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RESEARCH LABS

INNOVATION. AUTOMATION. ANALYTICS

PROJECT ON

Library Database Analysis

About me

Background:

I am L.Thrisha Sai, a B.Tech student specialized in Computer Science and Business Systems.

I want to learn Data Science because it allows me to combine my interest in technology with problem-solving in real-world business contexts. In today's data-driven world, most of the companies rely on insights from data to guide their strategy and operations. I want to gain the skills to collect, analyze, and interpret data to help solve real business challenges, improve decision-making, and create impactful solutions.

work experience:

I am a fresher with a strong interest in data science and database management. Although I do not have prior work experience, I have completed an internship at **Intel-Unnati Labs**, where I gained valuable exposure to research and project development. During this internship, I proposed a research project titled "Innovative Monitoring System for Tele-ICU Patients",

LinkedIn and GitHub profile URLs:

GitHub URL - https://github.com/Thrishasai

LinkedIn URL - https://www.linkedin.com/in/thrisha-sai-28146a272/

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Agenda

Objective:

This project's primary objective is to use SQL to design and analyze a library management database. With appropriate relationships between entities like publishers, books, authors, borrowers, and library branches, the project seeks to build a structured database. We can run SQL queries through this database to find answers to practical business queries like branch-level loan statistics, borrower activity, and book availability. The ultimate objective is to demonstrate how SQL can effectively assist in managing, organizing, and deriving valuable insights from library data.

ER Diagram and schema explanation:

