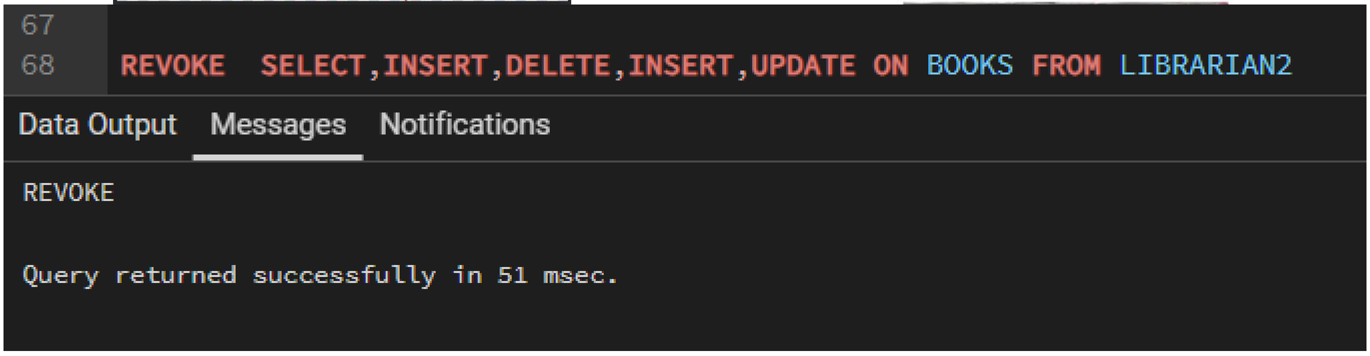
```
INSERT INTO LIBRARY_VISITOR_USER
VALUES(1,'RAM',19,'RAM@GMAIL.COM')

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(100,1,101,'2026-01-09')

SELECT * FROM BOOK_ISSUE
```

	issue_id [PK] integer	book_id integer	user_id integer	issue_date date
1	100	1	101	2026-01-09

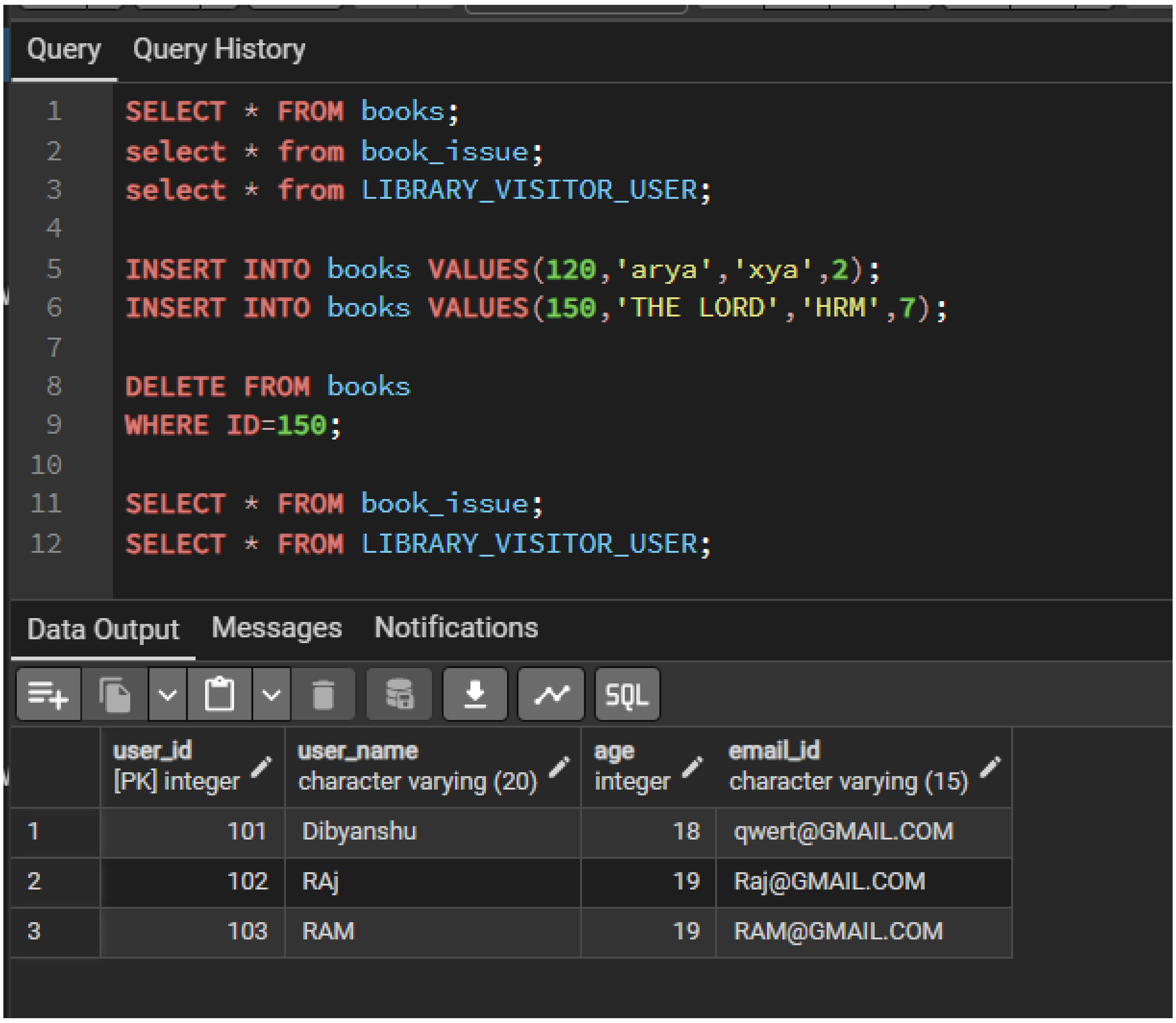


```
GRANT SELECT, INSERT, DELETE, UPDATE ON BOOKS TO LIBRARIAN2
```

```
GRANT

Query returned successfully in 60 msec.
```

