BACHELOR OF COMPUTER SCIENCE
SCHOOL OF COMPUTER SCIENCE
BINA NUSANTARA UNIVERSITY
JAKARTA

ASSESSMENT FORM

Course: COMP6791051 - Program Design Methods
Method of Assessment: Case Study
Semester/Academic Year : Odd /2022-2023

Name of Lecturer	**: D6672 – Anang Prasetyo**
Date	**: 13 December 2022**
Class	**: LA95, LB95, LC95**
Topic	**: Review Material**

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Class	**LC95**

Student Outcomes:
(SO 1) Able to analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions (SO 2) Able to design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of computer science

Learning Objectives:

(LObj 1.2) Able to apply the principles of computing and other relevant disciplines to identify solutions

(LObj 2.2) Able to implement a computing-based solution to meet a given set of computing requirements in the context of computer science

NO	Learning Outcome	Weight	Key Indicator	Proficiency Level				Score	Weight x Score
				Excellent	Good	Average	Poor		
				(85 - 100)	(75 - 84)	(65 - 74)	(0 - 64)		
1	LO1: Explain the requirements of writing a program or system	15%	The ability to gather the requirements of a program	The requirement gathered are all correct and complete	The requirement gathered are all correct and almost complete	The requirement gathered are partly correct and almost complete	The requirement gathered are incorrect and incomplete		
			The ability to explain the requirements for a program	All of the requirements are explained correctly	Some of the requirements are explained correctly	Some of the requirements are explained partly correct	Some of the requirements are explained incorrectly		
2	LO2: Apply pseudocode to solve problem	30%	The ability to identify the programming problem	At least 90% of the problem is identified correctly	At least 75% of the problem is identified correctly	At least 60% of the problem is identified correctly	Less than 60% of the problem is identified correctly		
			The ability to apply pseudocode to solve the programing probem	The pseudocode written solves at least 90% of the programming problem	The pseudocode written solves at least 75% of the programming problem	The pseudocode written solves at least 60% of the programming problem	The pseudocode written solves less than 60% of the programming problem		
3	LO3: Analyze the requirements of a system	25%	The ability to collect the requirements for a system	All of the requirement of a system is collected	Some of the requirement of a system is collected	A few of the requirement of a system is collected	The requirement of a system is not collected		
			The ablity to analyze the collected requirements in order to solve the system	All of the requirements are analyzed correctly	Some of the requirements are analyzed correctly	Some of the requirements analyzed are partly correct	The requirements are analyzed incorrectly		
4	LO4: Solve system design problems using UML	30%	The ability to design a system using UML Structural Modeling	The ability to design at least 90% correct using Structural Model1	The ability to design at least 75% correct using Structural Model	The ability to design at least 60% correct using Structural Model	The ability to design less than 60% correct using Structural Model		
			The abllity to design a system using UML Behavioral Modeling	The ability to design at least 90% correct using behavioral Modeling	The ability to design at least 90% correct using behavioral Modeling	The ability to design at least 90% correct using behavioral Modeling	The ability to design at least 90% correct using behavioral Modeling		

Remarks:

Case study is a personal work

ASSESSMENT METHOD

Instructions

The library is one of the most important parts of the Binus @Semarang Campus, the library is a place for students to look for study references, discussions, or just read books. As a programmer, you are asked to help the library section to develop a library system with the following criteria:

- The system must include features for borrowing books, returning books, searching for books, managing book stock
- The system can also calculate penalties if students are late in returning books

To build a library system, first make some of the things needed below:

a. Make a **pseudocode / flowchart (choose one),** the features for borrowing books and returning books
b. Write down the **functional and non-functional requirements** for the case above
c. Make a **use case diagram** for the library system
d. Make a **class diagram** of the case above

Final Output

Format :

- Personal Assignment (**Please use application tools for creating any diagrams for this assignment**).
- Format file please export to **pdf format**.

