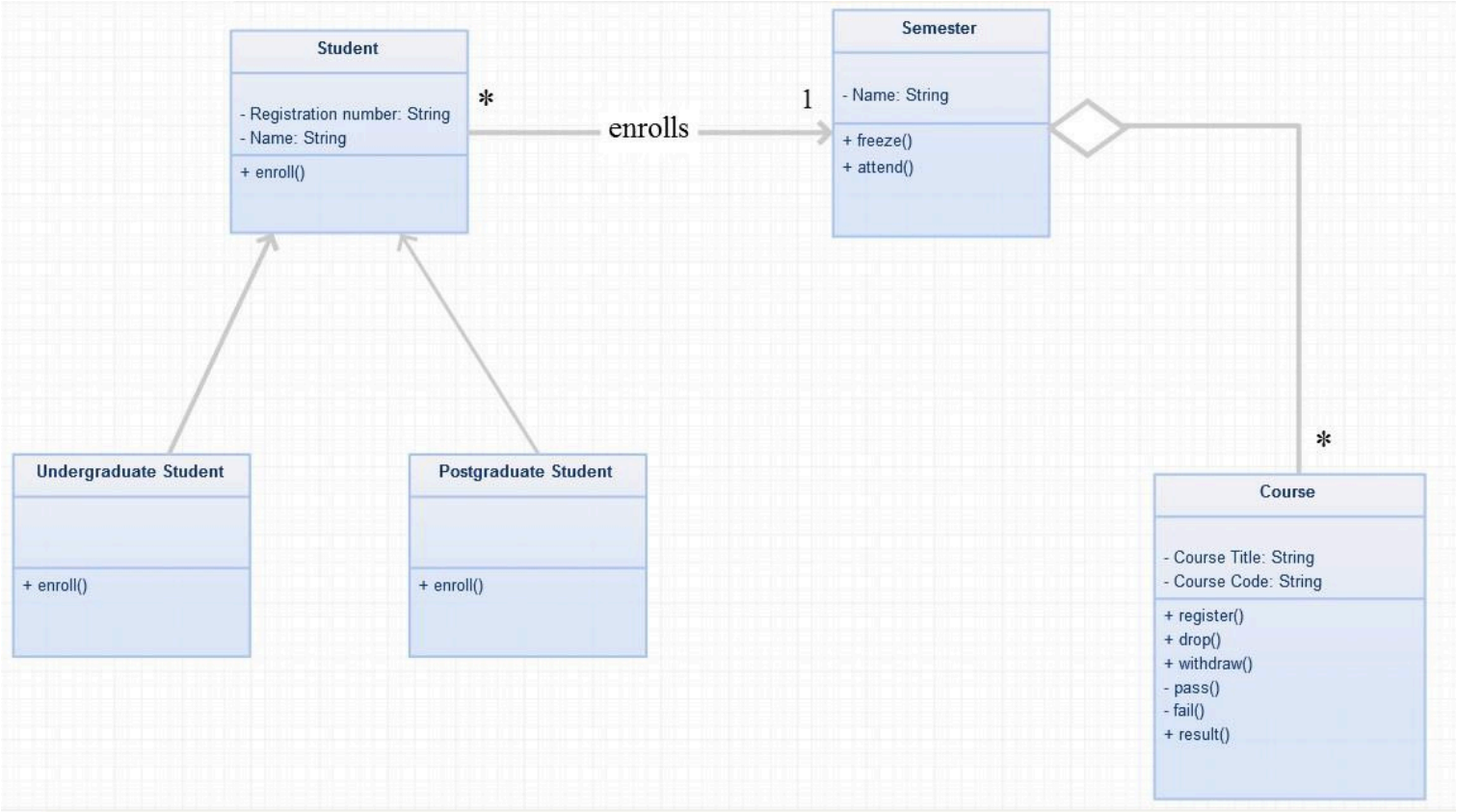
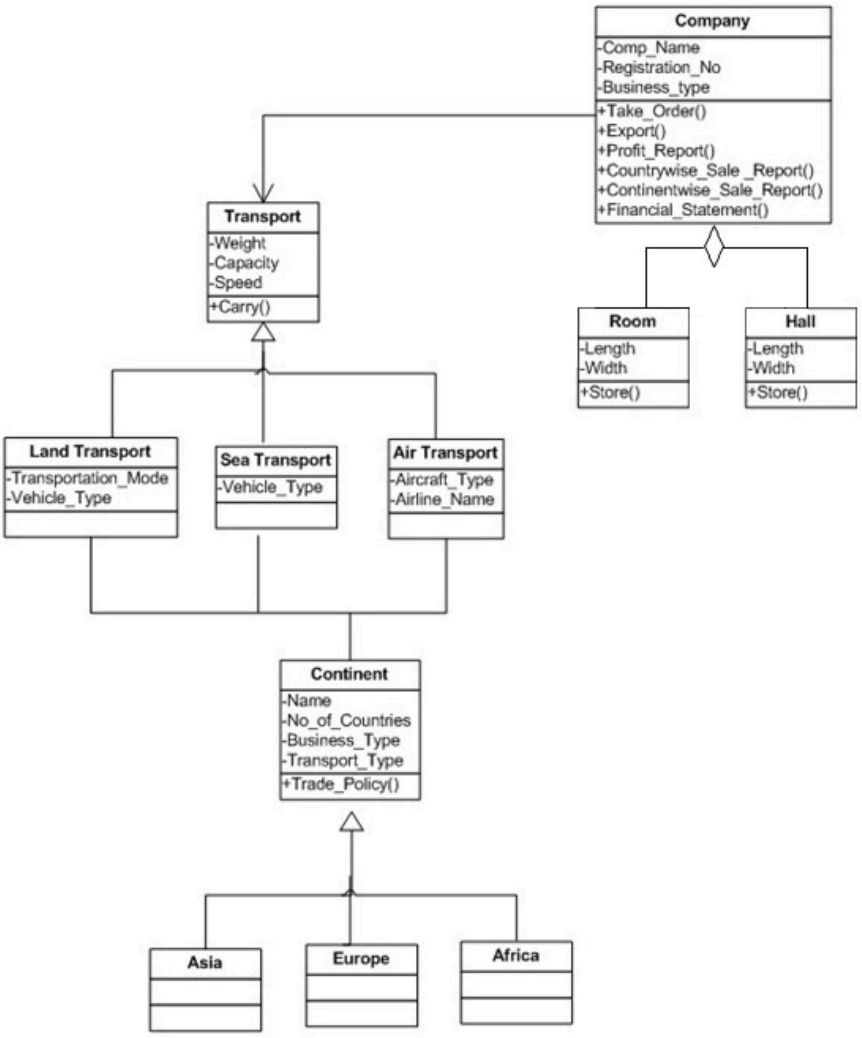
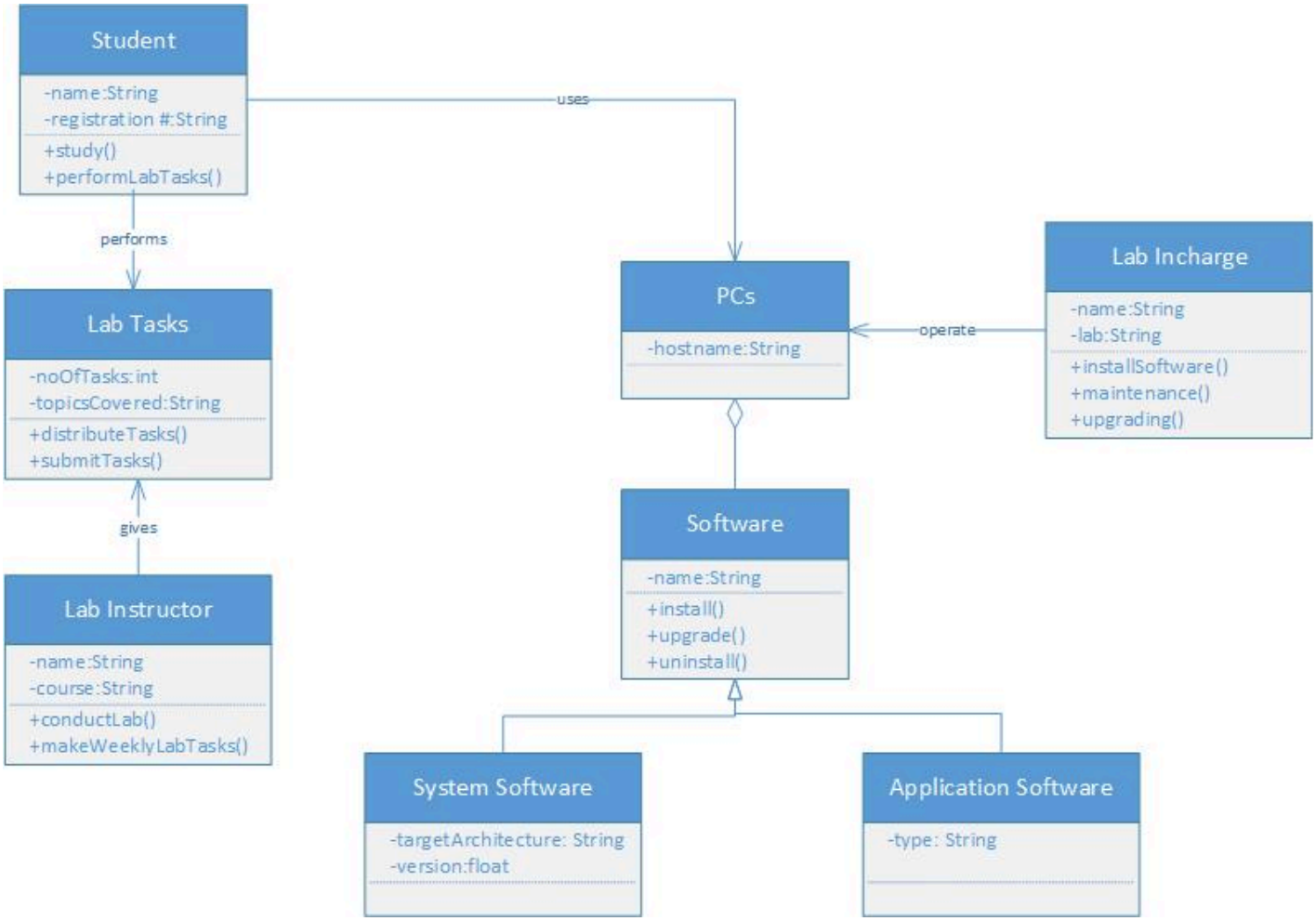
1) "Develop a Student Registration System in which students enroll in a semester. The semester contains courses. Each course has a title and course Code. The course can be registered, dropped, withdraw, passed and failed by the students. Also a semester may be freezed or attended. There are two kinds of students; Undergraduate Students (for BCS & MCS) and Postgraduate Students (for MPhil & PhD). Each type of students enroll in different ways."



