1. Git

I have used git to upload all the relevant files of the project. First I uploaded a readme which includes the details of the project then uploaded the java files the src files nd the test files on git. During this phase I have learned about different git commands like git init to create the new repo. To add the files on github I have learned that we can use git add –all command. Similarly to commit the changes made in the repo we can use git commit command with various arguments like -a to commit all changes, -m to commit with a message etc. I have learned that we can also push a local repo content on a git repo with the help of git push command. A big benefit of Github is that we can create branches with it. Essentially, git branches are a reference to a copy of your modifications. No matter how big or tiny the bug, if you intend to add a new feature or correct one, you create a new branch to contain your changes. Branching makes it easier to create bug fixes, add new features, and integrate new versions once they have been through isolation testing. To create a new branch we can use git branch <branch name> command.

2. UML

UML is a standard language for better understanding the project visually. For visualizing and describing software systems, UML is quite helpful. I have developed three diagrams of the project which includes the project use case diagram, activity diagram, and class diagram. Structure diagrams, interaction diagrams, and behavior diagrams are only a few of the subsets of diagrams included in the Unified Modeling Language. Activity diagrams are regarded as behavior diagrams since they specify what must occur in the system being represented, along with use case and state machine diagrams. An essential UML diagram for describing the system's dynamic elements is the activity diagram. An activity diagram is essentially a flowchart that shows how one activity leads to another. The action might be referred to as a system operation. One operation leads to the next in the control flow. This flow may be parallel, contemporaneous, or branched. Activity diagrams use many features, such as fork, join, etc., to cope with all types of flow control. An activity is a specific system function. Activity diagrams are used to build the executable system utilizing forward and reverse engineering approaches, as well as to visualize the dynamic nature of a system. The message portion is the only item the activity diagram is missing. No message flow from one activity to another is shown. Occasionally, an activity diagram is used in place of a flowchart. The diagrams are not flowcharts, despite their appearance. It displays various flows, including single, parallel, branching, and concurrent flows. Use-case diagrams aid in capturing system requirements and depict a system's behavior in UML. The scope and high-level functions of a system are described in use-case diagrams. The interactions between both the system and its users are also depicted in these diagrams. Utilize-case diagrams show what the system does and how the users use it, but they do not show how the system works within. The context and requirements of either the complete system or the key components of the system are illustrated and defined through use-case diagrams. A complicated system can be represented by a simple use-case diagram, or its various components can be represented by a number of use-case diagrams. The basic edifice of object-oriented modeling is the class diagram. It is used for detailed modeling, which converts the models into computer code, as well as for general conceptual modeling of the application's structure. Data modeling can also employ class diagrams.

The link to my uml diagrams is: https://github.com/WinterASE2022-23/LibraryManagementSystem/tree/main/LibraryManagamentSystem-main/images/UML

3. DDD

The domain, or area of expertise, of individuals who will utilize it is at the center of the domain-driven design (DDD) software development concept. The method makes it possible to design software that is concentrated on the intricate needs of those who need it and doesn't waste time on anything unnecessary. It is a set of guidelines and patterns that aid designers in creating beautiful object systems. When used correctly, it can result in software abstractions known as domain models. These models bridge the gap between business fundamentals and code by encapsulating intricate business logic. During this project, It helped me in developing an approach which lead to abstraction of the project. It helped in understanding the business logic and bridge the gap between reality and code. It is used to ease the development of my project. I have created and added the DDD in my readme file in git. The link to file is: https://github.com/WinterASE2022-23/LibraryManagementSystem/blob/main/README.md

4. METRICES

Software metrics are measurements of quantifiable or countable software attributes. Measuring software performance, organizing tasks, gauging productivity, and many more purposes make software metrics crucial. Metrices are also included in the readme files. The two metrices I have chosen are complexity and security of the system. I have utilized the SonarQube metrices. Cyclomatic complexity, a quantitative metric used to determine the number of paths through the code, is referred to as complexity. The complexity counter is increased by one each time a function's control flow divides into two separate directions. Each function has a complexity that is at least 1. Because keywords and functionalities differ between languages, this computation differs a little bit. Metrics for software product security Give a numerical evaluation of the level of software system trustworthiness.

