

LIBRARY DBMS

CMPE343 REPORT

0. Project Members and Contributions

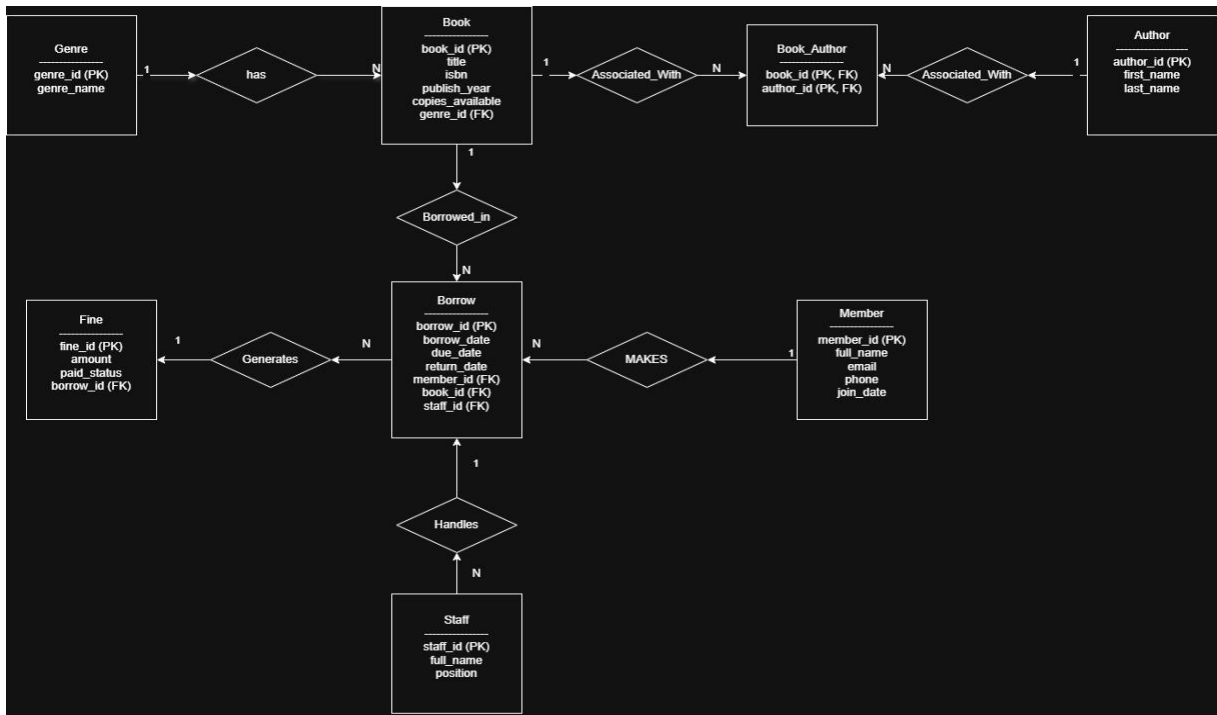
- TRESOR KALOMBO KALALA 22512651 : DDL, DML, QUERIES(1-5)
- Sultan Makhmut 22305640: ERD, DML, QUERIES(6-10)
- Dzaan Zachariah Allam 22120765: Report, DML, QUERIES(11-15)

1. Introduction

This Library Database Management System (DBMS) was developed using PostgreSQL for the CMPE343 course. The system manages authors, books, genres, members, staff, borrow transactions, and fines. Assumptions include unique IDs for each entity, proper constraints for data integrity, and realistic sample data.

2. Database

● ER Diagram



● Data Definition Language (DDL)

-- TABLE 1: AUTHOR : Stores book authors

```
CREATE TABLE Author (  
  author_id INT PRIMARY KEY, -----Unique author ID  
  first_name VARCHAR(50) NOT NULL, -----Author first name  
  last_name VARCHAR(50) NOT NULL -----Author last name  
);
```

-- TABLE 2: BOOK: Stores books in the library

```
CREATE TABLE Book (  
  book_id INT PRIMARY KEY, -----Unique book ID  
  title VARCHAR(100) NOT NULL, -----Book title  
  isbn VARCHAR(20) UNIQUE, -----ISBN number (unique)  
  publish_year INT, -----Year of publication  
  copies_available INT DEFAULT 1 -----Available copies  
  CHECK (copies_available >= 0) -----Cannot be negative  
);
```

-- TABLE 3: MEMBER: Stores library members

```
CREATE TABLE Member (  
  member_id INT PRIMARY KEY, -----Unique member ID  
  full_name VARCHAR(100) NOT NULL, -----Member name  
  email VARCHAR(100) UNIQUE, -----Email (unique)  
  phone VARCHAR(20), -----Phone number  
  join_date DATE DEFAULT CURRENT_DATE -----Date joined  
);
```

--TABLE 4: STAFF: Stores library staff

```
CREATE TABLE Staff (  
  staff_id INT PRIMARY KEY, -----Unique staff ID  
  full_name VARCHAR(100) NOT NULL, -----Staff name  
  position VARCHAR(50) -- Job position  
);
```

