Thakur Educational Trust's (Regd.)
THAKUR COLLEGE OF SCIENCE & COMMERCE
UGC Recognized * Affiliated to University of Mumbai
(NAAC Accredited with Grade 'A' [CPGA-3.10] * ISO 9001:2008)

A Project Report On

Library Management System in C++

Submitted by

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2019-2020

Under the guidance of

Mr. Abhijeet Pawaskar

Submitted in partial fulfilment of requirement for

Qualifying B.Sc. (I.T) Semester-VI Examination

Thakur College of Science and Commerce,

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Mumbai - 400101

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Project Certificate

This is to verify that the project titled **"Library Management System in C++"** is undertaken at the "**Thakur College of Science and Commerce**" by **Mr. Roshan Yadav, Roll Number – 19401** & **Mr. Dharmesh Mishra, Roll Number – 19464** in partial fulfilment of B.Sc. (IT) degree (Semester VI) Examination had not been submitted yet for our other examination and does not form part of any other course undergone by the candidates.

It is further certified that the candidates has completed all required phases of the project.

_____ _____

External Examiner Internal Examiner

_____ _____

Project Guide Head of Department

Acknowledgement

Before we begin discussing the minute details of the project, we would take the opportunity to thank some individuals for their unnerving support. This support carried from the day we undertook the project to its termination. First and foremost, we would like to express our gratitude to our respected Head of Department **Dr.Santosh Singh** for his support, encouragement and guidance, without which the successful completion of this project wouldn't have been possible.

Secondly, we are very thankful to our internal guide **Mr.Abhijeet Pawaskar** for his guidance and help for the conception of the idea of the project and support during the project. We would also thank our colleagues for giving their helping hand.

Also thanking to teaching and non-teaching staff that never hesitated to sort our problems and our confusion and always present to help us in the lab and arrange for the necessary requirements for the successful completion of project.

It was because of the support provided by the above individualistic groups that the project was comprehensively completed.

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Abstract

Library Management System is a project which aims in developing a computerized system to maintain all the daily works of a library. The project is developed in C++ language, which mainly focuses on the operations of library like addition, deletion and modification of books and students and their details, search books, issue books, return books, demand books and fine calculations. The system can generate reports based on the number of books issued, number of books added, number of students added, etc. Librarian is the admin of the system and monitors the whole activities of the system. Students can perform operation like search books and demand books. Students have to pay fine if they fail to return the books on time that has been borrowed by them.

Overall this project is being developed to help librarian as well as students to maintain library in the best possible way and also reduces the human efforts required in maintenance of library records.

Introduction

The Library Management System deals with managements of books and their records. These records include books that are issued, classification of books, new books required by the students and more. Maintaining such records manually may become a difficult task, so we are providing a system which can hold the necessary records. The system will be an application which will assist the librarian for managing a book library.

A library in simple terms is the collection of books and sources of information made accessible to people for borrowing and reference purposes. It's a storehouse of books. The collection of library may include books, manuscripts, magazines, periodicals, and various other formats. Wide range of books are stored in a library and they are well organised in book shelves. But keeping track of all the books and the records of those books manually on paper can be a difficult and hectic task. It can also be error prone. It also is very inefficient and a time consuming process considering the currently increasing population and mainly the increase in number of people visiting the libraries. Recording and maintaining these records in a library are highly unreliable, inefficient and error prone task. Also it is not economically and technically feasible to maintain these records on paper.

To overcome all the mentioned problems, a Library Management System is being designed. The System will provide the basic set of features such as add/update/delete members i.e. students, add/update/delete books, classification of books based on its category , searching of books , fine charge on late return and much more. This project of Library Management System gives us the complete information about the library. The librarian is the administrator of the system. So he can enter records of new books, retrieve the details of the books available in the library. He can issue books to the students and maintain their records. He can also check how much books are issued to the students and the stock of books available in the library. We can also maintain the late fine of students those who return the issued books after the due date. The system will help in classification of the books which can otherwise be a messed work. It is extremely useful for monitoring and controlling the transactions in a Library. The system can generate reports based on the summary of the books issued, returned, etc. Throughout the project the focus has been on presenting the information and data in an easy and simple manner and make it more useful and user friendly.

This computerized system will help the librarian to manage the library's daily activities in an electronic format. It reduces the risk of paper work such as files lost, files damaged, and other time consuming processes. The system will provide improvement in control and performance. It is developed to cope up with the current issues and problems of a typical library. It will prove to be time and cost efficient as less human work is required. The various modules included in the system will help to keep track of students using the library and also a detailed description about the books in the library.

With the system being computerized, chances of loss of book records or student's records are quite less which may generally happen when a non-computerized system is used.

So a Library Management System can significantly reduce the workload of managing a big Library. In Earlier Systems, when transactions of books were done manually, more time was taken for any transaction like borrowing a book or returning a book and also searching for books or students. Another major disadvantage was that to prepare the list of books borrowed and available books in the Library. It would be a really long process to verify all these records. So having a computerized system would be a huge help for the librarian as well as the students to do their required tasks in a much quicker way.

