UML Exercise: Design a Library Management System

Problem Statement:

You are required to design a **Library Management System** using UML diagrams. The system should manage books, library members, and the borrowing process. The system should have the following capabilities:

1. **Books:**
   - Each book should have a title, author, ISBN, and publication date.
   - Books can be available in different genres (e.g., Fiction, Non-Fiction, Science, etc.).
   - The library keeps track of the number of copies of each book.
2. **Members:**
   - Library members should have a name, membership ID, contact details, and membership expiration date.
   - Members can borrow books from the library.
   - Each member can borrow up to 5 books at a time.
   - The system should track which books are currently borrowed by each member.
3. **Borrowing Process:**
   - A member can borrow a book if it is available in the library.
   - The borrowing record should include the borrow date and the due date for return.
   - Members should be able to return books, and the system should update the availability of the book.
4. **Fines:**
   - If a member returns a book after the due date, they should be fined.
   - The fine should be calculated based on the number of days overdue.

Tasks:

1. **Class Diagram:**
   Create a class diagram to represent the system, showing the classes, their attributes, methods, and the relationships between them.
2. **Use Case Diagram:**
   Draw a use case diagram to identify the main actors (e.g., Librarian, Member) and the key use cases (e.g., Borrow Book, Return Book, Add New Book).

3. **Sequence Diagram:**
   Create a sequence diagram to illustrate the process of a member borrowing a book, including interactions between the member, the book, and the library system.
4. **Activity Diagram:**
   Design an activity diagram to show the workflow of returning a book, including the steps of checking for overdue fines and updating the book's availability.

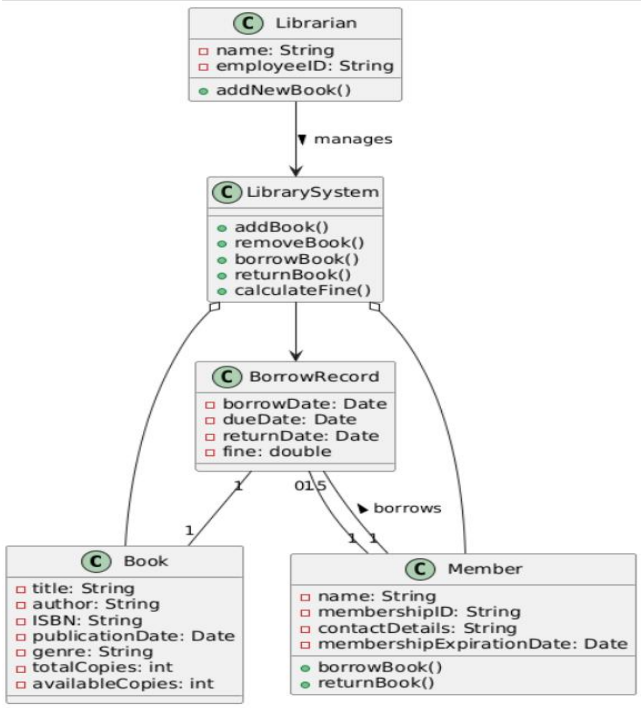
Deliverables:

- Create your UML diagrams (Class Diagram, Use Case Diagram, Sequence Diagram, and Activity Diagram) with proper annotations.
- Provide a brief explanation of each diagram, describing the design decisions and how the system fulfills the requirements.

#work

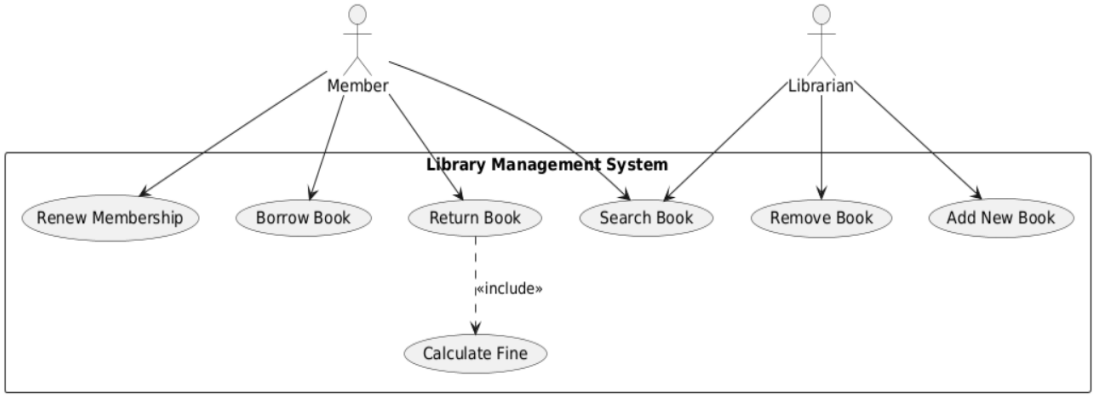
1.Class Diagram:

Book: Has details like title, author, and how many copies are available.
Member: People who borrow books; we keep their info and what books they borrowed.
BorrowRecord: Keeps track of when a member borrows and returns a book, plus any fines.
LibrarySystem: The main system that lets members borrow and return books.
Librarian: The person who can add or remove books from the library.



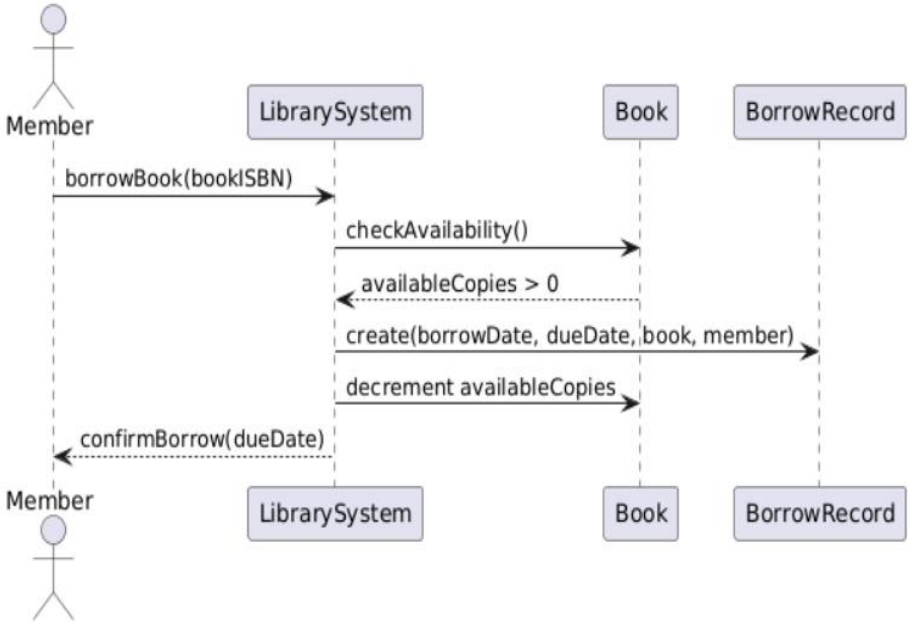
2.Use Case Diagram:

Members can borrow books, return books, search for books, and renew membership.
Librarians can add or remove books and search for books.
The system also calculates fines if a book is returned late.



3. Sequence Diagram:

The member asks the system to borrow a book.
The system checks if the book is available.
If yes, it records the borrowing and updates the number of available copies.
Then it tells the member the book is borrowed and when to return it.



4. Activity Diagram:

The member returns the book.
The system checks if the book is late.
If it is late, the system calculates a fine.
The system updates the book's availability and the member's record.
The member is told if they have to pay a fine or not.