-- TABLE 5: BOOK_AUTHOR : Connects books and authors (many-to-many)

```
CREATE TABLE Book_Author (  
  book_id INT, -----Book ID  
  author_id INT, -----Author ID  
  PRIMARY KEY (book_id, author_id), -----Composite primary key  
  FOREIGN KEY (book_id) REFERENCES Book(book_id),  
  FOREIGN KEY (author_id) REFERENCES Author(author_id)  
);
```

--TABLE 6: BORROW: Stores borrow transactions

```
CREATE TABLE Borrow (  
  borrow_id INT PRIMARY KEY, -----Borrow ID  
  member_id INT, -----Member borrowing  
  book_id INT, -----Borrowed book  
  staff_id INT, -----Staff handling  
  borrow_date DATE NOT NULL, -----Borrow date  
  due_date DATE NOT NULL, -----Due date  
  return_date DATE, -----Return date
```

```

FOREIGN KEY (member_id) REFERENCES Member(member_id),
FOREIGN KEY (book_id) REFERENCES Book(book_id),
FOREIGN KEY (staff_id) REFERENCES Staff(staff_id)
);

```

```

-----

```

```

--TABLE 7: FINE : Stores fines for late returns

```

```

CREATE TABLE Fine (
fine_id INT PRIMARY KEY, -----Fine ID
borrow_id INT UNIQUE, -----Related borrow
amount DECIMAL(6,2), -----Fine amount
paid_status VARCHAR(10) DEFAULT 'UNPAID',
FOREIGN KEY (borrow_id) REFERENCES Borrow(borrow_id)
);

```

```

-----

```

```

-- TABLE 8: GENRE : Stores book genres

```

```

CREATE TABLE Genre (
genre_id INT PRIMARY KEY, -- Unique genre ID
genre_name VARCHAR(50) NOT NULL -- Genre name
);

```

- **Data Manipulation Language (DML)**

```

-- Authors

```

```

INSERT INTO Author VALUES (1, 'Tresor', 'Kalombo');
INSERT INTO Author VALUES (2, 'Fyodor', 'Dostoevsky');
INSERT INTO Author VALUES (3, 'Friedrich', 'Nietzsche');
INSERT INTO Author VALUES (4, 'Jane', 'Austen');

```

```
INSERT INTO Author VALUES (5, 'Albert', 'Camus');
```

```
-- Books
```

```
INSERT INTO Book VALUES (1, 'The Truth', '000077770000', 2057, 7);
```

```
INSERT INTO Book VALUES (2, 'The Brothers Karamazov', '000077770001', 1880, 5);
```

```
INSERT INTO Book VALUES (3, 'Next Year', '000077770002', 2059, 4);
```

```
INSERT INTO Book VALUES (4, 'Pride and Prejudice', '000077770003', 1813, 6);
```

```
INSERT INTO Book VALUES (5, 'The Stranger', '000077770004', 1942, 0); -- no copies  
available
```

```
INSERT INTO Book VALUES (6, 'Thus Spoke Zarathustra', '000077770005', 1883, 1);
```

```
INSERT INTO Book VALUES (7, 'Notes from Underground', '000077770006', 1864, 0); -- no  
copies available
```

```
-- Connect books with authors
```

```
-- Author 1 wrote two books
```

```
INSERT INTO Book_Author VALUES (1, 1);
```

```
INSERT INTO Book_Author VALUES (3, 1);
```

```
-- Author 2 wrote two books
```

```
INSERT INTO Book_Author VALUES (2, 2);
```

```
INSERT INTO Book_Author VALUES (7, 2);
```

```
-- Other authors
```

```
INSERT INTO Book_Author VALUES (6, 3); -- Nietzsche
```

```
INSERT INTO Book_Author VALUES (4, 4); -- Austen
```

```
INSERT INTO Book_Author VALUES (5, 5); -- Camus
```

```
---Genre
```

```
-- Add genre reference to Book table
```

```
ALTER TABLE Book

ADD COLUMN genre_id INT;

-- Add foreign key constraint

ALTER TABLE Book

ADD CONSTRAINT fk_book_genre

FOREIGN KEY (genre_id) REFERENCES Genre(genre_id);

-- Insert genres

INSERT INTO Genre VALUES (1, 'Philosophy');

INSERT INTO Genre VALUES (2, 'Classic Literature');

INSERT INTO Genre VALUES (3, 'Fiction');

INSERT INTO Genre VALUES (4, 'Romance');

INSERT INTO Genre VALUES (5, 'Psychological');

-- Assign genres to books

UPDATE Book SET genre_id = 3 WHERE book_id = 1; -- The Truth (Fiction)

UPDATE Book SET genre_id = 2 WHERE book_id = 2; -- The Brothers Karamazov (Classic)

UPDATE Book SET genre_id = 3 WHERE book_id = 3; -- Next Year (Fiction)

UPDATE Book SET genre_id = 4 WHERE book_id = 4; -- Pride and Prejudice (Romance)

UPDATE Book SET genre_id = 5 WHERE book_id = 5; -- The Stranger (Psychological)

UPDATE Book SET genre_id = 1 WHERE book_id = 6; -- Thus Spoke Zarathustra (Philosophy)

UPDATE Book SET genre_id = 2 WHERE book_id = 7; -- Notes from Underground (Classic)


-- Members

INSERT INTO Member VALUES (1, 'Zachariah', '22120765@student.ciu.edu.tr',
'+2347061614885', '2025-10-07');
```

```
INSERT INTO Member VALUES (2, 'Sultan', '22305640@student.ciu.edu.tr',  
' +77052175021', '2025-09-07');
```

```
INSERT INTO Member VALUES (3, 'Josh', 'josh@student.ciu.edu.tr', '+90000000000', '2025-  
08-01');
```

```
INSERT INTO Member VALUES (4, 'Joel', 'joel@student.ciu.edu.tr', '+9044444444446', '2024-  
07-15');
```