5. CLEAN CODE DEVELOPMENT

I have utilized the clean code development approach for writing the code. I would like to highlight the points that I have used for clean code development.

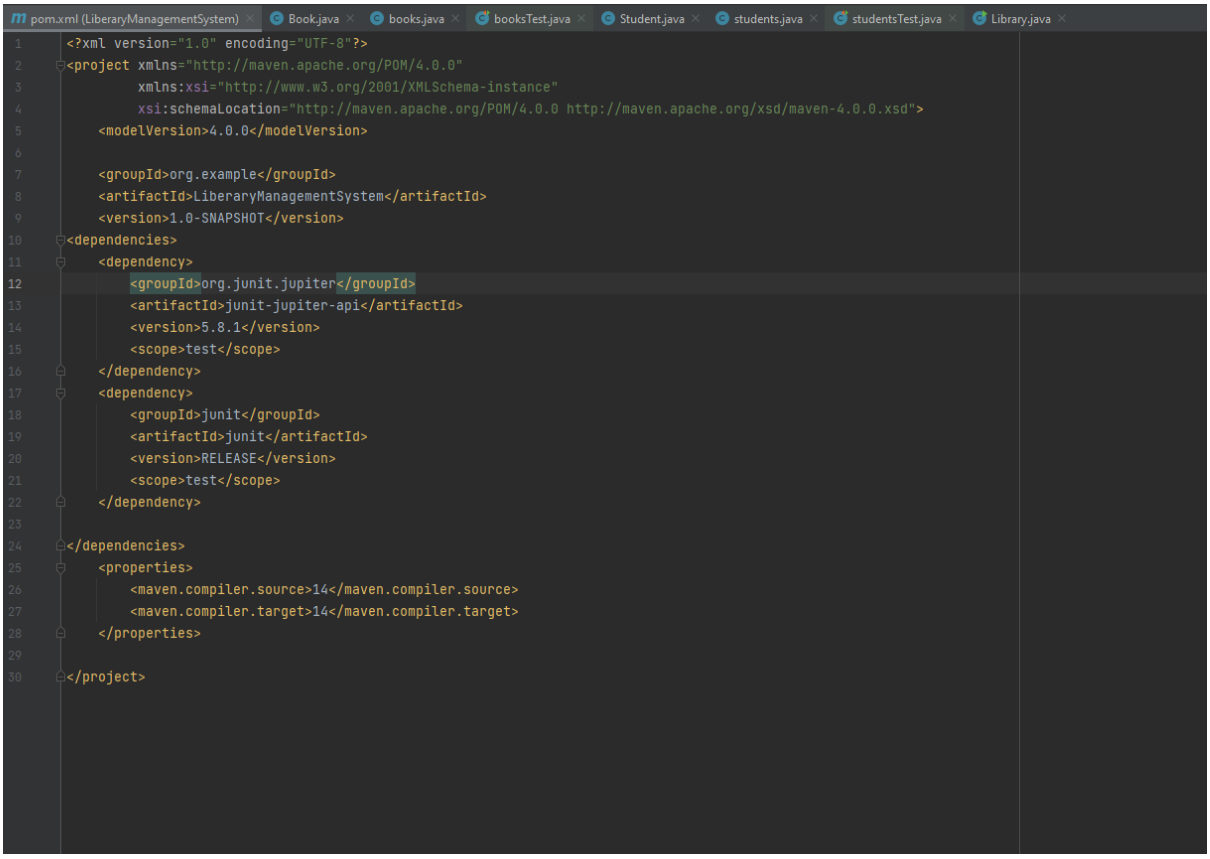
1. Build requires only one step. With just one click the project is build successfully.
2. Tests are also executed with just one step.
3. Naming conventions for methods, classes and variables are followed.
4. Good commenting can be found in my code.
5. Each Method does only one thing in my code.
6. My code is consistent.
7. Names are descriptive in my code.
8. My code is simple (KISS) followed

Link to my CCD cheat sheat:

https://github.com/WinterASE2022-23/LibraryManagementSystem/tree/main/LibraryManagamentSystem-main/CCD