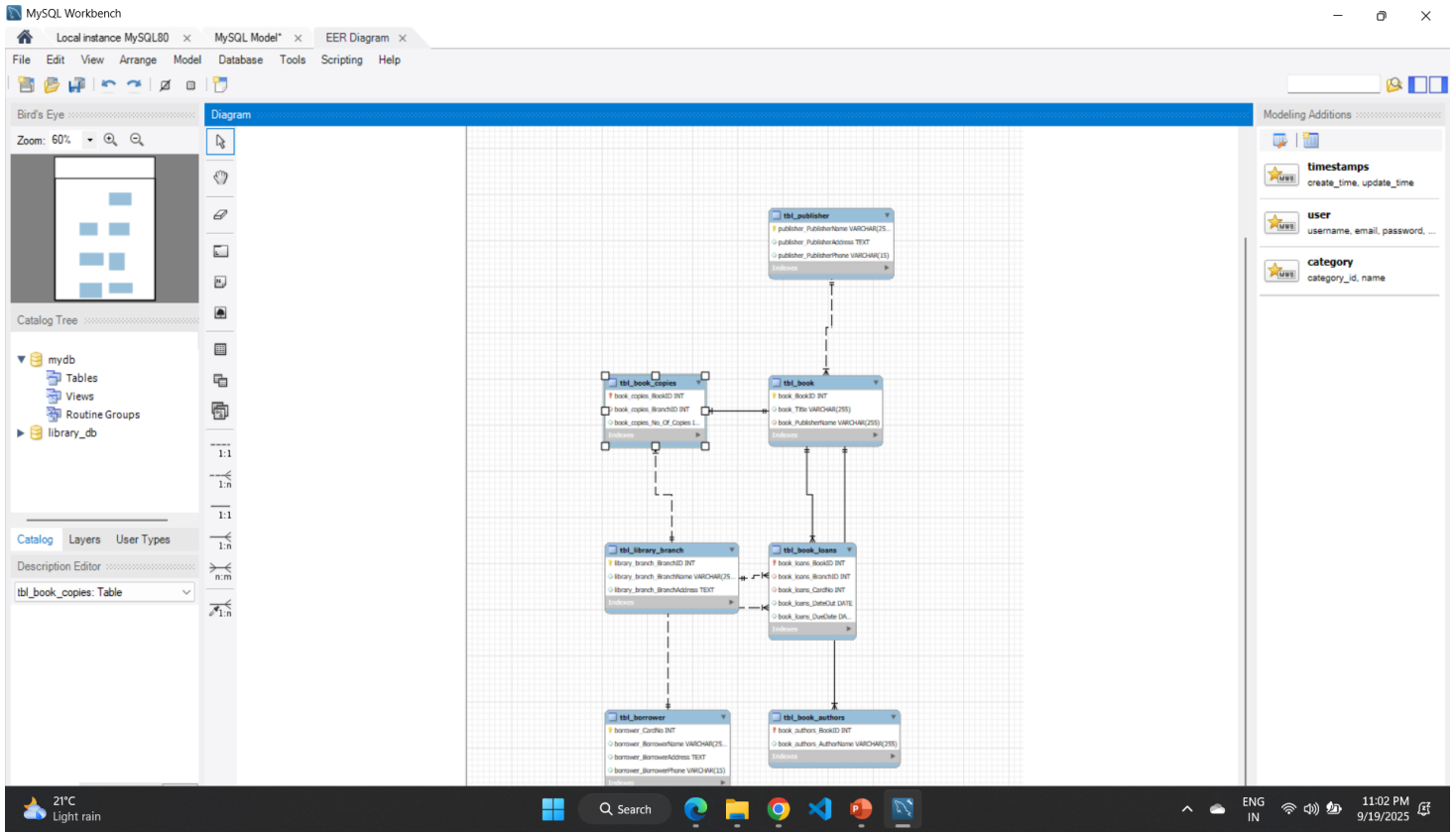

Fig.1:ER Diagram of library database with 7-tables inside the database

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The Entity Relationship (ER) diagram of the library database shows how different entities in the system are connected. The main entities are **Publisher, Book, Authors, Library Branch, Borrower, Book Copies, and Book Loans**.

- **Publisher** is linked to **Book** through the publisher name, indicating which publisher released a particular book.
- **Book** is further connected to **Book Authors**, establishing the relationship between books and their respective authors.
- **Library Branch** stores information about different branches of the library, and it is linked to both **Book Copies** and **Book Loans**.
- **Book Copies** represents the number of copies of each book available at different branches.
- **Borrower** contains details of library members, which is connected to **Book Loans**, showing which borrower has borrowed which book.
- **Book Loans** serves as the central table that records the issue of books from branches to borrowers, along with loan dates and due dates.

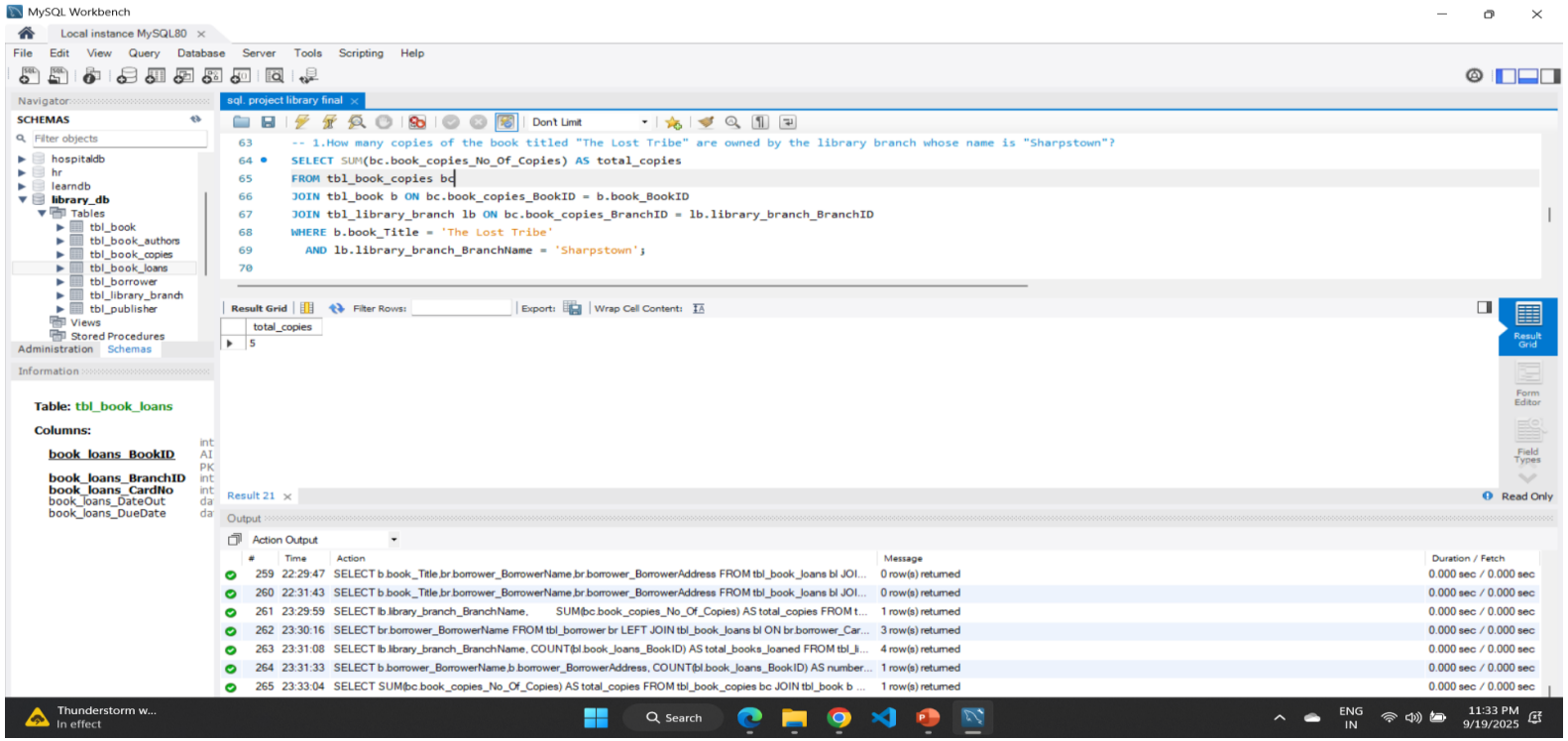
Key analysis questions (use cases):