Due Date : Submit this final assignment in week 13

a. PSEUDOCODE

```
Struct Book(
  integer id
  string title
  string author
  string subject
  integer stock
)
Struct Loan(
  integer id
  integer book_id
  integer student_id
  time_t due_date
  real late_fee
)
Struct User(
  int id
  string name
  string email
  string address
)
Declare integer num_books
Set num_books = 0
Struct Book as array books
Declare integer num_loans
Set num_loans = 0
Struct Loan as array loans
Declare integer num_users
Set num_students = 0
Struct Student as array students

Module loadData()
Declare InputFile book_file
Open book_file “Books.txt”
 If book_file == NULL then if (book_file == NULL)
 Display “Error opening Books file (Books file doesn’t exist)” printf("Error opening books file\n");
 Return            //When the return statement is executed, control is returned to the calling module, and any subsequent statements in the
                   loadData() module are not executed
 End if
 While not EOF (book_file)
    Read book_file books[num_books].id, books[num_books].title, books[num_books].author, books[num_books].subject,
    books[num_books].stock
    Set num_books++
 **End while**
**Close book_file**

**Declare InputFile loan_file**
**Open loan_file "Loans.txt"**
 **If loan_file == NULL then** if (loan_file == NULL)
 Display "Error opening Loans file (Loans file doesn't exist)"    printf("Error opening loans file\n");
 Return           //When the return statement is executed, control is returned to the calling module, and any subsequent statements in the
                  loadData() module are not executed
  **End if**
  **While not EOF (loan_file)**
    Read loan_file loans[num_loans].id, loans[num_loans].book_id, loans[num_loans].student_id, loans[num_loans].due_date,
    loans[num_loans].late_fee
    Set num_loans++
 **End while**
**Close loan_file**

**Declare InputFile student_file**
**Open student_file "Students.txt"**
 **If student_file == NULL then**
 Display "Error opening Students file (Students file doesn't exist)"
 Return           //When the return statement is executed, control is returned to the calling module, and any subsequent statements in the
                  loadData() module are not executed
 **End if**
 While not EOF (student_file)
     Read student_file students[num_students].id, students[num_students].name, students[num_students].email,
     students[num_students].address
     Set num_students++
 End while
Close student_file
End module

Module saveData()
Declare integer i
Declare OutputFile book_file
Open book_file "Books.txt"
 For i:=0 to num_books
     Write book_file books[i].id, books[i].title, books[i].author, books[i].subject, books[i].stock
 End for
Close book_file

Declare OutputFile loan_file
Open loan_file "Loans.txt"
 For i:=0 to num_loans
     Write loan_file loans[num_loans].id, loans[num_loans].book_id, loans[num_loans].student_id, loans[num_loans].due_date,
     loans[num_loans].late_fee
 End for
Close loan_file

Declare OutputFile student_file
```

```
Open student_file “Students.txt”
 For i:=0 to num_students
     Write student_file students[i].id, students[i].name, students[i].email, students[i].address
 End for
Close student_file
End module

Module borrowBook()
Declare integer book_id, student_id, i
Display “Enter the Book ID”
Input book_id
Display “Enter the Student ID: ”
Input student_id

  // Check if book is in stock
Declare  integer book_index
Set book_index = -1
For i:=0 to num_books  for (int i = 0; i < num_books; i++)
 If books[i].id == book_id then
 Set book_index = i
 Break
 End if
End for
If book_index == -1 then
Display “Book not found”
```

```
Return              //When the return statement is executed, control is returned to the calling module, and any subsequent statements in the