All the mentioned features will help the librarian to manage the library with more convenience and in a more efficient way when compared to library systems which are not computerized.

Objective and Scope

OBJECTIVE:

The objectives of the Library Management System are as follows;

- The Main objective of the system is to handle the entire activities happening inside a library.
- To automate the existing systems of manually maintaining the records of all the books in a library.
- To maintain and keep a track of all the books in the library and their complete details.
- To classify books in a logical order according to the department of the books for easy maintenance and searching.
- To provide various search options to know about the availability of the books in the library.
- To provide data about the books which are lost.
- To order new books as per the requirements of the students.
- To provide a database where all the information about the books and students will be stored safely.
- To Simply things such as searching of books.
- To make things easy for the librarian with respect to time as well as efforts taken.
- To collect fine from the students if the book is not returned on the due date provided.
- To provide a user friendly interface which will be less error prone when compared to non-computerized systems.
- To perform various operations such as add, update or delete books from the system.

SCOPE:

The software can be used in any educational institutes for supervising and managing the transactions occurring in a library. Usage of this software will help in maintaining the records of books in the library and make it a lot easier. The system can be used by any library to automate the process of manually maintaining the records related to the subject of maintaining the books and their details. Making the system automated will not only help in the librarian but also the students in searching the books . The software can also be used in offices and modifications can be done accordingly based on the requirements of the institute.

However, there are some limitations of using an automated system like this too. The system cannot provide any type of library card. Library management system having a really large library may be a bit difficult to update. Also, if the software gets corrupted by any chance, the entire data may get collapsed. The system may also be prone to cyber hacks. Also, the use of this software requires a knowledgeable person to use the system.

Theoretical Background

Library management system is used by librarians to manage the library using a computerized system where he or she can record various transactions like issue of books, addition of new books, order new books, addition, updating and deletion of students, etc.

System is developed in C++ language. C++ is flexible, structured programming language. It is widely available. C++ includes certain low level features that are normally available only in assembly or machine language. It is basically an object oriented programming language which is an extension of the C programming language. C++ has always been found useful in many contexts with key strengths being software infrastructure and resource constrained applications including desktop applications. C++ inherits most of the C language's syntax.

File handling is used as the back end. Files are used to store data in a storage device permanently. File handling provides a mechanism to store the output of the program in a file, retrieve the data of the file and perform various operations on the data of the file.

The system is developed in Turbo C++ platform. Turbo C++ is a discontinued C++ compiler and integrated development environment originally from Borland. It was designed as a home and hobbyist counterpart for Borland C++. As the developers focused more on professional tools, later Turbo C++ products were made as scaled down versions of its professional compilers.

The first release of Turbo C++ was made available during the MS-DOS era on personal computers. Version 1.0, running on MS-DOS, was released in May 1990. An OS/2 version was produced as well. Version 1.01 was released on February 28, 1991, running on MS-DOS. The latter was able to generate both COM and EXE programs and was shipped with Borland's Turbo Assembler compiler for Intel x86 processors. The initial version of the Turbo C++ compiler was based on a front end developed by TauMetric (TauMetric was later acquired by Sun Microsystems and their front end was incorporated in Sun C++ 4.0, which shipped in 1994). This compiler supported the AT&T 2.0 release of C++.

Turbo C++ 2006

It is a single language version of Borland Developer Studio 2006 for C++ language, originally announced in 2006-08-06, and was released later on 2006-09-05 the same year with Turbo Explorer and Turbo Professional editions. The Explorer edition was free to download and distribute while the Professional edition was a commercial product.

In October 2009 Embarcadero Technologies discontinued support of all Turbo C++ 2006 editions. As such, the Explorer edition is no longer available for download and the Professional edition is no longer available for purchase from Embarcadero Technologies. Turbo C++ 2006 was succeeded by C++Builder 2007 before Embarcadero's acquisition of Codegear and dropping support, and official Turbo C++ 2006 page was later redirect visitor to C++Builder 2010.

The software uses array, pointers, dynamic memory, recursion, file handling to manage the entire library data like as Modification, delete data from Library, add new data in the Library, etc.

An array in C or C++ is a collection of items stored at contiguous memory locations and elements can be accessed randomly using indices of an array. They are used to store similar type of elements as in the data type must be the same for all elements. They can be used to store collection of primitive data types such as int, float, double, char, etc of any particular type. To add to it, an array in C or C++ can store derived data types such as the structures, pointers etc. Given below is the picturesque representation of an array.

Pointer is a variable in C++ that holds the address of another variable. They have data type just like variables, for example an integer type pointer can hold the address of an integer variable and a character type pointer can hold the address of char variable. Dynamic memory allocation in C/C++ refers to performing memory allocation manually by programmer. Dynamically allocated memory is allocated on Heap and non-static and local variables get memory allocated on Stack

In C++ we have a set of file handling methods. These include ifstream, ofstream, and fstream. These classes are derived from fstreambase and from the corresponding iostream class. These classes, designed to manage the disk files, are declared in fstream and therefore we must include fstream and therefore we must include this file in any program that uses files.

In C++, files are mainly dealt by using three classes: fstream, ifstream, ofstream.