- Copies of *"The Lost Tribe"* in Sharpstown branch.
- Copies of *"The Lost Tribe"* across branches.
- Borrowers with no books checked out.
- Books loaned from Sharpstown (Due Date: 2/3/18).
- Total books loaned per branch.
- Borrowers with >5 books checked out.
- Copies of books by Stephen King in Central branch.

SQL query results with screenshots or summaries:

1. How many copies of “The Lost Tribe” are in Sharpstown branch?

Result: 5 copies - Returns the total number of copies of the book **"The Lost Tribe"** in the **"Sharpstown"** library branch.



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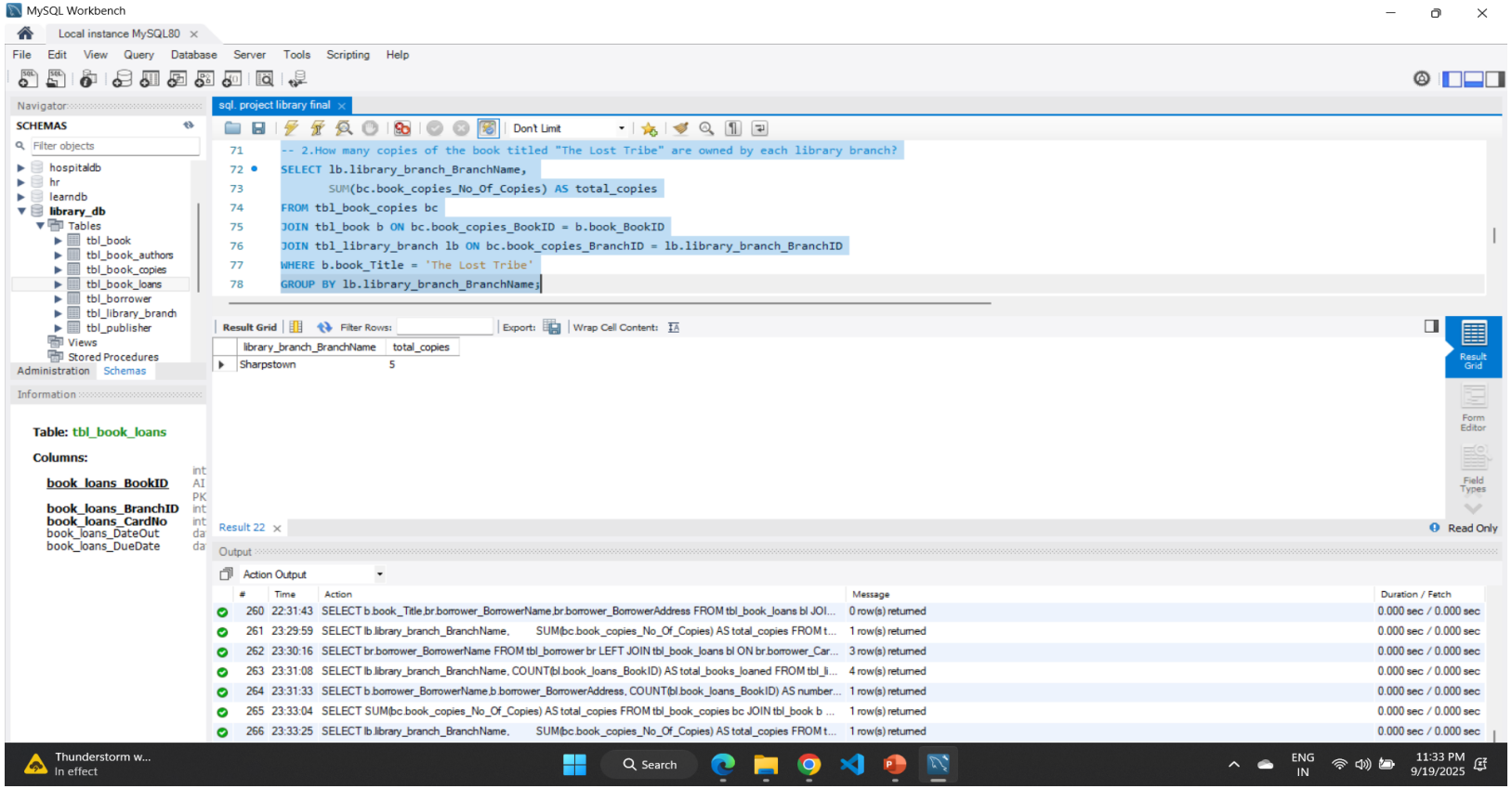
2. How many copies of “The Lost Tribe” are owned by each branch?