-- staff members

```
INSERT INTO Staff VALUES (1, 'Jacob Bush', 'Assistant');
```

```
INSERT INTO Staff VALUES (2, 'Aline Koj', 'Librarian');
```

```
INSERT INTO Staff VALUES (3, 'Mark Koop', 'Supervisor');
```

```
INSERT INTO Staff VALUES (4, 'Jil Umar', 'Manager');
```

-- Borrow

```
INSERT INTO Borrow VALUES (1, 1, 1, 1, '2025-03-01', '2025-03-15', '2025-03-20');
```

```
INSERT INTO Borrow VALUES (2, 2, 2, 2, '2025-03-05', '2025-03-19', '2025-03-18');
```

```
INSERT INTO Borrow VALUES (3, 3, 3, 3, '2025-03-10', '2025-03-24', NULL);
```

```
INSERT INTO Borrow VALUES (4, 4, 4, 4, '2025-03-12', '2025-03-26', '2025-03-30');
```

```
INSERT INTO Borrow VALUES (5, 1, 6, 2, '2025-02-01', '2025-02-15', '2025-02-14');
```

-- Fines

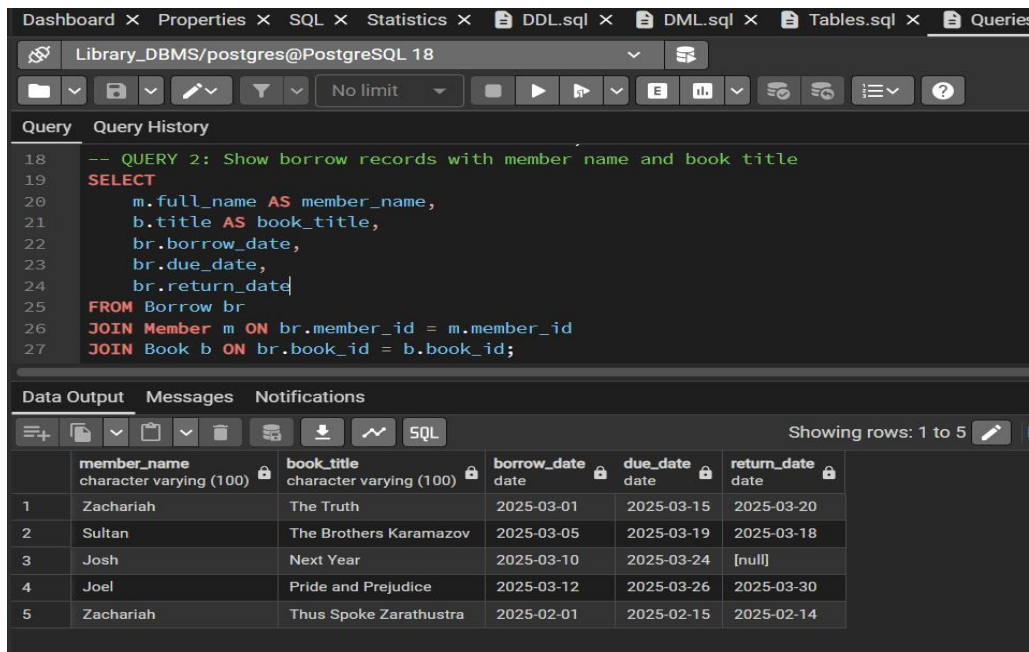
```
INSERT INTO Fine VALUES (1, 1, 5.00, 'UNPAID');
```

```
INSERT INTO Fine VALUES (2, 4, 7.00, 'PAID');
```

```
INSERT INTO Fine VALUES (3, 3, 3.50, 'UNPAID');
```