- ofstream: This Stream class signifies the output file stream and is applied to create files for writing information to files
- ifstream: This Stream class signifies the input file stream and is applied for reading information from files
- fstream: This Stream class can be used for both read and write from/to files.

Problem Definition

The problem with the existing non computerized systems in a Library is that keeping track of all the records manually on a paper can become a difficult and hectic task. It's a really time consuming process. Searching the books for both students and librarian can be a time consuming process. Also, classification of books is inefficient which also makes searching them difficult. For the librarian, maintaining the records of the books which are issued, returned, date on which they are issued, etc can be a time consuming and error prone task. Generating the summary of reports i.e.- total books issued , returned ,etc may not be possible due to so much paper work.

Also finding books which are not returned or missing may not always be possible. Maintaining dates of books when they are issued or returned may also not be possible. It would also not allow letting the librarian know whether the book has been returned on time or past the due date. Considering the rise in number of people using a library it is not technically as well as economically feasible to maintain all the records on a paper.

Consider all the mentioned issues, it is necessary to create a computerized system to manage all the records of a library.

User requirements/SRS

- The system will allow the students to search for books.
- The system will allow the librarian to add, update, or delete books.
- The system will allow the librarian to add, update, or delete the members.
- Librarian will issue books to the students after check the books available in the library
- The system can issue a fine if the student fails to return the book on or before the due date.
- The system can generate a report based on the summary of the books i.e. - total books issued, returned, etc.
- The Librarian can monitor all the students.
- The students can request for a particular book they require if it is not there already in the Library.
- The system can store all the information about the books issued, returned and their dates.
- The system will generate details of books that are not returned.
- The Librarian can check whether books are returned or not and total number of books pending to be returned.

Feasibility Study

Feasibility study is essential to evaluate cost and benefit of the proposed system. This is very important step because on the basis of this, system decision is taken on whether to proceed or to postpone the project or to cancel the project. Once a project is feasible we can go ahead and prepare project specification which finalizes the project requirements.

Need of feasibility study:

- It defines all problems of existing system.
- It finds all possible solution of the problems of existing system.
- It finds technology required to solve these problems.
- It determines the required hardware and software.
- It determines all goals of the system.
- It does the cost estimations in terms of cost of hardware required, software required, designing new system and maintenance cost.

Types of feasibility study:

1. Technical Feasibility

Technical feasibility is the complete study of the project in the terms of input, processes, output, fields and procedures .It is very effective tool for long term planning and trouble shooting .It deals with study of function, performance and constraints that may affect the ability to achieve an acceptable system. It mentions all benefits of the system .The Library Management system we are developing require just basic configurations and some basic software like Visual Studio. So it shows that technically it is feasible to get all the requirements.

2. Operational Feasibility

Operational feasibility, a determination of any violation or liability that could result from the development of system. It also involves determination of the security and validation. In this type of feasibility, the issue like,

operational scope for the fast acceptability of the alternative solution, human issue, social issue, internal issue and legal issues are to be checked out. The automation of the Library Management system will not create unemployment but rather create new job positions like programmers, maintenance staff, database expert, etc. The existing structure should remain unchanged except for addition of one more subsystem i.e. is the computer system for which the librarian will be accountable

3. Economical Feasibility

It this type of feasibility, the cost of hardware and software and overall budget is evaluated to run the system. It deals with an evaluation of development cost weighted against the final income or benefit derived from the development of the system. It is the analysis of projects cost and revenue in an effort to determine whether or not it is logical and possible to complete. It determines whether the time and money are available to develop the system. The proposed system will have some expenditure for the development of the system proposed. Manpower (salary), materials, equipment costs will also be counted. But in return the system will provide a way faster response time and accuracy in providing information which will improve the quality of the services provided. Availability of statistical information can lead to effective decision making and also elimination of wastage. So, the proposed system should be economically feasible.

Details of Hardware and Software used:

Software Requirements:

- Operating system: Windows 7 or above.
  Windows 7 is used as the operating system as it is stable and supports more features and is more user friendly.

1. File Handling – Files are used to store the data present in the system and also retrieve the data. File handling provides a mechanism to store the output of a system in a file and to perform various operations on it.
2. Programming language: The system is designed by using C++ language .Turbo C++ is the platform used for developing the system. Turbo C++ is a C++ compiler and integrated development environment originally from Borland. The editor is used to create the source file, compile it, link it and then execute it.

Hardware Requirements:

- Intel core is 2nd generation is used as a processor because it is faster than other processors and provide reliable and stability and we can run our PC for long-time. By using this processor we can keep on developing our project without any worries.
- RAM 4 GB is used as it will provide fast reading and writing capabilities and will in turn support in processing.
- ROM 20 GB is used.

Detailed Lifecycle of the Project

The process of software development goes through a series of stages in a step wise fashion also known as Software Development Life Cycle (SDLC) that includes 6 phases namely Analysis, Design, Implementation, Testing, Deployment and Maintenance.

Considering these 6 phases and the various other requirements, we are following **Incremental Model** as it's a simple model which is easy to understand and implement. Incremental Model is a process of software development where requirements are broken down into multiple standalone modules of software development cycle. Incremental development is done in steps from analysis, design, implementation, testing, and maintenance.