Result: Distribution shown per branch (Sharpstown = 5 others vary depending on data). -Shows **how many copies** of "The Lost Tribe" each **library branch** owns.



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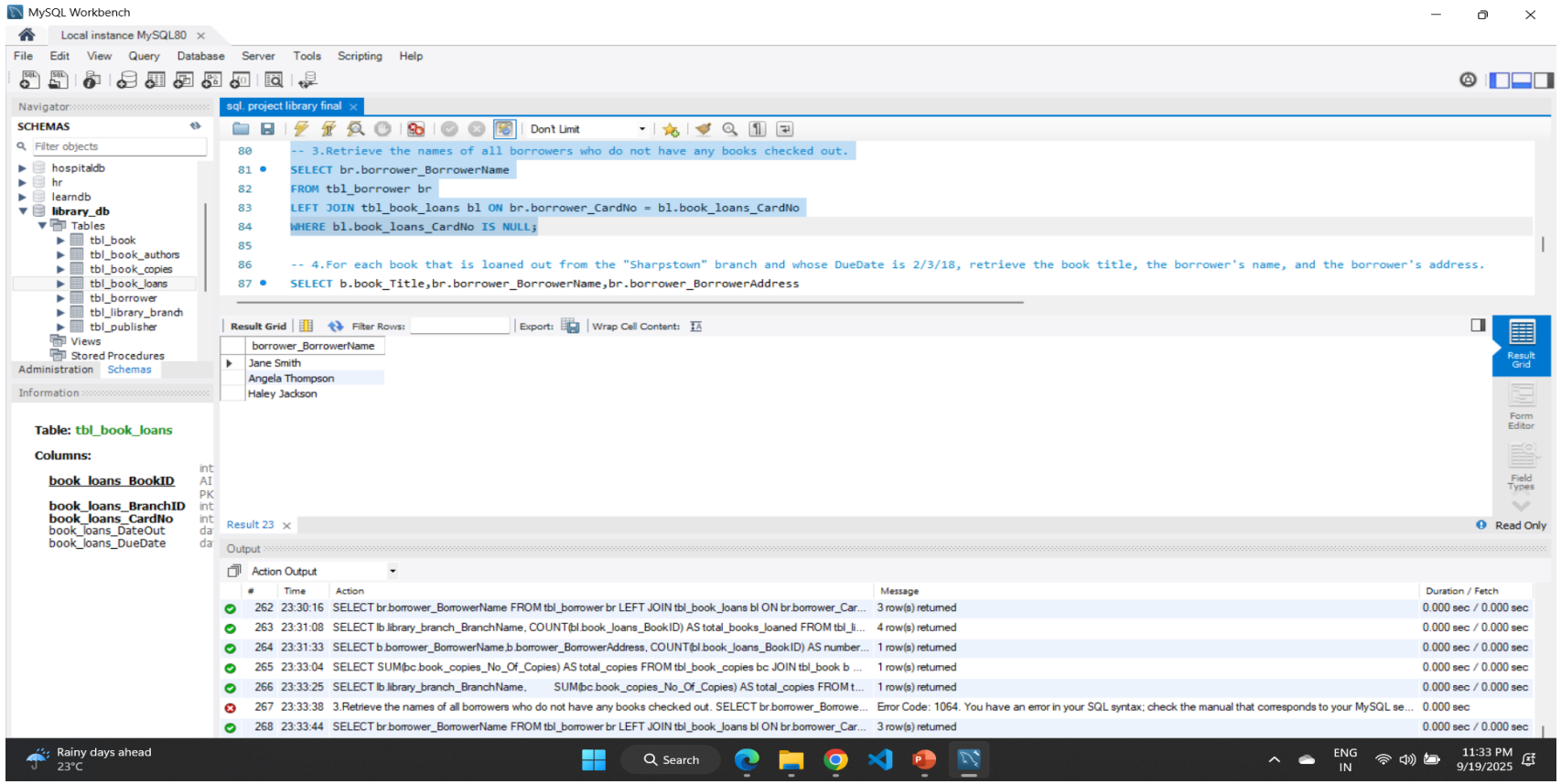
3. Borrowers with no books checked out

