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Faculty of Science & Technology

Community Library Management System Database Schema Design V1

Prepared for: Advanced Databases (CMPS3162)

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Instructor: Mr. Dalwin Lewis

Date: February 19th, 2026

Declaration of Use for Generative AI in Assessments

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I hereby declare that in the planning, drafting, and/or revision of the work attached, I have made use of Generative AI tools in the following ways:

Acknowledgement of Generative AI Tools Used

☑ For brainstorming,

☐ To find sources.

☐ To plan the structure/outline of the work.

☐ To generate programming code.

☐ To generate translations of primary/secondary source content for consultation.

☐ To generate translations included in the submitted work, whether or not manually revised.

☐ To improve the language of my own phrases, sentences, and/or paragraphs.

☐ To generate the text of (part of) the submitted work.

Acknowledgement of Assessment Submission

I, **Tysha Daniels,** hereby confirm that on **February 19, 2026**:

1. I am the author of this submitted document.
2. I am responsible for any AI-generated errors or fabrications.
3. I understand the limitations and risks of using AI.
4. I used AI tools ethically, protecting all sensitive information.
5. I ensure any AI-assisted work remains originally my own.
6. I have appropriately acknowledged all use of generative AI.
7. Undeclared AI use constitutes academic dishonesty, which I acknowledge.
8. I am accountable for any resulting academic misconduct.

Add more rows to the table as needed to include ALL tools used in the creation of your assessment submission.

Generative AI Tool Used (Please List Each Separately)	Purpose of Use	Briefly Explain the Extent of Use
Grammarly	Grammar Correction	Used it to help correct any grammatical errors spotted.
Gemini	Cross-checking my schema	Used it to help verify the accuracy of my database schema.

Student Names: Tysha Daniels

Course Code: CMPS3162

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Department: MPIT

Date: Feb 19, 2026

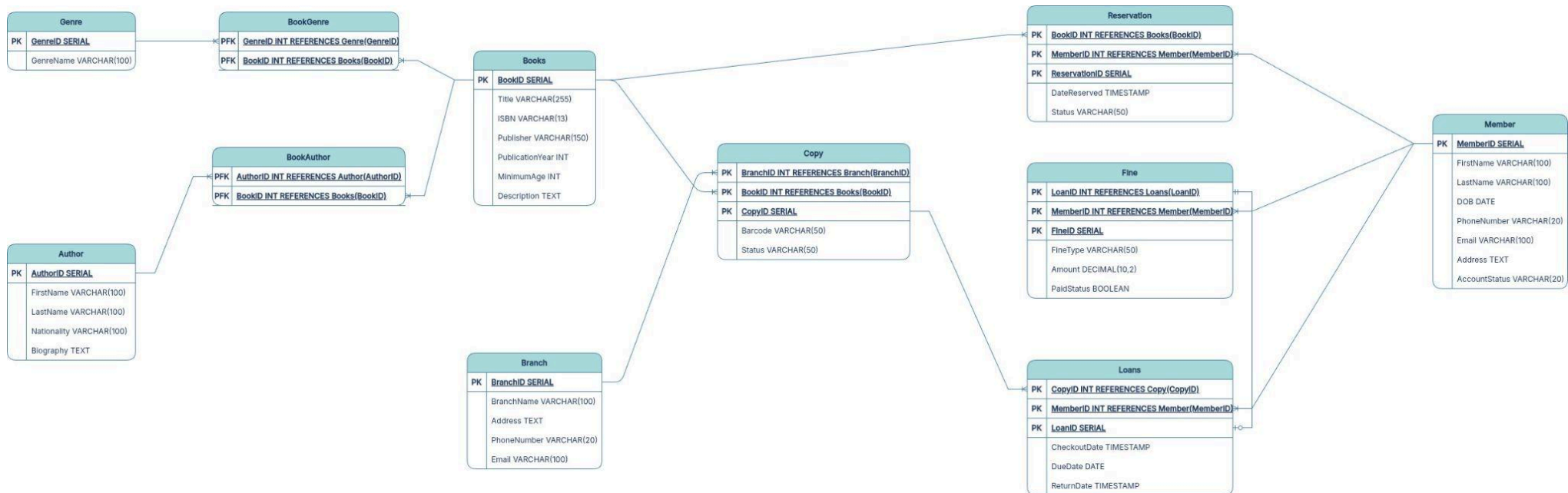# *<u>Table of Contents</u>*

1. Entity-Relationship Diagram (ERD)

Figure 1: *Entity-Relationship Diagram (ERD) for the Community Library Management System. It can be accessed here.*

2. Justification for Normalization Decisions

For the purpose of this project, the database is designed according to the Third Normal Form (3NF) to maintain data accuracy and limit redundancy, which is particularly important when handling physical stock and financial transactions.

- **Elimination of Redundancy (2NF & 3NF):** By separating "Titles" from "Physical Copies", storing data such as Title, ISBN, and Publisher only once in the Books table prevents update abnormalities that would occur if that information were repeated for each physical copy.

- **Separation of Concerns:** Member data is separated from Loans, so member contact details reside at a single point. So, if the member's address changes, it only needs to be updated in one row, not in every past loan record.

- **Normalization of Many-to-Many Relationships:** It uses junction tables, such as BookAuthor and BookGenre, to resolve complex relationships. This allows a single book to have multiple authors and a single author to be associated with multiple books without creating duplicate data blocks.

- **Transitive Dependency Removal:** Elements such as BranchLocation belong to the Branch table and not the Copy table. The Copy table contains only a BranchID, thus branch-specific details (e.g., phone number) are not made transitively dependent on a physical book copy.

3. Identification of Critical Indexes

To meet the performance requirements of a high-concurrency system, especially during "peak" search or checkout periods, the following indexes are critical:

Table	Column(s)	Index Type	Business Justification
Books	ISBN	Unique Index	Enables rapid retrievals when librarians check out books using their standard 13-digit code.
Members	Email	Unique Index	Makes it easy and secure to sign in and prevents members registering with the same email.
Copy	Barcode	Unique Index	Essential for a checkout transaction. The system quickly finds the exact item physically scanned.
Loans	MemberID, ReturnDate	Composite Index	Improves the verification process to determine whether a member has exceeded their 10-book limit. Filtering for ReturnDate IS NULL quickly finds active loans.
Fine	MemberID, PaidStatus	Composite Index	Important for the small checkout process. It enables the system to

			quickly tally unpaid fines and determine whether they are under the $50 threshold.
Reservation	BookID, Status	Filtered Index	Accelerates the "Hold Queue" logic by allowing the system to efficiently determine the next person in line for a particular title that has just become available.