3. Queries

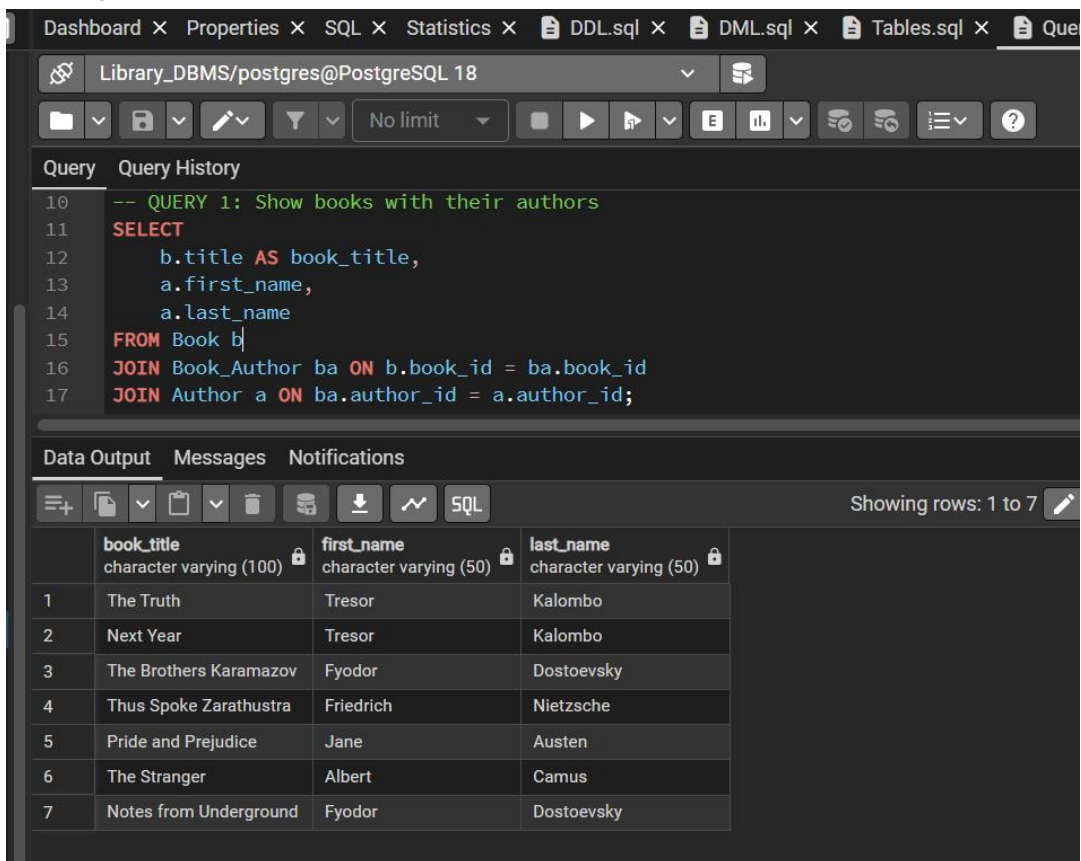
- Query 1



```
18 -- QUERY 2: Show borrow records with member name and book title
19 SELECT
20     m.full_name AS member_name,
21     b.title AS book_title,
22     br.borrow_date,
23     br.due_date,
24     br.return_date
25 FROM Borrow br
26 JOIN Member m ON br.member_id = m.member_id
27 JOIN Book b ON br.book_id = b.book_id;
```

	member_name character varying (100)	book_title character varying (100)	borrow_date date	due_date date	return_date date
1	Zachariah	The Truth	2025-03-01	2025-03-15	2025-03-20
2	Sultan	The Brothers Karamazov	2025-03-05	2025-03-19	2025-03-18
3	Josh	Next Year	2025-03-10	2025-03-24	[null]
4	Joel	Pride and Prejudice	2025-03-12	2025-03-26	2025-03-30
5	Zachariah	Thus Spoke Zarathustra	2025-02-01	2025-02-15	2025-02-14

- Query 2



```
10 -- QUERY 1: Show books with their authors
11 SELECT
12     b.title AS book_title,
13     a.first_name,
14     a.last_name
15 FROM Book b
16 JOIN Book_Author ba ON b.book_id = ba.book_id
17 JOIN Author a ON ba.author_id = a.author_id;
```

	book_title character varying (100)	first_name character varying (50)	last_name character varying (50)
1	The Truth	Tresor	Kalombo
2	Next Year	Tresor	Kalombo
3	The Brothers Karamazov	Fyodor	Dostoevsky
4	Thus Spoke Zarathustra	Friedrich	Nietzsche
5	Pride and Prejudice	Jane	Austen
6	The Stranger	Albert	Camus
7	Notes from Underground	Fyodor	Dostoevsky

Query 3

Dashboard X Properties X SQL X Statistics X DDL.sql X

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Query Query History

```
28 --QUERY 3: Show books with available copies
29 SELECT title, copies_available
30 FROM Book
31 WHERE copies_available > 0
32 ORDER BY copies_available DESC;
```

Data Output Messages Notifications

	title character varying (100)	copies_available integer
1	The Truth	7
2	Pride and Prejudice	6
3	The Brothers Karamazov	5
4	Next Year	4
5	Thus Spoke Zarathustra	1