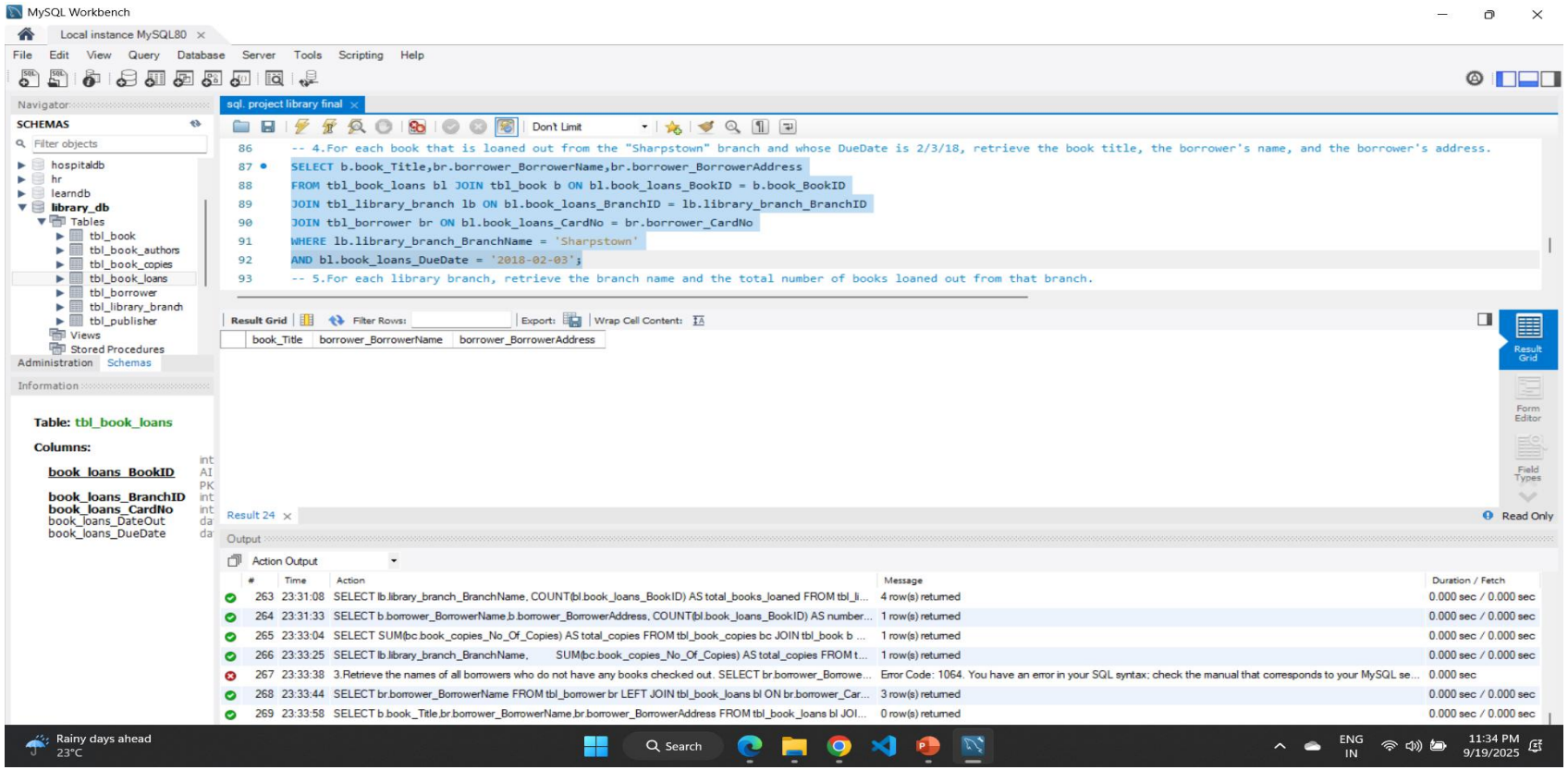
Result: List of borrower names who currently have no active loans. Jane Smith, Angela Thompson, Haley Jackson.

