

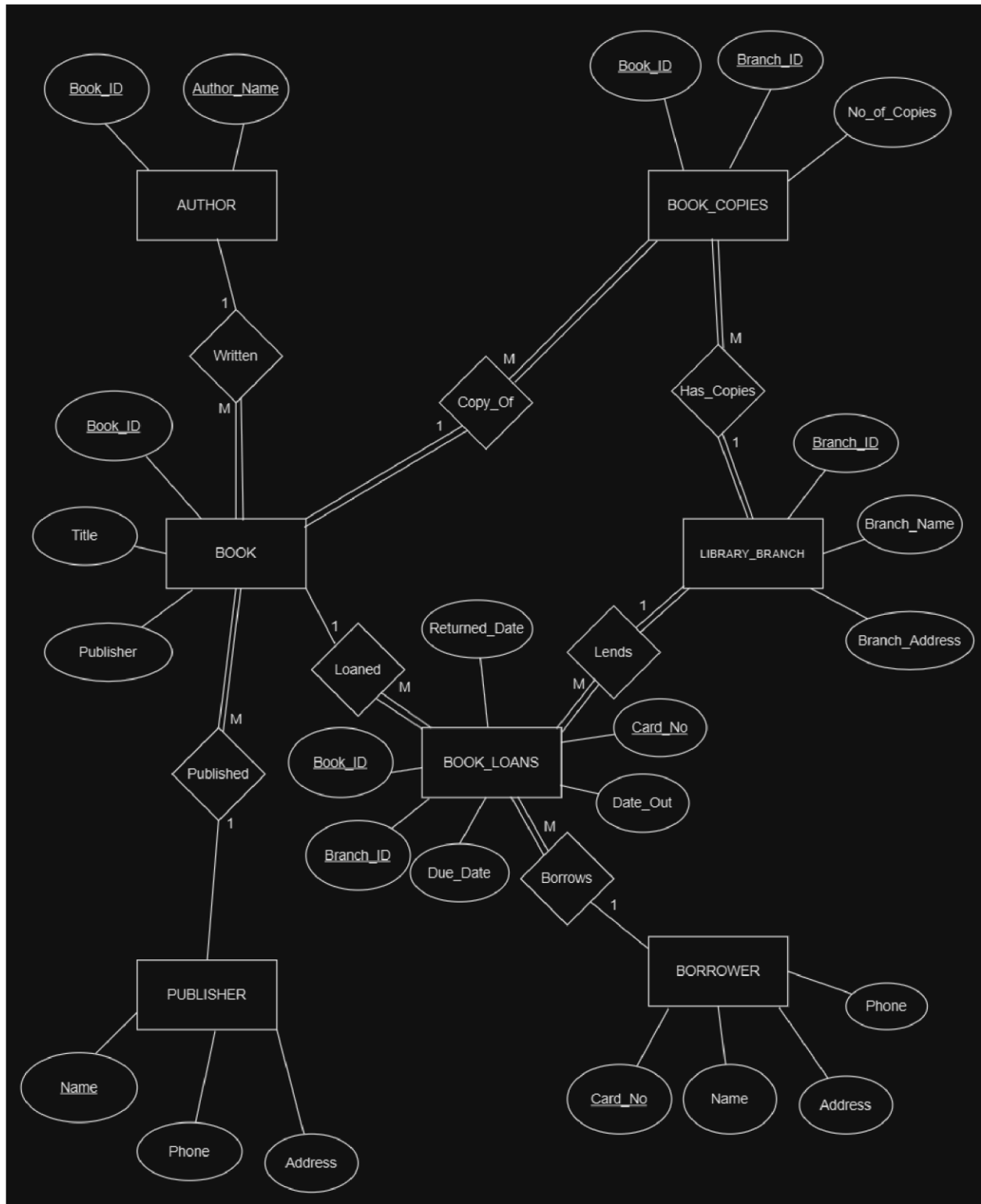
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**Project #2 Part 1 - CSE 3330-004 - Library  
Management System Database**  
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# ER DIAGRAM



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## ER DIAGRAM EXPLANATIONS/ASSUMPTIONS

### Entities and Attributes:

#### 1. BOOK

- Purpose: Represents each book in the library system.
- Attributes:
- Book\_ID: A unique identifier for each book (ID). - Title: The name of the book.

#### 2. AUTHOR

- Purpose: Represents authors who have written books available in the library.
- Attributes:
- Book\_ID: The Book\_IDs of books the author wrote. - Author\_Name: The name of the author.

#### 3. BOOK\_COPIES

- Purpose: Represents individual copies of each book at multiple library branches.
- Attributes:
- Book\_ID: Links each copy to a specific book's Book ID.
- Branch\_ID: Identifies the branch where the copies are located.
- No\_of\_Copies: Tracks how many copies of the book are available at that branch.