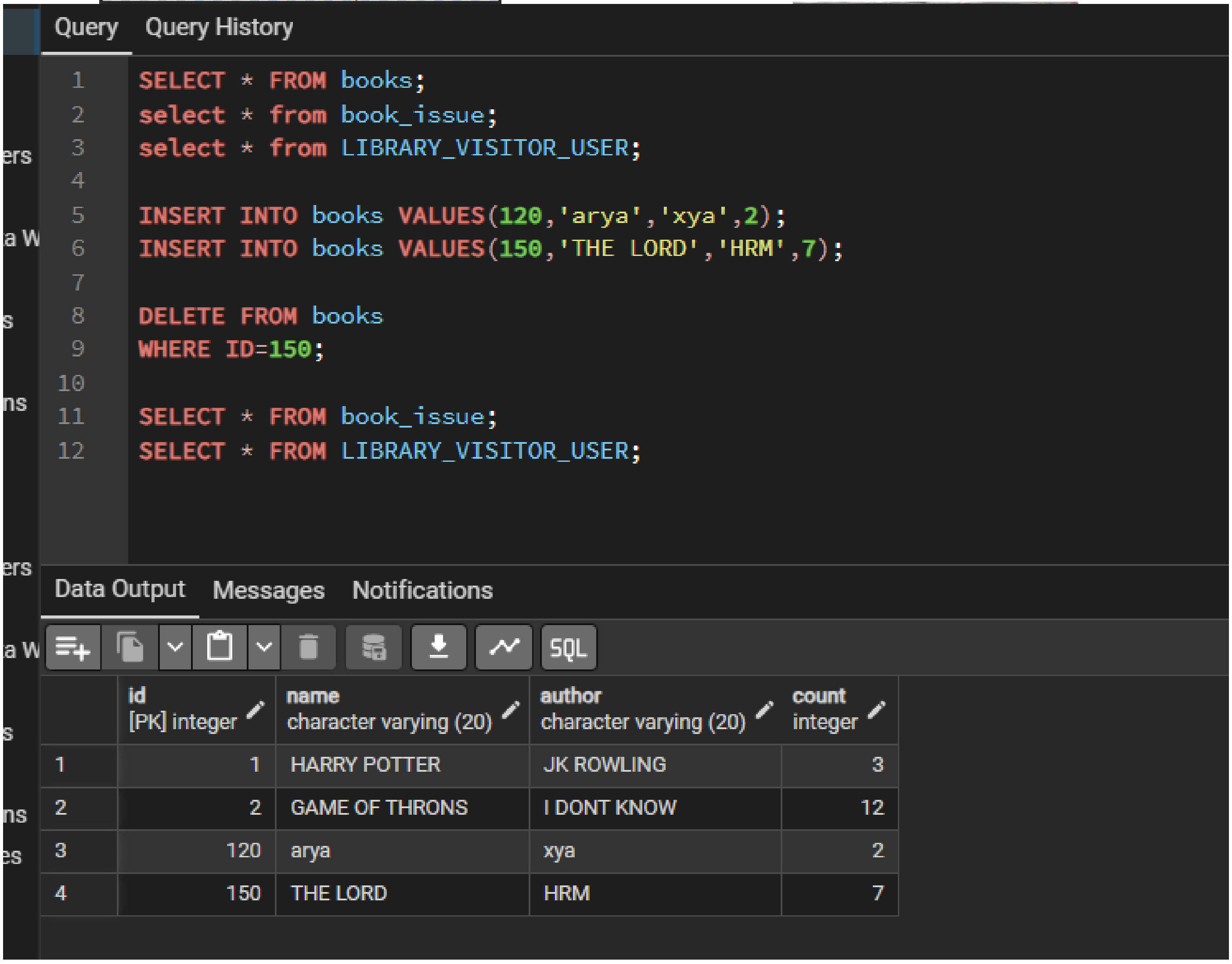

```
REVOKE  SELECT,INSERT,DELETE,INSERT,UPDATE ON BOOKS FROM LIBRARIAN2
```

```
REVOKE

Query returned successfully in 51 msec.
```



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

INSERT INTO books VALUES(120,'arya','xya',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;
```

	user_id [PK] integer	user_name character varying (20)	age integer	email_id character varying (15)
1	101	Dibyanshu	18	qwert@GMAIL.COM
2	102	RAj	19	Raj@GMAIL.COM
3	103	RAM	19	RAM@GMAIL.COM



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

INSERT INTO books VALUES(120,'arya','xya',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;
```

	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	120	arya	xya	2
4	150	THE LORD	HRM	7