Lists names of **borrowers who have not checked out any books.**



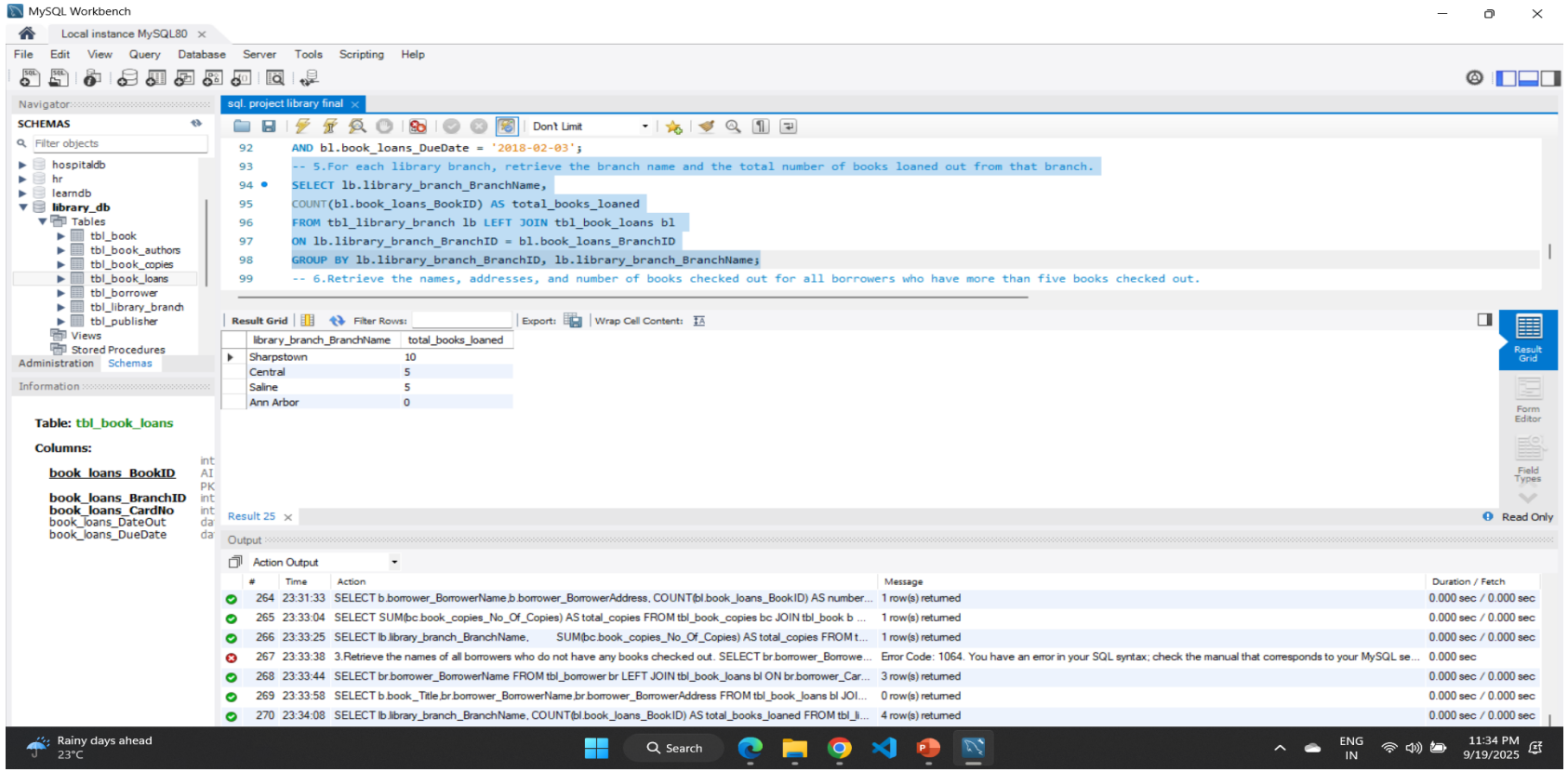
4. Books loaned from Sharpstown with Due Date = 2/3/18

Result: Returns book title, borrower's name, and address for matching records. There are no matching results meant there are no books loaned from Sharpstown with due date 2/3/18. Retrieves **book titles**, **borrower names**, and **addresses** for books loaned from **Sharpstown branch**, with a **due date of Feb 3, 2018**.



5. Total number of books loaned per branch

Result: Each branch with count of total issued books. 'Sharpstown'- '10', 'Central'-'5', 'Saline'- '5'(rest of the branches have 0 number of books loaned),Shows the **total number of books loaned** from **each library branch**. Includes branches even if they have **zero loans** (LEFT JOIN).