Requirements of Software are first broken down into several modules that can be incrementally constructed and delivered at any time, the plan is made just for the next Increment and not for any kind of long-term plans. Therefore, it is to modify the version as per the need of the customer.

Once the core features are fully developed, then these are refined to increase levels of capabilities by adding new functions in Successive versions. As each successive version of the software is constructed and delivered, now the feedback of the Customer is to be taken and these were then incorporated in the next version. Each version of the software has more additional features over the previous one.

The phases of Incremental Model are as follows:

1. Requirement Gathering and Analysis – All possible requirements of the system to be developed and captured in this phase and documented in a required specification document.

2. System Design – The requirement specifications from first phase are studied in this phase and the system design is prepared. This system design helps in specifying hardware and system requirements and helps in defining the overall system architecture.

3. Implementation – With Inputs from the system design, the system is first developed in small programs called units, which are integrated in next phase. Each unit is developed and tested for its functionality, which is referred to as Unit testing.

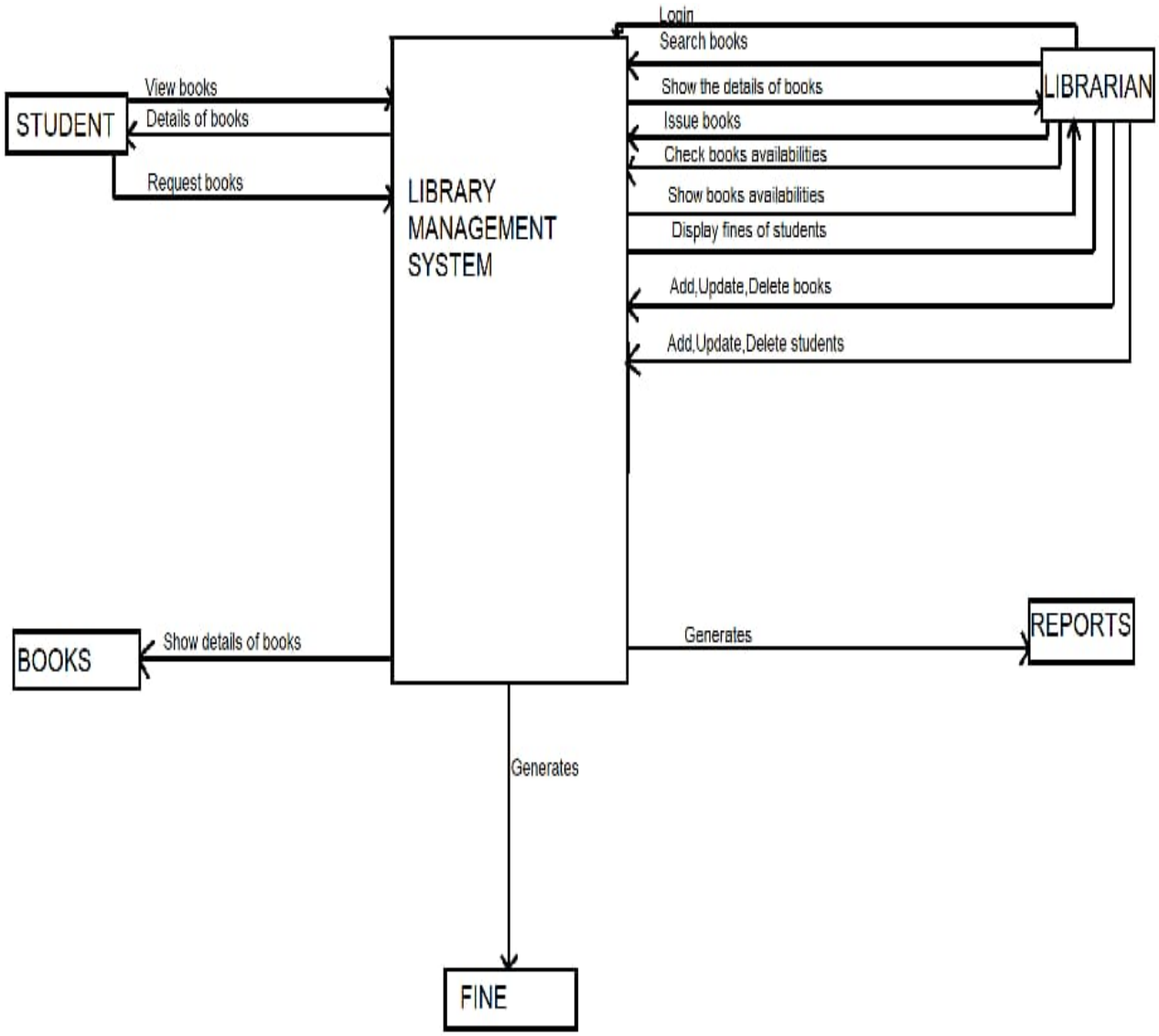
4. Integration and Testing – All the units developed in the implementation phase are integrated into a system after testing of each unit. Post integration the entire system is tested for any faults and failures.