3) "Let's assume a firm called "Pakfood Internationals", that is running an export trade business of vegetables from Pakistan to 3 continents Africa, Asia and Europe. The company is using three kinds of transport i.e. Land transport, Sea transport, and Air transport to carry goods for shipments. It uses Land and Sea transport from Pakistan to South East Asia, Middle East, Far East, and Africa. Moreover, it uses sea and air transport for European countries. It also has cold rooms and halls available to rent in for customers' small and large orders respectively"



4) Develop a UML class diagram that models the working of computer labs in your department. It relates Students, Lab Instructor, weekly Lab Tasks, PCs, and Software installed on the PCs. There are two types of software installed i.e. System Software and Application Software. All the PCs are connected through LAN with a server which is being operated by a lab in charge. The lab in charge is also responsible for installation and maintenance of System and Application Software for all the systems in the lab.

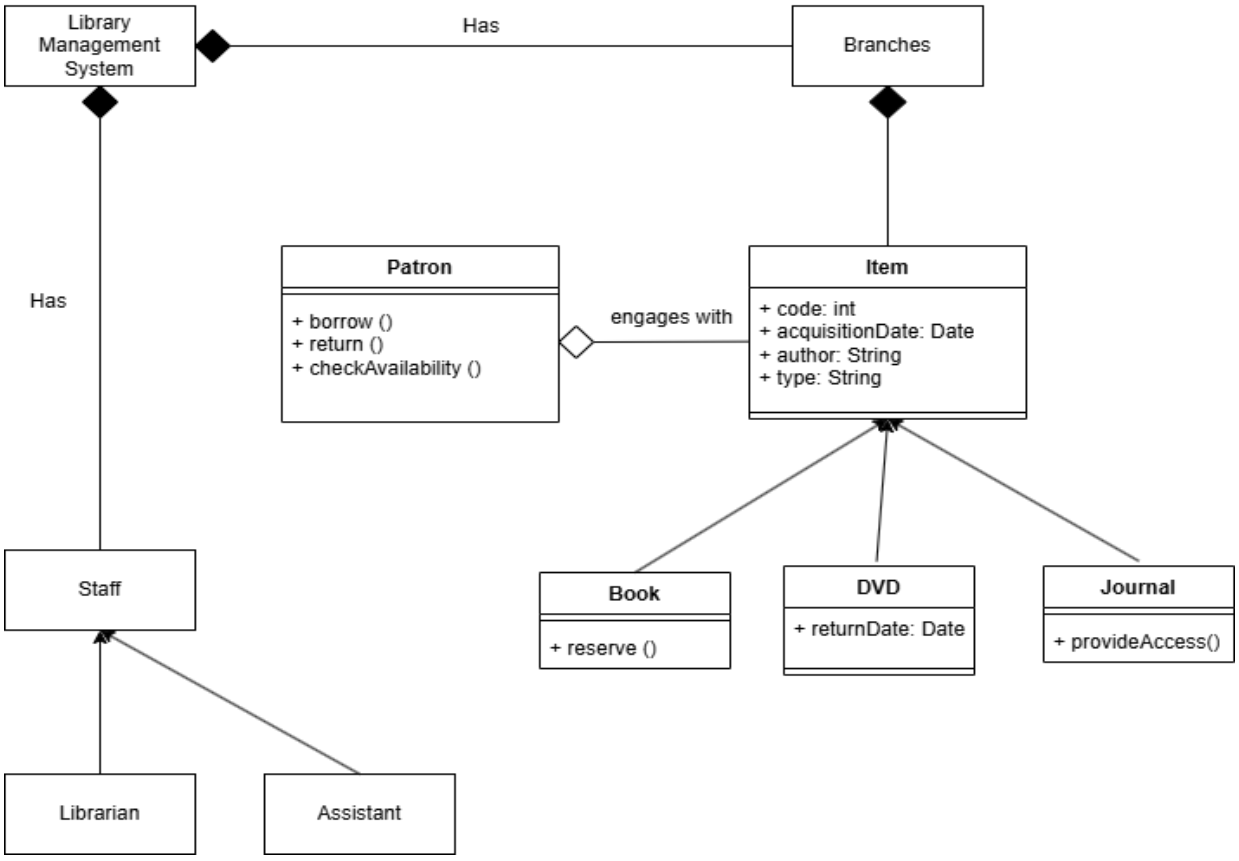


4) You've been assigned the development of a Library Management System. The library system is composed of multiple branches, each housing an array of books and multimedia resources. The library catalog includes various types of items, such as Books, DVDs, and Journals. Each library item is identified by a distinct code, contains information about its acquisition date, and is associated with a specific author or creator.