Query 4

Dashboard X Properties X SQL X Statistics X DDL.sql X DML.sql X Tables.sql

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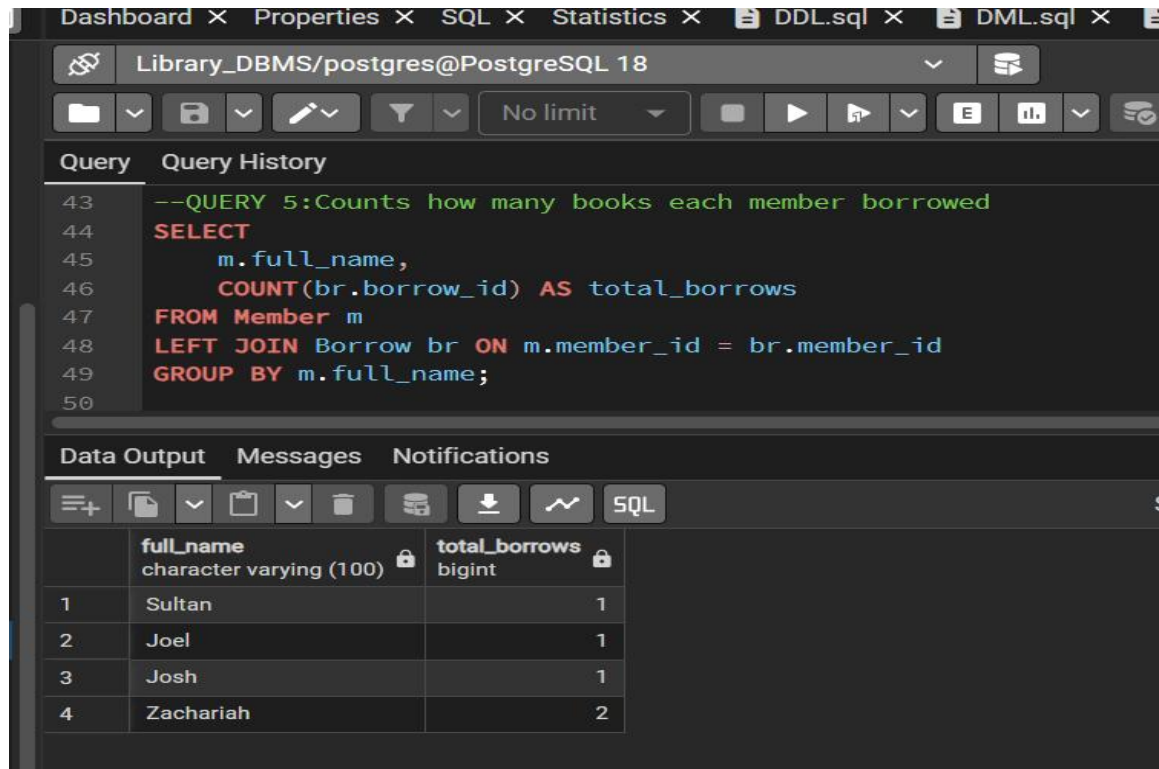
Query Query History

```
33 --QUERY 4: Shows members who returned books after the due date
34 SELECT
35     m.full_name AS member_name,
36     b.title AS book_title,
37     br.return_date,
38     br.due_date
39 FROM Borrow br
40 JOIN Member m ON br.member_id = m.member_id
41 JOIN Book b ON br.book_id = b.book_id
42 WHERE br.return_date > br.due_date;
```

Data Output Messages Notifications

	member_name character varying (100)	book_title character varying (100)	return_date date	due_date date
1	Zachariah	The Truth	2025-03-20	2025-03-15
2	Joel	Pride and Prejudice	2025-03-30	2025-03-26

Query 5



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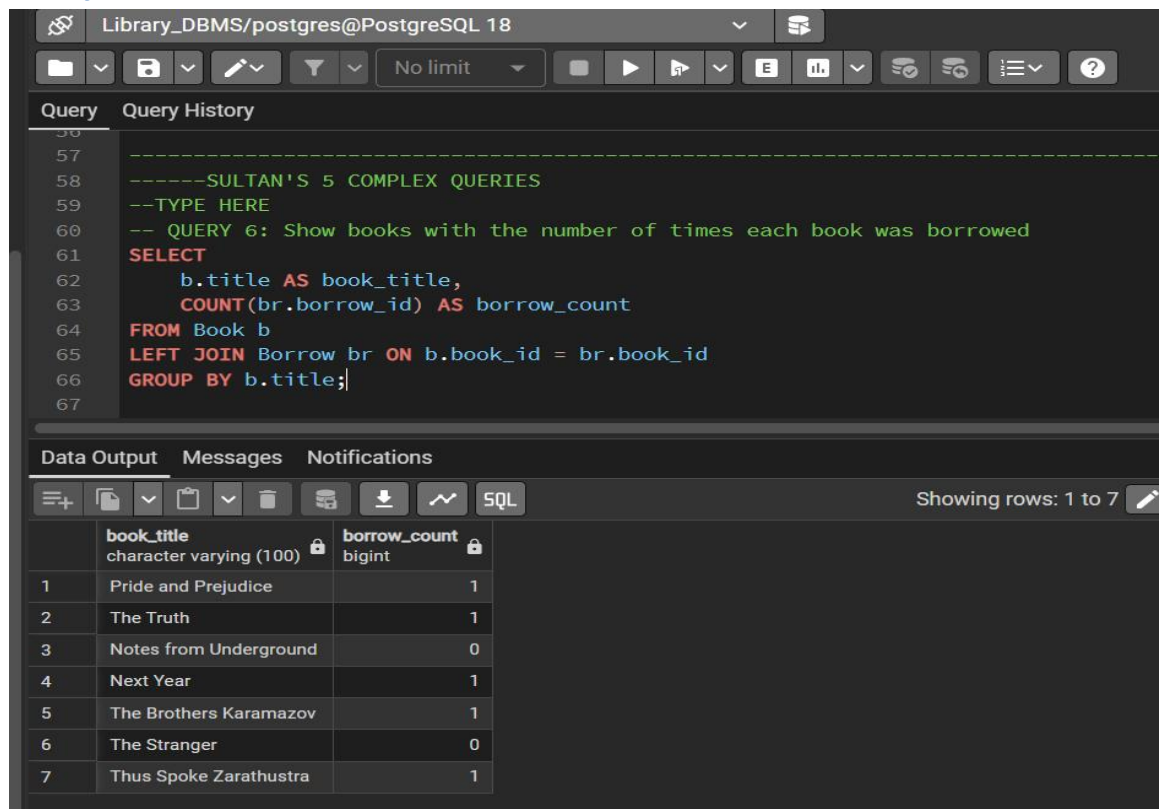
Query Query History

```
43 --QUERY 5:Counts how many books each member borrowed
44 SELECT
45     m.full_name,
46     COUNT(br.borrow_id) AS total_borrows
47 FROM Member m
48 LEFT JOIN Borrow br ON m.member_id = br.member_id
49 GROUP BY m.full_name;
50
```