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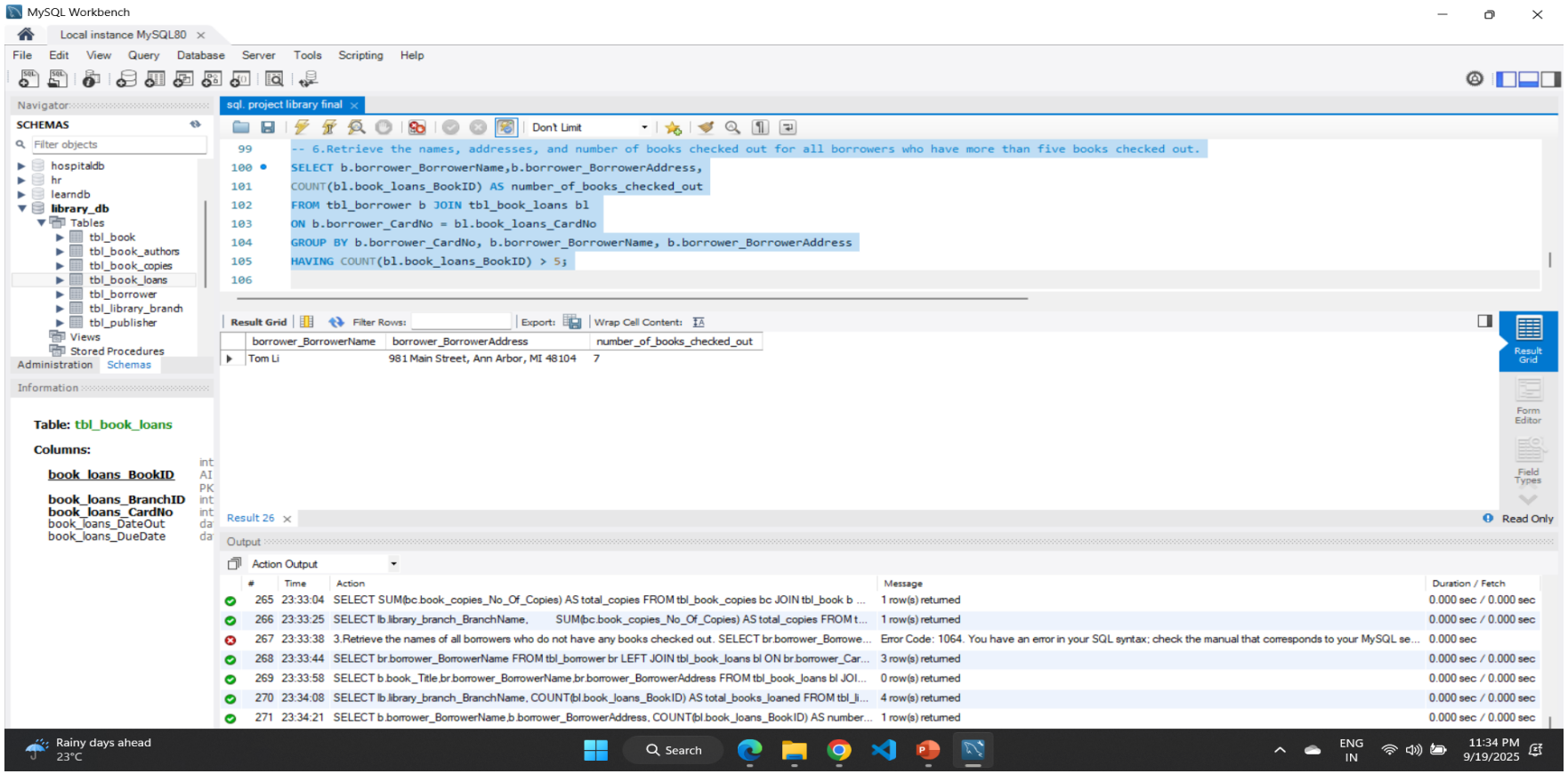
6. Borrowers with more than 5 books checked out

Result: Names, addresses, and number of books checked out (only those exceeding 5). Only one -'Tom Li', '981 Main Street, Ann Arbor, MI 48104', '7'. Lists borrowers who have checked out **more than 5 books**, along with their **name** and **address**.



