Your name

[Email address]

**Assignment 1**

* 1. **Part 1: Design**

1. **Class** :- LibraryItem *( Represents books, articles, and digital media )*

**Attributes**: itemID, title, author, itemType, isBorrowed

**Methods**: borrowItem(), returnItem(), renewItem()

The LibraryItem class is employed to encapsulate all the resources in the library, such as books, articles, and digital media. Because all these items have similar properties (such as title, author, and availability), it's more convenient to have one class to handle them. The borrowItem(), returnItem(), and renewItem() methods of this class provide the functionality for borrowing, returning, or renewing an item and maintaining its availability.

**Class** :- User (*Abstract base class for different kinds of users*)

**Attributes**: userID, name, borrowedItems

**Methods**: borrowItem(), returnItem(), renewItem()

The User class is utilized as a general template for all users of the library system. Since students and staff members both borrow items, this class provides general functions like borrowing, return, and renewal of items and eliminates redundancy in the code. It maintains that all kinds of users come under one general umbrella while providing an option for different rules for students and staff.

**Class** :- Student (*Inherits from User* )

**Attributes** : maxBorrowLimit = 5, borrowedCount, renewalLimit = 1

**Methods**: borrowItem(), renewItem(), calculateFine()

The Student class is a derived class of the User class. Students have fewer privileges than library staff: they can borrow at most 5 items per trimester and may renew an item only once. If they do not return or renew an item within the deadline, they incur a $5 fee per day. The methods in this class enforce these limits, so students will follow the borrowing rules at the library.

**Class :-** Personnel (*Derives from User*)

**Attributes:** maxBorrowLimit = unlimited, renewalLimit = unlimited

**Methods:** borrowItem(), renewItem()

The Staff class is another version of the User class, but it follows more relaxed rules. Unlike students, staff members can borrow an unlimited number of items and renew them as many times as needed. This class ensures that staff members have more flexibility while still keeping track of their borrowings.

**Class :-** BorrowingRecord

**Attributes:** users, borrowRecords, items

**Methods:** registerUser(), addItem(), borrowItem(), returnItem(), calculateFine()

The BorrowingRecord class is responsible for keeping track of all borrowing activities. Whenever a user borrows an item, a new record is created to store details like the borrow date, due date, and renewal status. This class also helps calculate late return fines by checking if an item is overdue and applying the $5 per day penalty.

|  |  |
| --- | --- |
| **LibraryItem** |  |
| Responsibilities | Store book |
|  | article, and digital media details |
|  | Track availability of items |
|  | Process borrowing, return, and renewal activities. |
| Collaborators | User (to enable borrowing/return) |
|  | BorrowingRecord (to record loan information) |

|  |  |
| --- | --- |
| **Users** |  |
| Responsibilities | Allow borrowing, |
|  | returning, and renewing of materials. |
| Collaborators | LibraryItem (To borrow/return items) |
|  | User (Registers users and processes transactions) |
|  | BorrowingRecord (Keeps user borrowing history) |

|  |  |
| --- | --- |
| **Student** |  |
| Responsibilities | Borrow up to 5 items per trimester. |
|  | Allow only one renewal per item. |
| Collaborators | LibraryItem (To borrow/return items) |
|  | BorrowingRecord (To track borrowing history and calculate fines) |

|  |  |
| --- | --- |
| **Staff** |  |
| Responsibilities | Borrow any number of items. |
|  | Renew items any number of times. |
|  | Borrow items for a year. |
| Collaborators | LibraryItem (To borrow/return items) |
|  | BorrowingRecord (To keep borrowing history) |

|  |  |
| --- | --- |
| **BorrowingRecord** |  |
| Responsibilities | Log borrowed items, due dates, and renewals. |
|  | Determine if an item is overdue. |
|  | Calculate late return charges. |
| Collaborators | User (To track who borrowed the item) |
|  | LibraryItem (To track borrowed items) |

1. 