Data Output Messages Notifications

	full_name character varying (100)	total_borrows bigint
1	Sultan	1
2	Joel	1
3	Josh	1
4	Zachariah	2

Query 6



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Query Query History

```
57 -----SULTAN'S 5 COMPLEX QUERIES
58 --TYPE HERE
59 -- QUERY 6: Show books with the number of times each book was borrowed
60 SELECT
61     b.title AS book_title,
62     COUNT(br.borrow_id) AS borrow_count
63 FROM Book b
64 LEFT JOIN Borrow br ON b.book_id = br.book_id
65 GROUP BY b.title;
66
67
```

Data Output Messages Notifications

	book_title character varying (100)	borrow_count bigint
1	Pride and Prejudice	1
2	The Truth	1
3	Notes from Underground	0
4	Next Year	1
5	The Brothers Karamazov	1
6	The Stranger	0
7	Thus Spoke Zarathustra	1

Showing rows: 1 to 7

Query 7

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Query Query History

```
67
68 -- QUERY 7: Show members and the titles of books they borrowed along with borrow dates
69 SELECT
70     m.full_name AS member_name,
71     b.title AS book_title,
72     br.borrow_date
73 FROM Borrow br
74 JOIN Member m ON br.member_id = m.member_id
75 JOIN Book b ON br.book_id = b.book_id;
76
```

Data Output Messages Notifications

Showing rows: 1 to 5 Page No: 1

	member_name character varying (100)	book_title character varying (100)	borrow_date date
1	Zachariah	The Truth	2025-03-01
2	Sultan	The Brothers Karamazov	2025-03-05
3	Josh	Next Year	2025-03-10
4	Joel	Pride and Prejudice	2025-03-12
5	Zachariah	Thus Spoke Zarathustra	2025-02-01

Query 8

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Query Query History

```
76
77 -- QUERY 8: Show staff members and the total number of borrows they handled
78 SELECT
79     s.full_name AS staff_name,
80     COUNT(br.borrow_id) AS total_borrows
81 FROM Staff s
82 LEFT JOIN Borrow br ON s.staff_id = br.staff_id
83 GROUP BY s.full_name;
84
```

Data Output Messages Notifications

Showing rows: 1 to 4 Page No: 1

	staff_name character varying (100)	total_borrows bigint
1	Jil Umar	1
2	Jacob Bush	1
3	Mark Koop	1
4	Aline Koj	2

Query 9

Library_DBMS/postgres@PostgreSQL 18

Query Query History

```
85 -- QUERY 9: Show books that were returned late
86 SELECT
87     b.title AS book_title,
88     br.return_date,
89     br.due_date
90 FROM Borrow br
91 JOIN Book b ON br.book_id = b.book_id
92 WHERE br.return_date > br.due_date;
93
```

Data Output Messages Notifications

Showing rows: 1 to 2 Page No:

	book_title character varying (100)	return_date date	due_date date
1	The Truth	2025-03-20	2025-03-15
2	Pride and Prejudice	2025-03-30	2025-03-26