Library patrons can engage in activities such as borrowing items, returning them, and checking the availability of resources. In addition to the general library items, special features are implemented for different types of items. For instance, books can be reserved, DVDs have a return date, and Journals provide access to specific articles.
Library patrons are allowed to have multiple borrowed items, but each item is uniquely associated with one patron. The library is managed by a team of employees, each having a unique ID, name, hiring date, and expertise level indicating their experience in the library system.

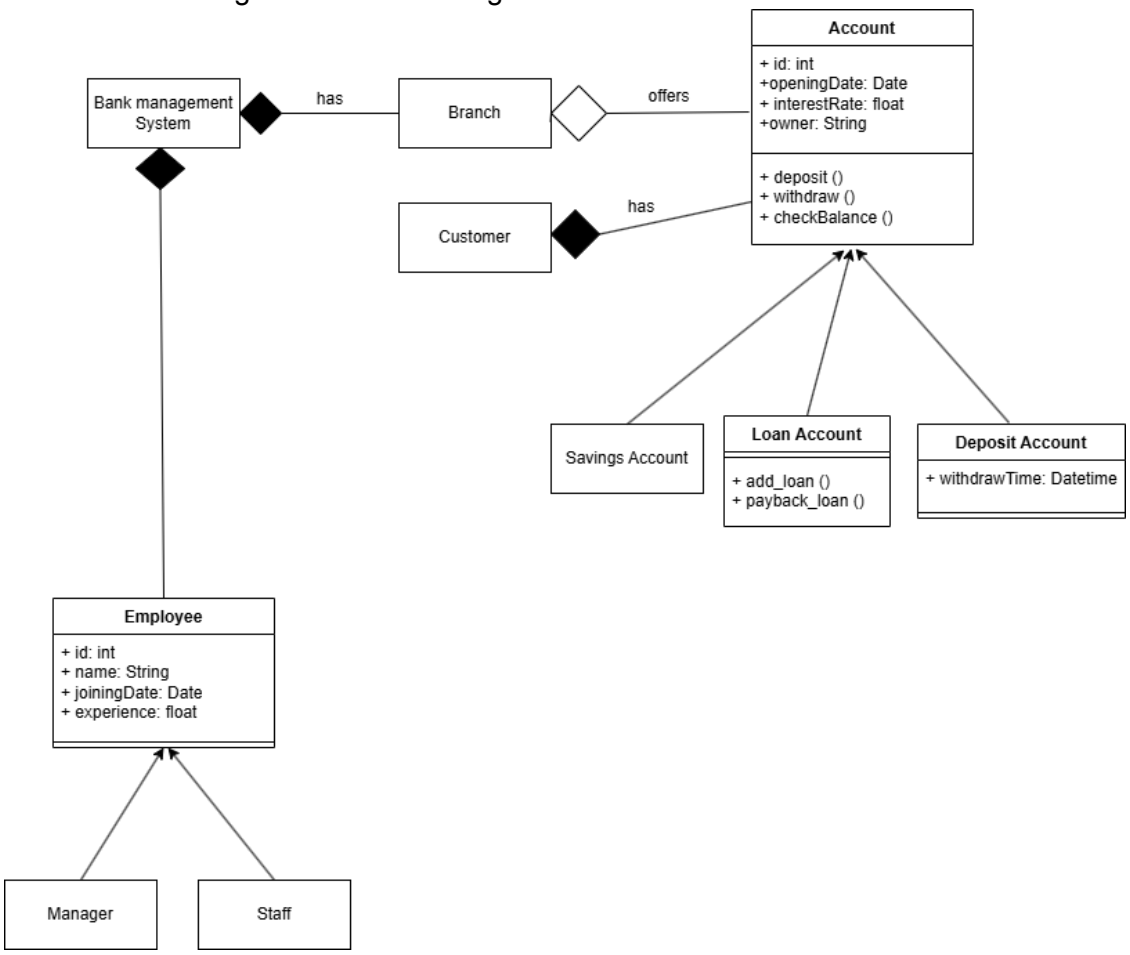
The library staff is divided into two categories: Librarians and Assistants. Both roles have distinct attributes and methods tailored to their specific responsibilities within the library system. It is essential to ensure that the attributes and methods are appropriately configured for Librarians and Assistants to efficiently manage the library resources and provide quality service to patrons.