#### 4. LIBRARY\_BRANCH

- Purpose: Represents the different branches within the library system.
- Attributes:
- Branch\_ID: A unique identifier for each branch, allowing differentiation between different branch locations.
- Branch\_Name: Name of the branch.

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- Branch\_Address: Physical address of the branch.

## 5. BOOK\_LOANS

Purpose: Tracks the loans of books made by borrowers from specific branches.

- Attributes:
- Book\_ID: Identifies the specific book's Book ID being borrowed in the loan record.
- Branch\_ID: Indicates the branch from which the book was loaned from.
- Card\_No: Links the loan record to the borrower's library card.
- Date\_Out: The date the book was checked out.
- Due\_Date: The date by which the book should be returned.
- Returned\_Date: Tracks the actual date of return.

## 6. BORROWER

- Purpose: Represents individuals who borrow books from the library.
- Attributes:
- Card\_No: A unique identifier for each borrower, issued as a library card number.
- Name: The name of the borrower.
- Address: The borrower's address.
- Phone: Contact number for the borrower.

## 7. PUBLISHER

- Purpose: Represents the publisher that published each book.
- Attributes:
- Name: The name of the publisher, acting as a unique identifier.
- Phone: Contact number of publisher.
- Address: Physical address of publisher.

**Relationships (Cardinality Ratio and Participation) between Entities:**

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## 1. Book – Publisher

- Relationship Name: *Published* (connects the *Publisher* names attributes)
- Cardinality Ratio: Many-to-One (M:1) (Each Book is associated with one Publisher, an Publisher can have multiple books) Participation:  
Book: Total (Every book must have a publisher)
- Publisher: Partial (A publisher may not have published all their books in the library database)

## 2. Book – Author

- Relationship Name: *Written* (connects the *Book\_ID* attributes)
- Cardinality Ratio: Many-to-One (M:1) (Each book has one author, while an author can have multiple books) - Participation:  
Book: Total (Every book has to have an author)
- Author: Partial (An author may not have all their books in the library database)

## 3. Library\_Branch – Book\_Copies

- Relationship Name: *Has\_Copies* (connects the *Branch\_ID* attributes)
- Cardinality Ratio: One-to-Many (1:M) (Each library ranch has multiple book copies, each book copy belongs to one library branch at a time) Participation:  
Library\_Branch: Total (Every branch must have book copies to function as a library branch)
- Book\_Copies: Total (Each book copy record is associated with a specific branch)

## 4. Book – Book\_Copies

- Relationship Name: *Copy\_Of* (connects the *Book\_ID* attributes)

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- Cardinality Ratio: One-to-Many (1:M) (Each book can have multiple copies, and each book copy is associated with one book)  
Participation:
- Book: Total (Every book entry has at least one copy in the library system)
- Book\_Copies: Total (Each book copy entry must reference a Book)

#### 5. Borrower – Book\_Loans

- Relationship Name: *Borrows (connects the Card\_No attributes)*  
Cardinality Ratio: One-to-Many (1:M) (Each borrower can loan multiple books, while each book can be loaned to one borrower at a time)  
Participation:
- Borrower: Partial (A borrower may not have borrowed any books yet)
- Book\_Loans: Total (Each book loan record must be associated with a borrower)

#### 6. Library\_Branch – Book\_Loans

- Relationship Name: *Lends (connects the Branch\_ID attributes)*
- Cardinality Ratio: One-to-Many (1:M) (Each library branch can have multiple book loan records, while each book loan record is associated with one library at a time) - Participation:
- Library\_Branch: Total (Each branch lend books to borrowers)
- Book\_Loans: Total (Each loan record must be associated with a specific branch)

#### 7. Book – Book\_Loans

- Relationship Name: *Loaned (connects the Book\_ID attributes)*
- Cardinality Ratio: One-to-Many (1:M) (Each book can have multiple book loan records, while each book loan record is associated with one book)
- Participation:

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- Book: Partial (Not all books may be loaned out at any given time)  
Book\_Loans: Total (Each loan record must reference a book)

The Library Management System is designed with entities, attributes, and relationships to efficiently manage library operations, including tracking books, authors, publishers, library branches, borrowers, and loans. The entities are BOOK,

AUTHOR, PUBLISHER, LIBRARY\_BRANCH, BOOK\_COPIES, BORROWER, and BOOK\_LOANS. This DBMS, with necessary entities, attributes, defined relationships, participation constraints, and cardinalities, is necessary for a comprehensive and functional Library Management

System. It enables the tracking of book inventory across branches, borrower activities, and loan statuses. This design closely follows the assignment instructions and rubric by including all required entities, attributes, and relationships, with clear participation and cardinality constraints that reflect the real-world interactions between books, branches, borrowers, and loans. Each entity and relationship has been created to align with the specifications outlined in the assignment, ensuring our system meets the project's functional requirements.



# RELATIONAL DATABASE SCHEMA