6. BUILD

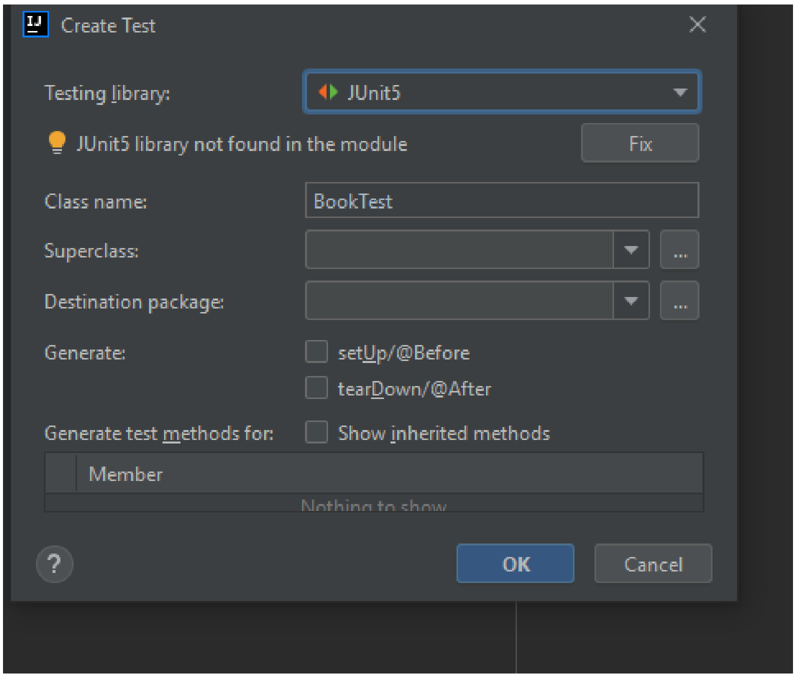
I have used maven for my project build. It is an open source automation tool that can be used for complete build lifecycle. The Apache Group created the well-known open-source build tool Maven to build, publish, and deploy several projects simultaneously for better project management. Developers can create and document the lifecycle framework using the provided tool. Maven does numerous helpful tasks, like Maven makes it simple to develop a project. With the aid of maven, adding jars and other project dependencies is simple. Maven offers project details (log document, dependency list, unit test reports etc.) When upgrading the central repository of JARs and other dependencies, Maven is very beneficial to a project. With the help of Maven we can build any number of projects into output types like the JAR, WAR etc without doing any scripting. We can easily integrate our project with a source control system using maven (such as Subversion or Git).



```xml
<?xml version="1.0" encoding="UTF-8"?>
<project xmlns="http://maven.apache.org/POM/4.0.0"
         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
         xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/xsd/maven-4.0.0.xsd">
    <modelVersion>4.0.0</modelVersion>

    <groupId>org.example</groupId>
    <artifactId>LiberaryManagementSystem</artifactId>
    <version>1.0-SNAPSHOT</version>
<dependencies>
    <dependency>
        <groupId>org.junit.jupiter</groupId>
        <artifactId>junit-jupiter-api</artifactId>
        <version>5.8.1</version>
        <scope>test</scope>
    </dependency>
    <dependency>
        <groupId>junit</groupId>
        <artifactId>junit</artifactId>
        <version>RELEASE</version>
        <scope>test</scope>
    </dependency>

</dependencies>
    <properties>
        <maven.compiler.source>14</maven.compiler.source>
        <maven.compiler.target>14</maven.compiler.target>
    </properties>

</project>
```

7. UNIT TESTS

Software testing with a focus on individual software system units or components is known as unit testing. Unit testing checks that each piece of software operates as intended and complies with specifications. Each time the code is modified, unit tests are automatically run to make sure that the new code won't break any functionality already in place. A function or method, for example, can be tested independently from the rest of the system using unit tests, which are created to check the smallest possible unit of code. As a result, early on in the development process, developers may immediately discover and address any errors, enhancing the software's overall quality and cutting down on the time needed for testing. I have created and upload test files on git. I have used Junit5 library in IntelliJ to create test cases for different methods in different classes of my code.