Create a class diagram based on the given scenario.



5) You have been tasked with creating a Bank Management System. A Bank has many Branches which offer various types of bank accounts, these accounts consist of Savings Account, Deposit Account, and Loan Account. Each bank account has a unique identifier, an opening date, interest rate and an owner(customer).Accounts can be used to deposit money, withdraw money and check balance. Loan Accounts have add_loan and payback_loan and Deposit Account has a withdraw_time .A customer can have multiple bank accounts, but a bank account can only belong to one customer. A bank is run by employees, every employee has a unique ID,name, joining date and an experience value(No of years worked in current company). Employees are of two types: Manager and Staff. They have their own attributes and methods, fill them up appropriately.

Create a class diagram based on the given scenario.



6) The bustling Modern City Library implemented a robust Library Management System to handle its growing collection of 20,000 books and its 5,000 active members. The system revolves around several key entities: **Library**, **Book**, **Member**, **Transaction**, and **Librarian**, each playing a pivotal role in ensuring smooth operations.

At the heart of the system is the **Library**, which acts as a central hub. Its attributes include libraryName, address, books, members, and transactions. The library provides functions such as searching books and showing a list of books available for borrowing.

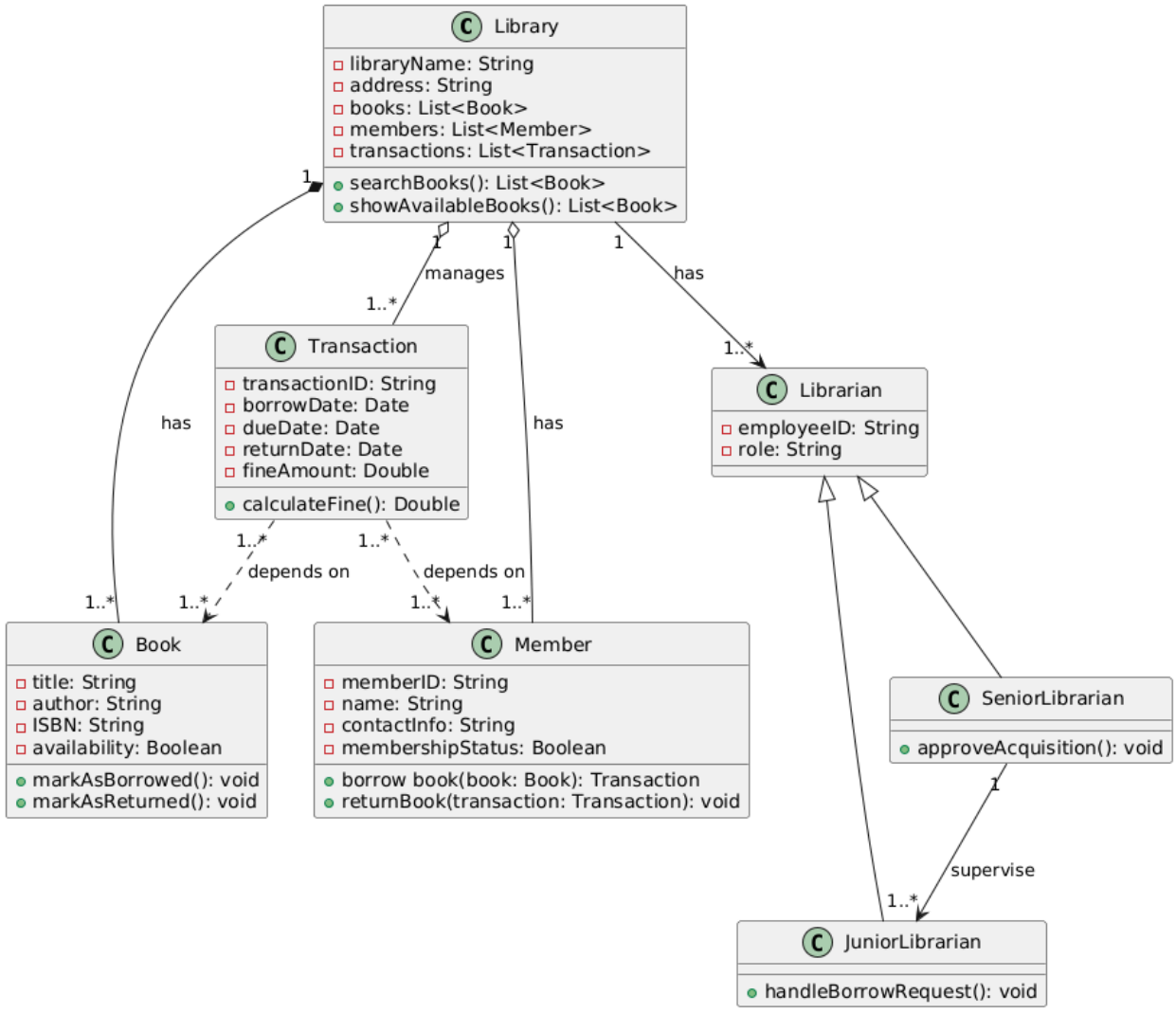
The **Book** class represents each book in the library's collection. It has attributes like title, author, ISBN, and availability. A book can be marked as borrowed or returned to help in tracking whether a book is in circulation. The **Book** class is related compositionally to the **Library** in a way that the books cannot exist outside the library's domain.