Query 10

Library_DBMS/postgres@PostgreSQL 18

Query Query History

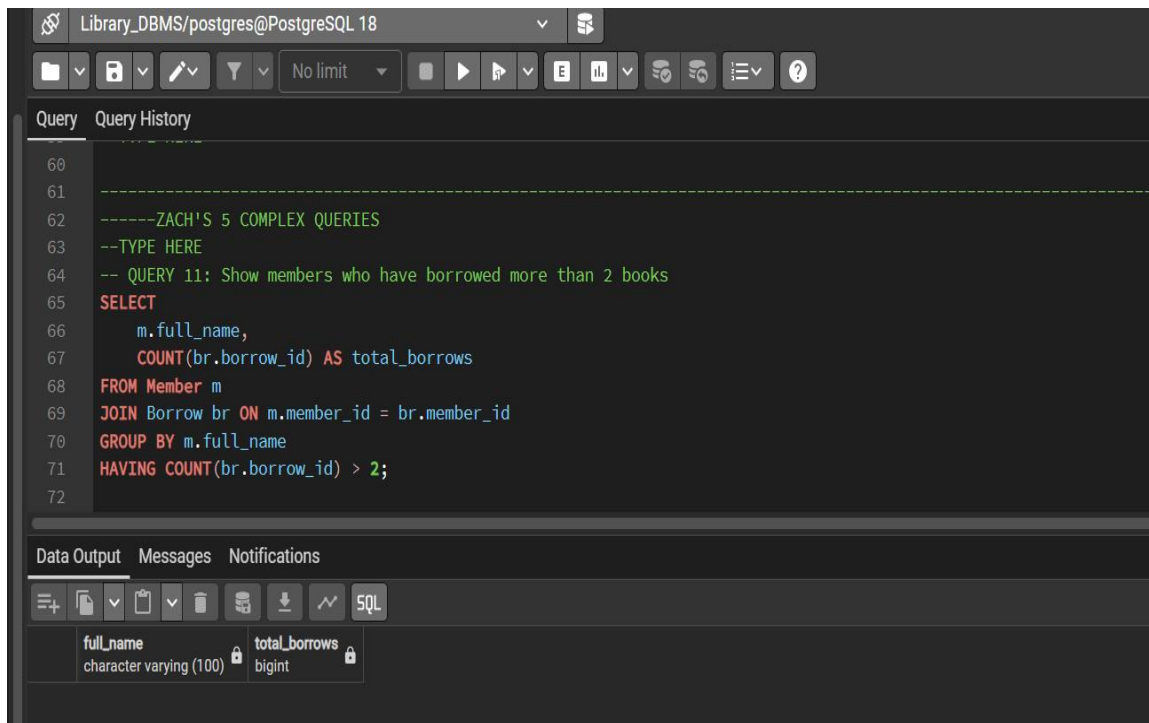
```
94 -- QUERY 10: Show members and the total number of fines they received
95 SELECT
96     m.full_name AS member_name,
97     COUNT(f.fine_id) AS total_fines
98 FROM Member m
99 JOIN Borrow br ON m.member_id = br.member_id
100 JOIN Fine f ON br.borrow_id = f.borrow_id
101 GROUP BY m.full_name;
102
```

Data Output Messages Notifications

Showing rows: 1 to 3 Page No:

	member_name character varying (100)	total_fines bigint
1	Joel	1
2	Josh	1
3	Zachariah	1

Query 11

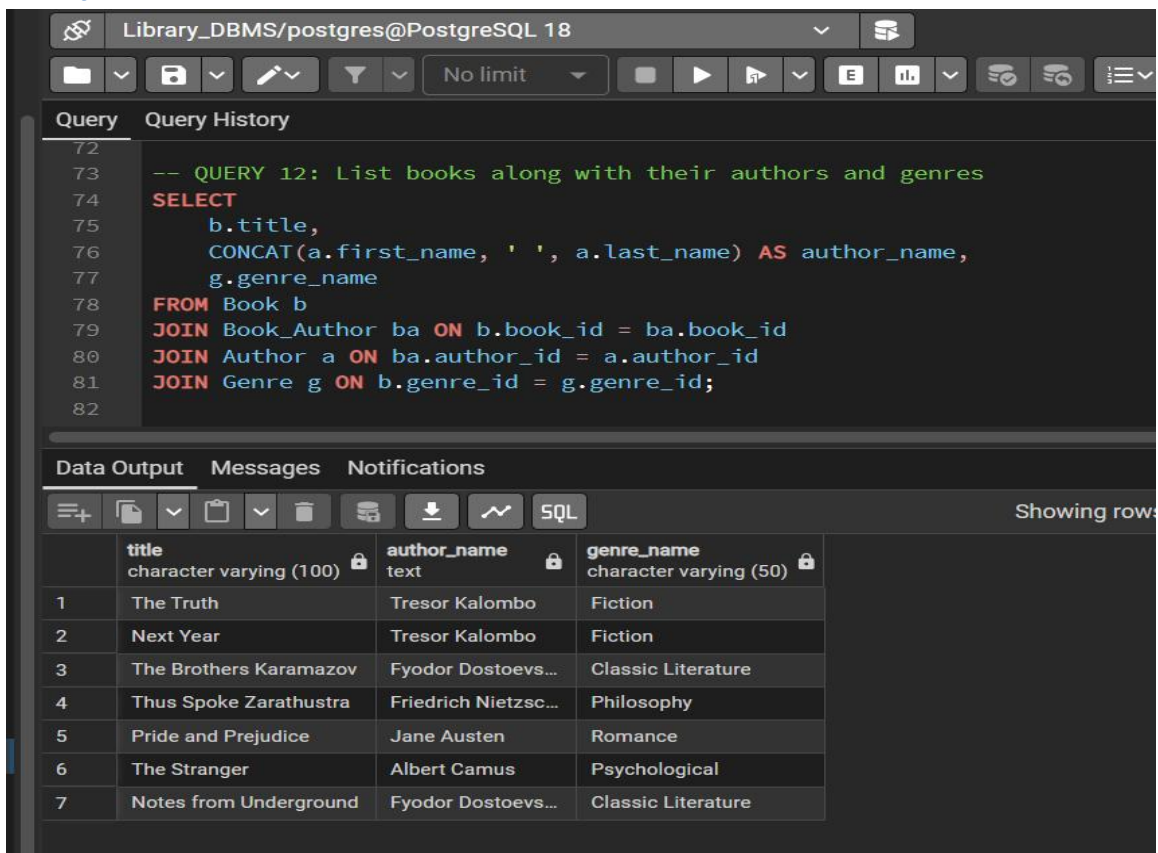


```
60
61 -----ZACH'S 5 COMPLEX QUERIES
62 --TYPE HERE
63 -- QUERY 11: Show members who have borrowed more than 2 books
64
65 SELECT
66     m.full_name,
67     COUNT(br.borrow_id) AS total_borrows
68 FROM Member m
69 JOIN Borrow br ON m.member_id = br.member_id
70 GROUP BY m.full_name
71 HAVING COUNT(br.borrow_id) > 2;
72
```