Testing library: JUnit5

JUnit5 library not found in the module

Class name: BookTest

Superclass:

Destination package:

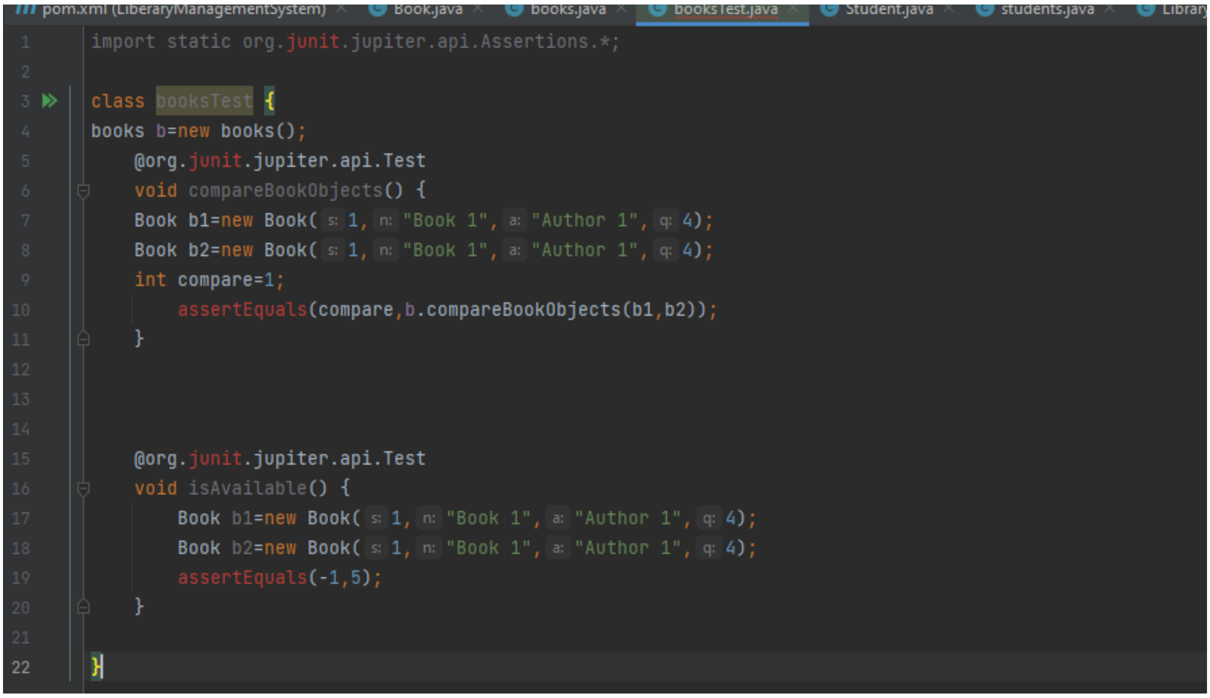
Generate: □ setUp/@Before

□ tearDown/@After

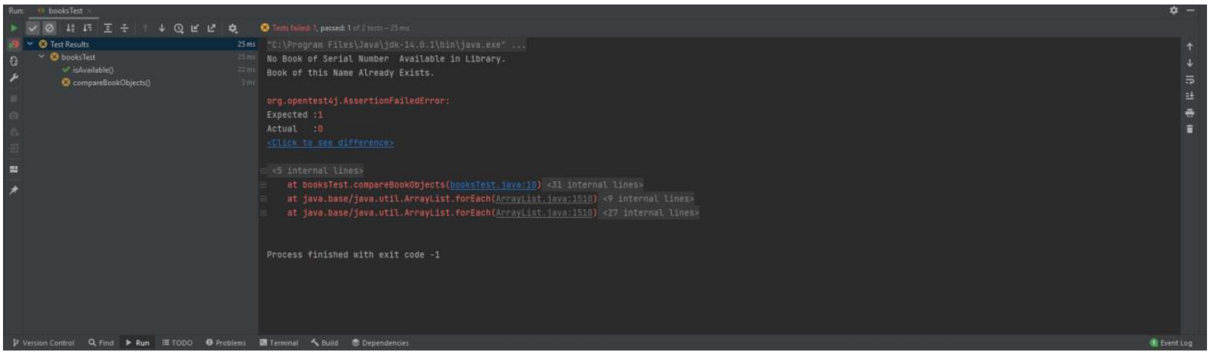
Generate test methods for: □ Show inherited methods