                    borrowBook() module are not executed
End if
If books[book_index].stock == 0 then
Display “Book is not in stock”
Return              //When the return statement is executed, control is returned to the calling module, and any subsequent statements in the
                    borrowBook() module are not executed
End if

 // Check if user exists
Declare  integer student_index
Set student_index = -1
For i:=0 to num_students  for (int i = 0; i < num_students; i++)
If students[i].id == student_id then
Set student_index = i
Break
End if
End for
If student_index == -1 then
Display “Student not found”
Return              //When the return statement is executed, control is returned to the calling module, and any subsequent statements in the
                    borrowBook() module are not executed
End if

 // Update book stock
```

```
Set books[book_index].stock--
  // Create new loan
Struct Loan as loan
Set loan.id = num_loans + 1
Set loan.book_id = book_id
Set loan.student_id = student_id
Set time_t current_time = time(NULL)
Set loan.due_date = current_time + 14 * 24 * 60 * 60
Set loan.late_fee = 0
Set loans[num_loans] = loan
Set num_loans++
Display "Book borrowed succesfully"
End module

Module returnBook()
Declare integer book_id, student_id, i
Display "Enter the Book ID: "
Input book_id
Display "Enter the Student ID: "
Input student_id

  // Find loan
Declare integer loan_index
Set loan_index = -1
For i:=0 to num_loans  for (int i = 0; i < num_loans; i++) {
 If loans[i].book_id == book_id AND loans[i].student_id == student_id then
 Set loan_index = i
 Break
 End if
End for
If loan_index == -1 then  if (loan_index == -1)
Display "Loan not found"
Return          //When the return statement is executed, control is returned to the calling module, and any subsequent statements in the
                returnBook() module are not executed
End if

  // Find book
Declare integer book_index
Set book_index = -1
For i:= 0 to num_books
 If books[i].id == book_id then
 Set book_index = i
 Break
 End if
End for
If book_index == -1 then
Display "Book not found"
Return          //When the return statement is executed, control is returned to the calling module, and any subsequent statements in the
                returnBook() module are not executed
End if
```

```
  // Update book stock
Set books[book_index].stock++

  // Check if the book was returned late
Set time_t current_time = time(NULL)
If current_time > loans[loan_index].due_date then
Set loans[loan_index].late_fee = (current_time - loans[loan_index].due_date) / (24 * 60 * 60) * 100; // Late fee is $1 per day
Display "Book was returned late. The late fee is $loans[loan_index].late_fee/100"
Else
Display "Book returned succesfully"
End if

  // Remove loan
For i:= loan_index to num_loans   for (int i = loan_index; i < num_loans - 1; i++) {
 Set loans[i] = loans[i+1]
End for
Set num_loans--;
End module

Module main()
Call loadData()
Declare integer choice
While choice not 5
 Display "BINUS @SEMARANG LIBRARY"
 Display "1. Borrow Book"
 Display "2. Return Book"
 Display "3. Search for Book"
 Display "4. Manage Book Stock"
 Display "5. Exit"
 Display "Enter Choice: "
 Input choice
    Select choice
     Case 1:
       Call borrowBook()
       Break
     Case 2:
       Call returnBook()
       Break
     Case 3:    //Here I do not make pseudocode for cases 3 and 4 because the instructions given are only cases other than 3 and 4 ( 1 and 2)
     Case 4:    //Here I do not make pseudocode for cases 3 and 4 because the instructions given are only cases other than 3 and 4 ( 1 and 2)
     Case 5:
       Call saveData()
      Display "Exit…"
       Break
     Default:
       Display "Invalid choice, please input the valid seletion"
       Break
 End select
End while
End module
```