Members of the library are represented by the **Member** class, which aggregates into **Library**. Each member has attributes like memberID, name, contactInfo, and membershipStatus. Members can borrow books and return them. The **Member** class depends on **Transaction** to record the borrowing and returning activities.

The **Transaction** class links books and members through attributes such as transactionID, borrowDate, dueDate, returnDate, and fineAmount. It determines fines for overdue returns. Transactions aggregate into **Library** but depend on **Book** and **Member** for their operation, highlighting the relationships between borrowing and returning activities.

The **Librarian** class oversees library operations, generalized into **Junior Librarian** and **Senior Librarian**. Common attributes include employeeID and role. Junior Librarian focuses on basic tasks like handling borrow requests, while Senior Librarian performs advanced functions like approving acquisitions and supervising junior librarians.

This tightly integrated system ensures that books, members, and transactions are managed seamlessly while enabling efficient communication between the different entities. This dependency between classes ensures data consistency and operational efficiency, making the Modern City Library a model of digital transformation in public services. -=-=-=-=-=->SHRR


Library
- libraryName: String
- address: String
- books: List<Book>
- members: List<Member>
- transactions: List<Transaction>
+ searchBooks(): List<Book>
+ showAvailableBooks(): List<Book>
1
1
manages
1..*
1
has
1..*
Transaction
- transactionID: String
- borrowDate: Date
- dueDate: Date
- returnDate: Date
- fineAmount: Double
+ calculateFine(): Double
has
has
Librarian
- employeeID: String
- role: String
1..*
depends on
1..*
1..*
depends on
1..*
1..*
1..*
1..*
Book
- title: String
- author: String
- ISBN: String
- availability: Boolean
+ markAsBorrowed(): void
+ markAsReturned(): void
Member
- memberID: String
- name: String
- contactInfo: String
- membershipStatus: Boolean
+ borrow book(book: Book): Transaction
+ returnBook(transaction: Transaction): void
SeniorLibrarian
+ approveAcquisition(): void
1
supervise
1..*
JuniorLibrarian
+ handleBorrowRequest(): void