Member

Nothing to show



```
import static org.junit.jupiter.api.Assertions.*;

class booksTest {
books b=new books();
    @org.junit.jupiter.api.Test
    void compareBookObjects() {
    Book b1=new Book( s: 1, n: "Book 1", a: "Author 1", q: 4);
    Book b2=new Book( s: 1, n: "Book 1", a: "Author 1", q: 4);
    int compare=1;
        assertEquals(compare,b.compareBookObjects(b1,b2));
    }



    @org.junit.jupiter.api.Test
    void isAvailable() {
        Book b1=new Book( s: 1, n: "Book 1", a: "Author 1", q: 4);
        Book b2=new Book( s: 1, n: "Book 1", a: "Author 1", q: 4);
        assertEquals(-1,5);
    }

}
```



Tests failed: 1, passed: 1 of 2 tests – 25 ms

```
"C:\Program Files\Java\jdk-14.0.1\bin\java.exe" ...
No Book of Serial Number  Available in Library.
Book of this Name Already Exists.

org.opentest4j.AssertionFailedError: 
Expected :1
Actual   :0
<Click to see difference>

<5 internal lines>
    at booksTest.compareBookObjects(booksTest.java:10) <31 internal lines>
    at java.base/java.util.ArrayList.forEach(ArrayList.java:1510) <9 internal lines>
    at java.base/java.util.ArrayList.forEach(ArrayList.java:1510) <27 internal lines>


Process finished with exit code -1
```

URL for test files: https://github.com/WinterASE2022-23/LibraryManagementSystem/tree/main/LibraryManagamentSystem-main/liberaryManagment/src/test/java

8. CONTINOUS DELIVERY

Continuous delivery is a software development practice where code changes are automatically prepared for a release to production. Git action is used for continuous delivery of the project. Teams can dependably release their software at any moment by working in short cycles. Development teams can create, test, and distribute software more quickly and frequently with CD. They can consequently cut back on time, money, and risk when implementing each modification. Continuous delivery requires a reproducible deployment methodology. According to TechTarget, "developers frequently send off new code to the quality assurance (QA) and operations teams for testing" in continuous delivery, which can be seen as an extension of continuous integration. Continuous delivery, also known as CI/CD, is the second component of continuous integration that enables application development teams to quickly and frequently push incremental code updates to production. It is the automation to speed up the release of new code. It pushes the changes made into code to repository or container registry. The link to git actions for the project is: https://github.com/WinterASE2022-23/LibraryManagementSystem/tree/main/.github/workflows

9. IDE

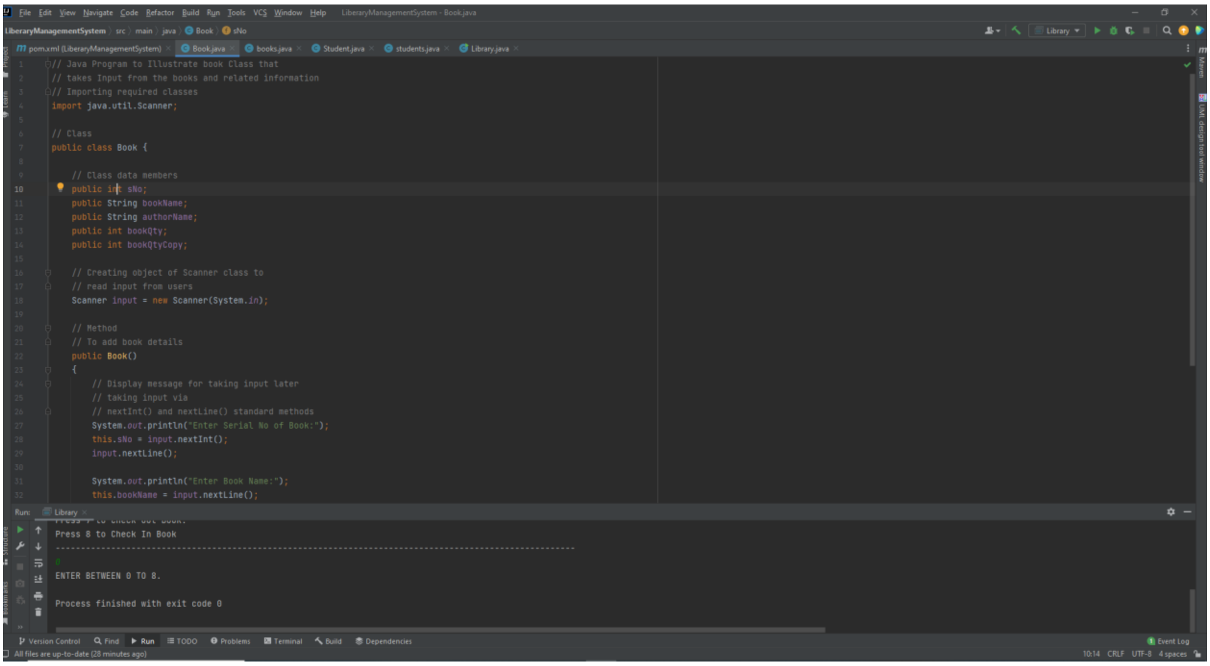
I have used IntelliJ for my project development. It is a very simple and easy IDE to use. I like working in it. I have created my project using maven on IntelliJ. The shortcuts I like in IntelliJ are following:

Shift+F2   navigate between different issues in code

Ctrl+Alt+L Reformat code

Ctrl+/ add a block comment

Alt+1 focus on tools of project


File Edit View Navigate Code Refactor Build Run Tools VCS Window Help
LiberaryManagementSystem - Book.java
LiberaryManagementSystem 〉 src 〉 main 〉 java 〉 Book 〉 sNo
pom.xml (LiberaryManagementSystem)
Book.java
books.java
Student.java
students.java
Library.java
Library
Run:
Version Control
Find
Run
TODO
Problems
Terminal
Build
Dependencies
Event Log
10:14 CRLF UTF-8 4 spaces

```java
// Java Program to Illustrate book Class that
// takes Input from the books and related information
// Importing required classes
import java.util.Scanner;

// Class
public class Book {

    // Class data members
    public int sNo;
    public String bookName;
    public String authorName;
    public int bookQty;
    public int bookQtyCopy;

    // Creating object of Scanner class to
    // read input from users
    Scanner input = new Scanner(System.in);

    // Method
    // To add book details
    public Book()
    {
        // Display message for taking input later
        // taking input via
        // nextInt() and nextLine() standard methods
        System.out.println("Enter Serial No of Book:");
        this.sNo = input.nextInt();
        input.nextLine();

        System.out.println("Enter Book Name:");
        this.bookName = input.nextLine();
```

```
Press 8 to Check In Book
-------------------------------------------------------------------------------------
0
ENTER BETWEEN 0 TO 8.

Process finished with exit code 0
```

All files are up-to-date (28 minutes ago)

10. DSL

A programming language with such a higher level of abstraction that is tailored for a particular class of issues is known as a domain specific language. The ideas and regulations in the field or domain are used by a DSL. The complexity of a domain-specific language is typically lower than that of a general-purpose language like Java, C, or Ruby. DSLs are typically developed in close collaboration with the subject matter experts for the field for which they are being designed. DSLs are frequently designed to be utilized by persons who aren't software developers but are experts in the field the DSL handles. The use of DSLs has a lot of advantages. The most immediately apparent advantage of adopting DSLs is that, once you have a language and a transformation engine, your work in the specific area of software development covered by the DSL becomes considerably more efficient because you don't have to perform the tedious tasks by hand. You can employ excellent, domain-specific abstractions without incurring any runtime complexity if you create source code from your DSL program (as opposed to reading it), as the generator, like a compiler, can remove the abstractions and generate efficient code. The demo DSL code is not related to my project but I have added the demo at the following links: https://github.com/WinterASE2022-23/LibraryManagementSystem/tree/main/LibraryManagamentSystem-main/DSL

11. FUNCITONAL PROGRAMMING

The organization of code is based on functions, which are present in all higher level programming languages. Functional programming, in general, refers to the optimum use of functions for producing orderly and maintainable software. More specifically, functional programming refers to a group of coding methods that are frequently referred to as a programming paradigm. Although it has been a trend in software development since the beginning, functional programming has gained new significance in the contemporary period. I have utilized functional programming in my code which can be seen in different methods, and different points in my code which is uploaded on git.

The link to source code: https://github.com/WinterASE2022-23/LibraryManagementSystem/tree/main/LibraryManagamentSystem-main/liberaryManagment/src/main/java