b. Functional and Nonfunctional Requirements

Functional Requirements

1. **Borrow Books**

   1.1. Ability to borrow books by logging in with a student ID and selecting a book from the available stock.

2. **Return Books**

   2.1. Ability to return books by logging in with a student ID and selecting a book from the list of borrowed books.

   2.2. Ability to calculate penalties for late book returns by comparing the return date with the due date

3. **Search Books**

   3.1. Ability to search for books by title, author, or subject.

4. **Manage Books**

   4.1. Ability to manage book stock by adding new books, editing book information, and deleting books.

Nonfunctional Requirements

1. **Usability Requirements**

   1.1. The system should have a user-friendly interface with intuitive navigation and simple search capabilities.

2. **Maintenance Requirements**

   2.1. The system should be easy to maintain and update as needed.

3. **Security Requirements**

   3.1. The system should ensure the security and privacy of student and book information.

4. **Scalability Requirements**

   4.1. The system should be able to accommodate an increase in the number of books and students in the future.

5. **Integration Requirements**

   5.1. The system should be able to integrate with existing library systems and other university systems, such as student information systems.

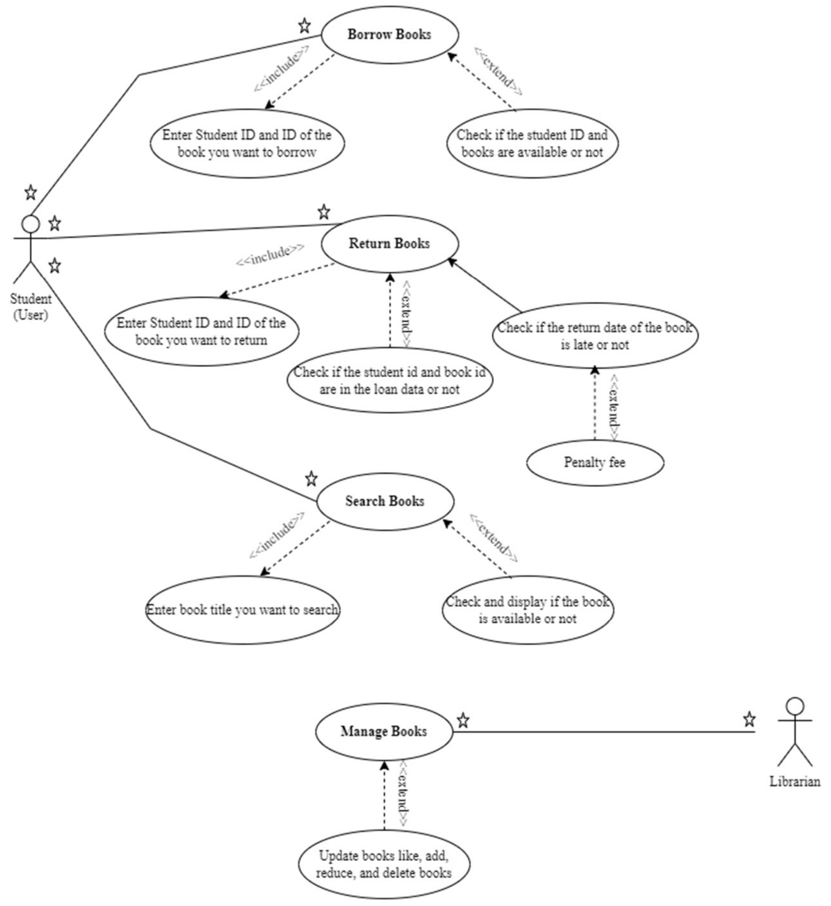
6. **Performance Requirements**

The system must efficiently complete tasks without causing delays for the user.

