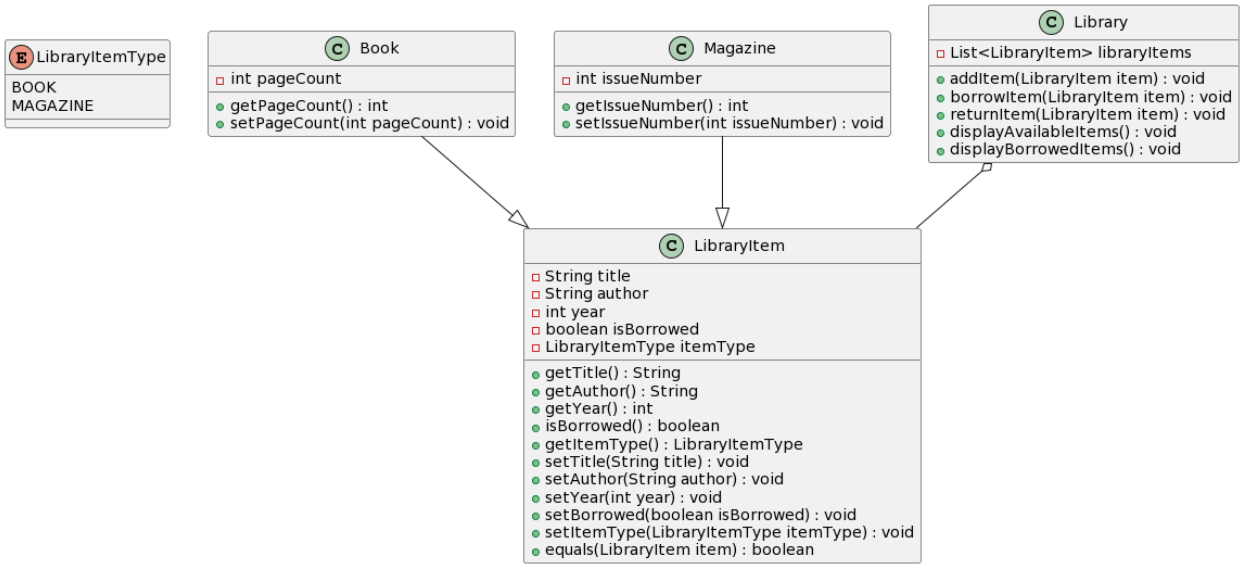
Lab Assignment 1

Object Oriented Programming CSC241

Date:6-10-2023 **Maximum Marks:10**

Scenario:

In this assignment, students will use object-oriented programming principles to design a simplified library system. The system will manage library items such as books and magazines and facilitate interactions like borrowing and returning items. You are tasked with designing and implementing a simplified library system in Java. This system will consist of classes representing library items, such as books and magazines. You must create a program allowing patrons to borrow and return items from the library using arrays. Additionally, you should utilize an enumeration to represent the type of library items.



Tasks:

1. **Enumeration:**
    - Develop an enumeration named LibraryItemType with the following constants:
        - **BOOK**
        - **MAGAZINE**
2. **LibraryItem Class:**
    - **Attributes:**
        - String title: Title of the item.
        - String author: Author or creator of the item.
        - int year: Year the item was published or created.
        - boolean isBorrowed: Indicates if the item is currently borrowed.
        - LibraryItemType itemType: Type of the item using the enumeration.
    - Provide appropriate constructors, getters, and setters to ensure encapsulation.
3. **Subclasses of LibraryItem:**

- **Book:**
  - Additional attribute: int pageCount: Number of pages in the book.
- **Magazine:**
  - Additional attribute: int issueNumber: Issue number of the magazine.
- Implement constructors that initialize the attributes for both classes.

4. **Library Class:**
   - Design a class that manages the library's collection of items. Implement the following methods:
     - void addItem(LibraryItem item): Add an item to the library's collection.
     - void borrowItem(LibraryItem item): Mark an item as borrowed.
     - void returnItem(LibraryItem item): Mark an item as returned.
     - void displayAvailableItems(): Show available items in the library.
     - void displayBorrowedItems(): List items that are currently borrowed.
5. **Typecasting:**
   - Implement appropriate typecasting techniques (downcasting, upcasting) to manage different types of library items.
6. **Comparison:**
   - Implement an equals method in the LibraryItem class to compare items based on their attributes.

```
public class Main {
    public static void main(String[] args) {
        // Creating a library
        Library lib = new Library();

        // Adding some books by Pakistani authors to the library
        Book book1 = new Book("Moth Smoke", "Mohsin Hamid", 2000, 247);
        Book book2 = new Book("The Reluctant Fundamentalist", "Mohsin
Hamid", 2007, 184);
        Magazine magazine1 = new Magazine("Dastaan-e-Pakistan",
"History Dept", 2022, 5);

        lib.addItem(book1);
        lib.addItem(book2);
        lib.addItem(magazine1);

        // Borrowing a book
        lib.borrowItem(book1);

        // Displaying available and borrowed items
        System.out.println("Available Items:");
        lib.displayAvailableItems();

        System.out.println("\nBorrowed Items:");
        lib.displayBorrowedItems();

        // Returning a book
        lib.returnItem(book1);
```

```
        System.out.println("\nAfter returning 'Moth Smoke':");
        System.out.println("Available Items:");
        lib.displayAvailableItems();

        System.out.println("\nBorrowed Items:");
        lib.displayBorrowedItems();
    }
}
```

Instructions:

- Use the LibraryItemType enumeration for item types.
- Ensure encapsulation by using private modifiers for attributes and public methods for getters and setters.
- Implement borrowing and returning items through the specified methods.
- When items are borrowed or returned, update their isBorrowed status accordingly.
- Design methods to display both available and borrowed items for reference.
- Test the entire system by simulating interactions using various library items.

===End===