5. Deployment of system – Once the functional and non-functional testing is done, the product is deployed in the customer environment or released into the market.

6. Maintenance – There are some issues, which come up in the client environment. To fix those issues, patches are released. Also, to enhance the product some better versions are released. Maintenance is done to deliver these changes in the customer environment.

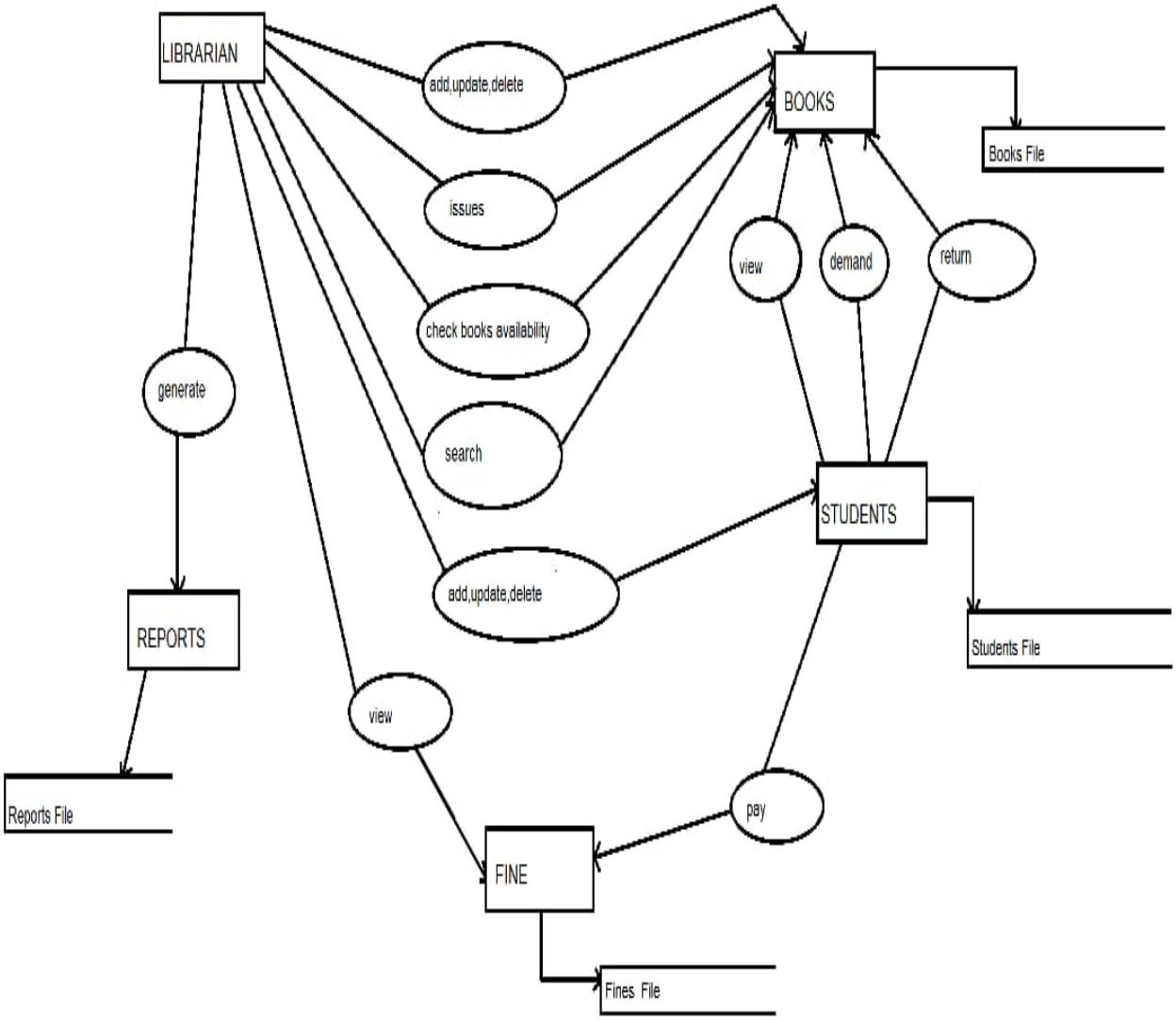
Context Diagram

Context diagram shows the system under consideration as a single high-level process and the relationship that the system had with other external entities.