Data Output Messages Notifications

full_name character varying (100) total_borrows bigint

Query 12



```
72
73 -- QUERY 12: List books along with their authors and genres
74 SELECT
75     b.title,
76     CONCAT(a.first_name, ' ', a.last_name) AS author_name,
77     g.genre_name
78 FROM Book b
79 JOIN Book_Author ba ON b.book_id = ba.book_id
80 JOIN Author a ON ba.author_id = a.author_id
81 JOIN Genre g ON b.genre_id = g.genre_id;
82
```

Data Output Messages Notifications

Showing rows

	title character varying (100)	author_name text	genre_name character varying (50)
1	The Truth	Tresor Kalombo	Fiction
2	Next Year	Tresor Kalombo	Fiction
3	The Brothers Karamazov	Fyodor Dostoevs...	Classic Literature
4	Thus Spoke Zarathustra	Friedrich Nietzsc...	Philosophy
5	Pride and Prejudice	Jane Austen	Romance
6	The Stranger	Albert Camus	Psychological
7	Notes from Underground	Fyodor Dostoevs...	Classic Literature

Query 13

Library_DBMS/postgres@PostgreSQL 18

Query Query History

```
82
83 -- QUERY 3: Show staff members who handled at least one borrow transaction
84 SELECT
85     s.full_name AS staff_name,
86     COUNT(br.borrow_id) AS transactions_handled
87 FROM Staff s
88 JOIN Borrow br ON s.staff_id = br.staff_id
89 GROUP BY s.full_name
90 HAVING COUNT(br.borrow_id) > 0;
```

Data Output Messages Notifications

Showing rows: 1 to 4

	staff_name character varying (100)	transactions_handled bigint
1	Jil Umar	1
2	Jacob Bush	1
3	Mark Koop	1
4	Aline Koj	2

Query 14

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Query Query History

```
92 -- QUERY 14: Find members with unpaid fines and the related book titles
93 SELECT
94     m.full_name,
95     b.title,
96     f.amount,
97     f.paid_status
98 FROM Fine f
99 JOIN Borrow br ON f.borrow_id = br.borrow_id
100 JOIN Member m ON br.member_id = m.member_id
101 JOIN Book b ON br.book_id = b.book_id
102 WHERE f.paid_status = 'UNPAID';
103
```

Data Output Messages Notifications

Showing rows: 1 to 2 Page No: 1

	full_name character varying (100)	title character varying (100)	amount numeric (6,2)	paid_status character varying (10)
1	Zachariah	The Truth	5.00	UNPAID
2	Josh	Next Year	3.50	UNPAID

Query 15

The screenshot shows a PostgreSQL query editor interface. At the top, the connection is set to 'Library_DBMS/postgres@PostgreSQL 18'. Below the connection bar is a toolbar with icons for file operations, query execution, and settings. The main editor area displays a SQL query labeled 'Query 5: Show the most popular genre based on number of borrows'. The query is as follows:

```
-- QUERY 5: Show the most popular genre based on number of borrows
SELECT
    g.genre_name,
    COUNT(br.borrow_id) AS borrow_count
FROM Genre g
JOIN Book b ON g.genre_id = b.genre_id
JOIN Borrow br ON b.book_id = br.book_id
GROUP BY g.genre_name
ORDER BY borrow_count DESC
LIMIT 1;
```

Below the query editor, there is a 'Data Output' tab. It shows the results of the query in a table format. The table has two columns: 'genre_name' (character varying (50)) and 'borrow_count' (bigint). The result shows one row: 'Fiction' with a borrow count of 2.

	genre_name character varying (50)	borrow_count bigint
1	Fiction	2