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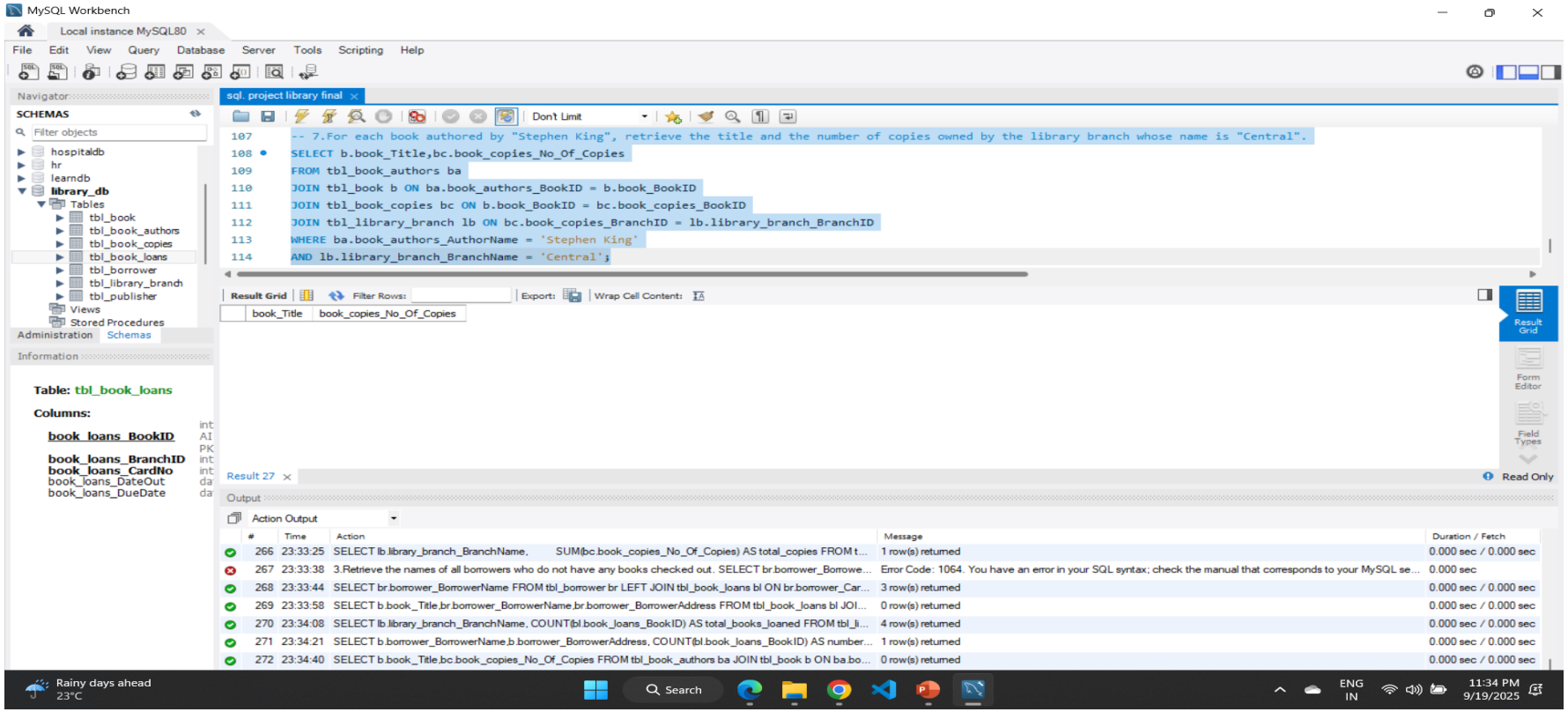
7. Books by Stephen King in Central branch

Result: Titles of Stephen King's books along with total copies available at Central branch. It results 0 as there are no Titles of Stephen King's books along with total copies available at Central branch. Finds all **books written by Stephen King** and shows how many **copies** of each are available in the **"Central"** branch.



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Final business insights and recommendations

The analysis of the library database provided several important observations.

The Sharpstown branch holds limited but significant copies of popular books such as *"The Lost Tribe"*, making it a key location for that title.

The borrower analysis revealed that some members check out more than five books, which may result in resource imbalances and longer wait times for others.

Interestingly, the Central branch does not currently hold any books authored by Stephen King, despite his general popularity. This highlights an opportunity for the library to expand its collection in response to reader demand.

Based on these findings, it is recommended to optimize book distribution across branches, implement borrower monitoring policies for fair access.

Conclusion

In conclusion, the Library Database successfully demonstrated how SQL can be used to design, query, and analyze a relational database in a real-world context. The library database schema maintained proper relationships between entities while supporting meaningful queries to solve business problems. Through this project, we identified branch-level book distribution patterns, borrower activity levels, and author-specific popularity trends. These findings shows the importance of structured data and query-based analysis in making informed decisions for resource management and service improvement in libraries.

Experience/Challenges working on SQL – Data Analysis Project

While working on this SQL project, gained valuable hands-on experience in database design, schema creation, and query formulation. One of the main challenges was ensuring that all foreign key relationships were correctly implemented to maintain data integrity across multiple tables. Writing queries with multiple joins was initially complex, especially when handling conditions like borrowers with no books or ensuring accurate counts per branch. Another challenge was handling cases such as NULL values and ensuring queries worked even for branches or borrowers with no records. Overcoming these challenges helped me improve my SQL skills, understand real-world use cases better, and appreciate the importance of clean schema design for smooth data analysis.

THANK YOU

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