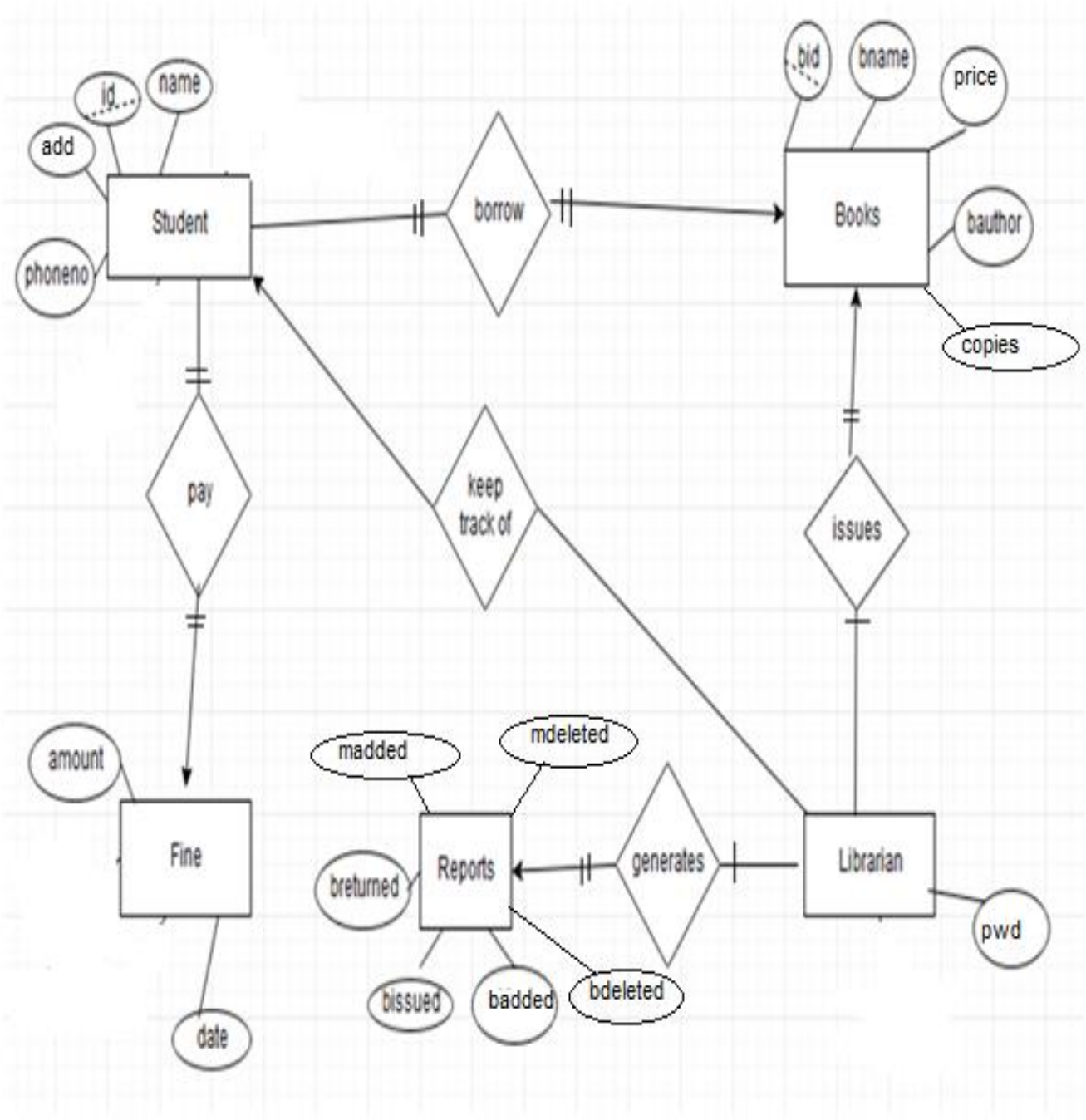
Data flow diagram

Data flow diagram is the graphical representation of the flow of data through on information system modelling its process aspects. DFD is often a preliminary step used to create an overview of the system which can later be collaborated.