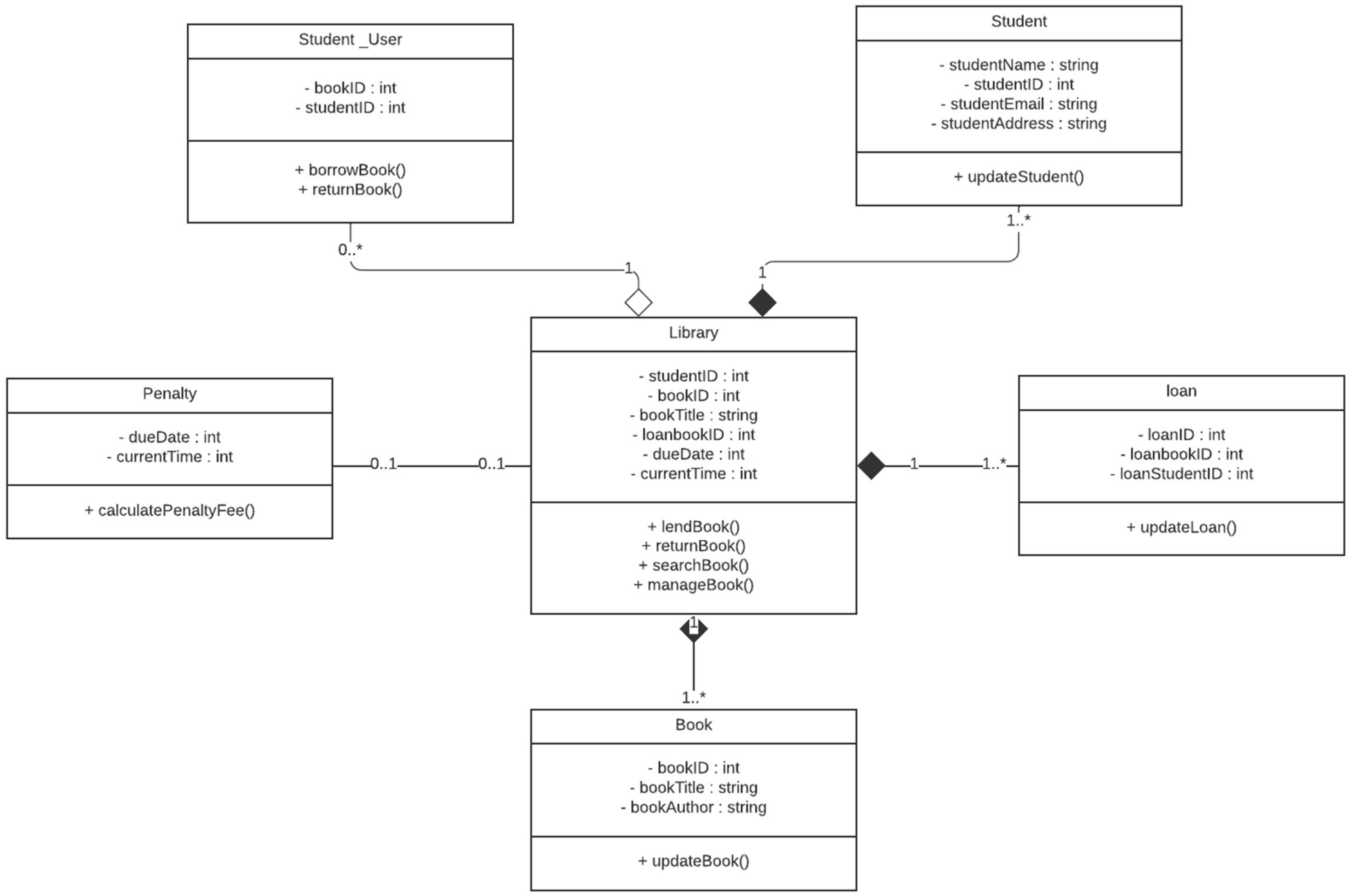
7. **Compatibility Requirements**

   The system should be able to function on a variety of devices and operating systems.

c. Use Case Diagram


Borrow Books
<<include>>
<<extend>>
Enter Student ID and ID of the book you want to borrow
Check if the student ID and books are available or not
Student (User)
Return Books
<<include>>
<<extend>>
Enter Student ID and ID of the book you want to return
Check if the student id and book id are in the loan data or not
Check if the return date of the book is late or not
<<extend>>
Penalty fee
Search Books
<<include>>
<<extend>>
Enter book title you want to search
Check and display if the book is available or not
Manage Books
<<extend>>
Update books like, add, reduce, and delete books
Librarian

d. Class Diagram


Student _User
- bookID : int
- studentID : int
+ borrowBook()
+ returnBook()
Student
- studentName : string
- studentID : int
- studentEmail : string
- studentAddress : string
+ updateStudent()
0..*
1
1..*
1
Library
- studentID : int
- bookID : int
- bookTitle : string
- loanbookID : int
- dueDate : int
- currentTime : int
+ lendBook()
+ returnBook()
+ searchBook()
+ manageBook()
Penalty
- dueDate : int
- currentTime : int
+ calculatePenaltyFee()
0..1
0..1
loan
- loanID : int
- loanbookID : int
- loanStudentID : int
+ updateLoan()
1
1..*
1
1..*
Book
- bookID : int
- bookTitle : string
- bookAuthor : string
+ updateBook()