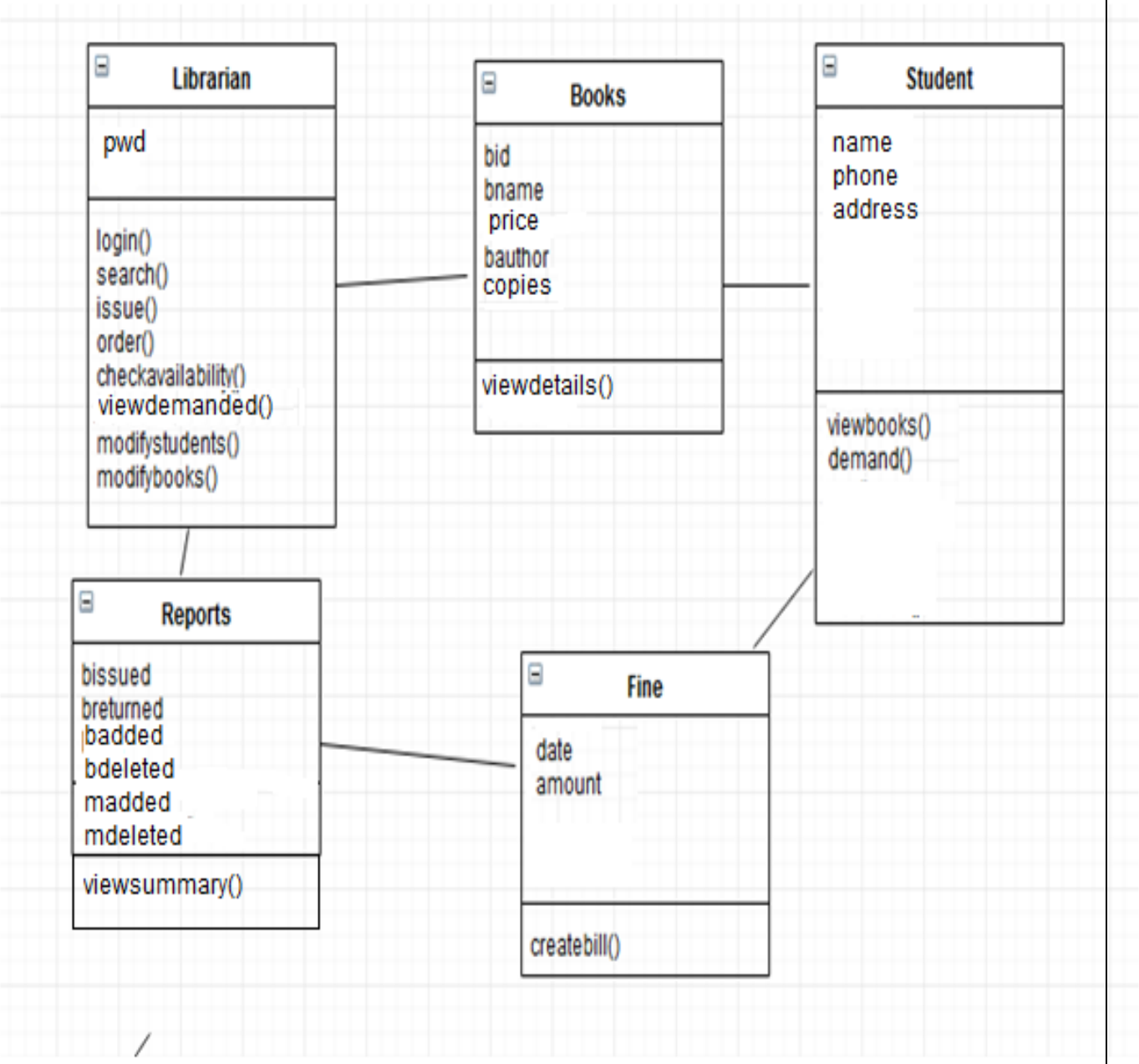
Entity Relationship Diagram

Entity Relationship diagram is a systematic model which describes and defines a business process. The process is modelled as components (entities) that are linked with each other by relationships that express the dependencies and requirements between them.



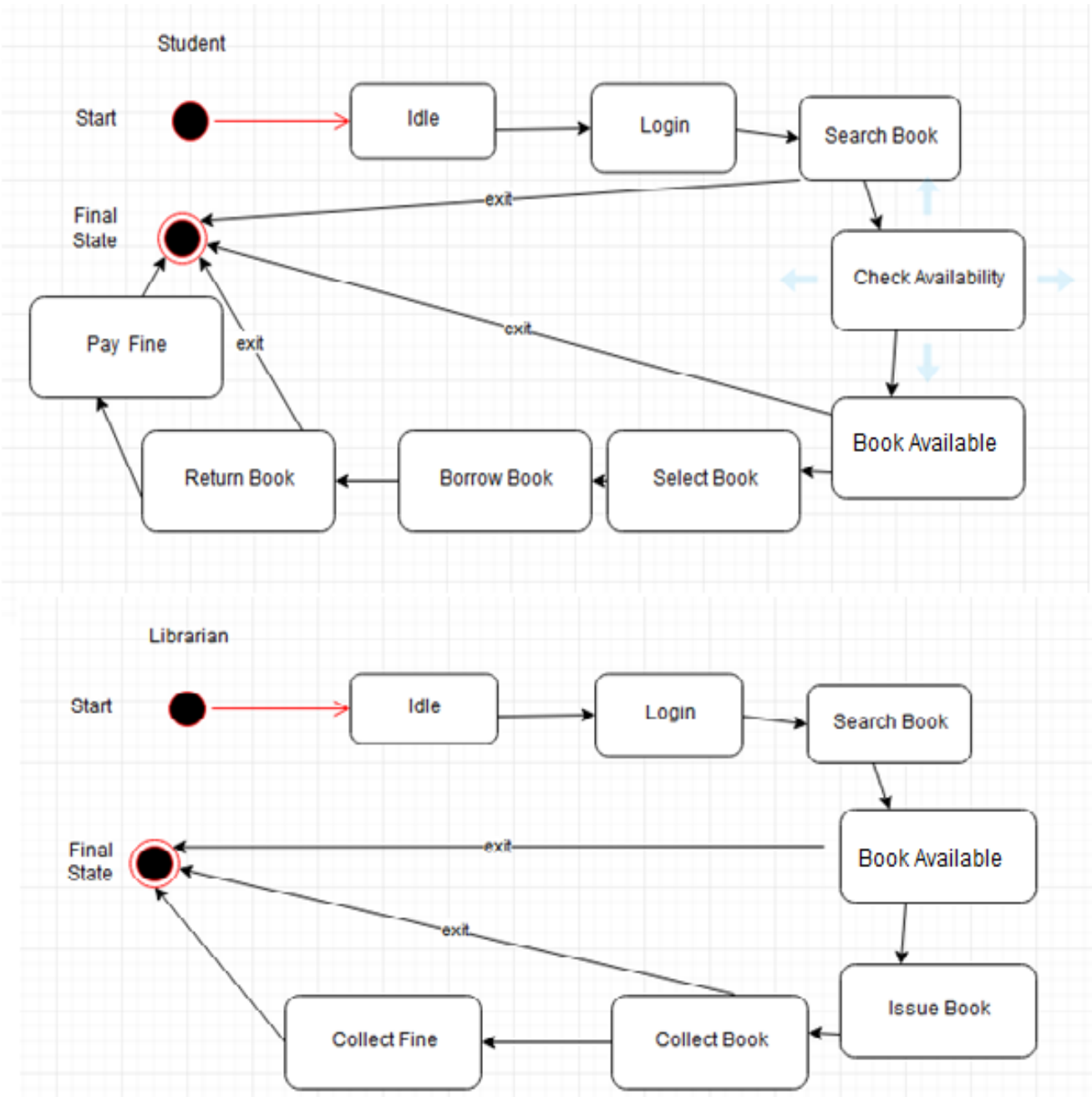
Class Diagram

A class diagram is a type of static structure of a system by representing its class, attributes and functions (operations) and the relationship among those defined objects.



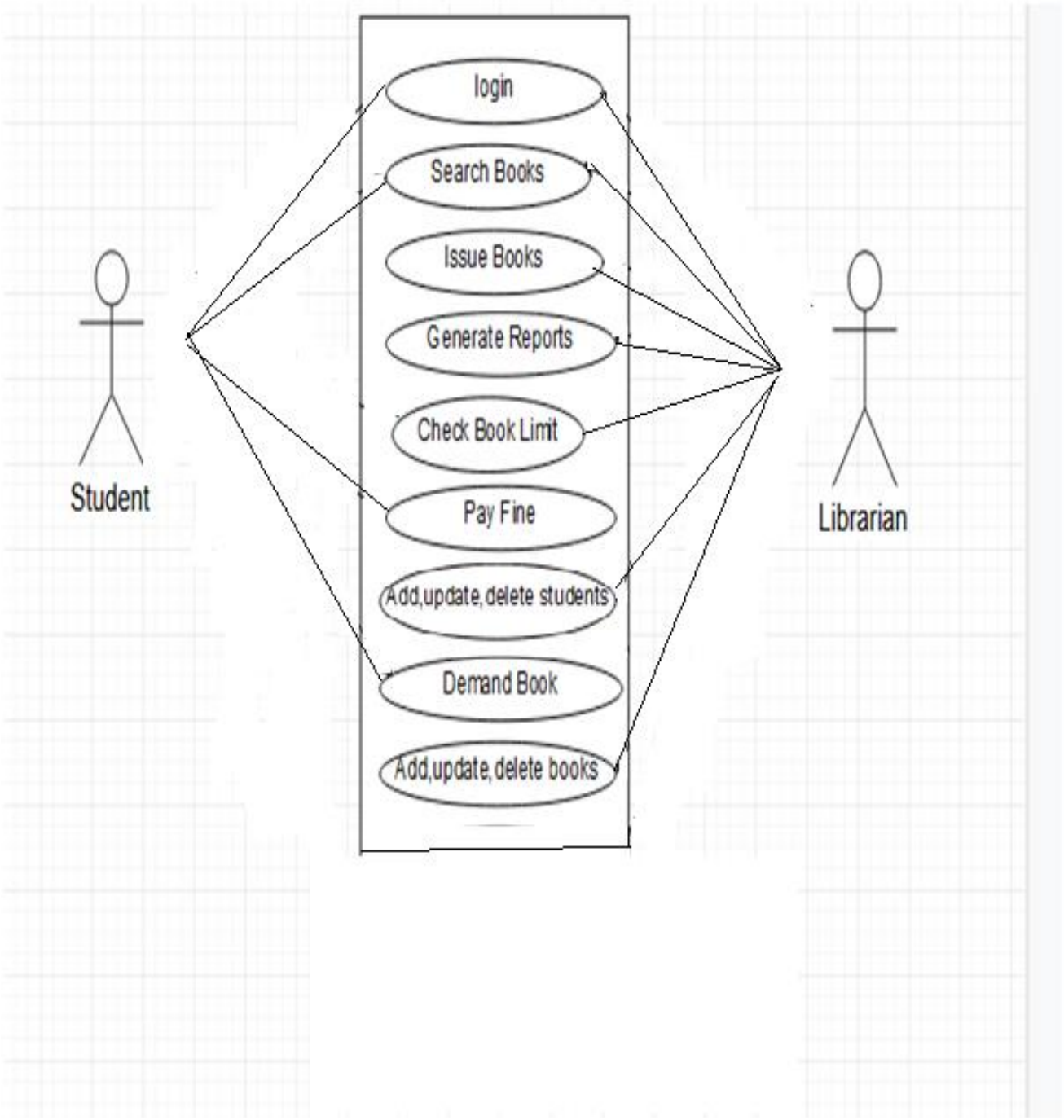
State Transition Diagram

A State Transition diagram consists of orders to represent states and directed line segments to represent transitions between the states, where one or more actions may be associated with each transition.



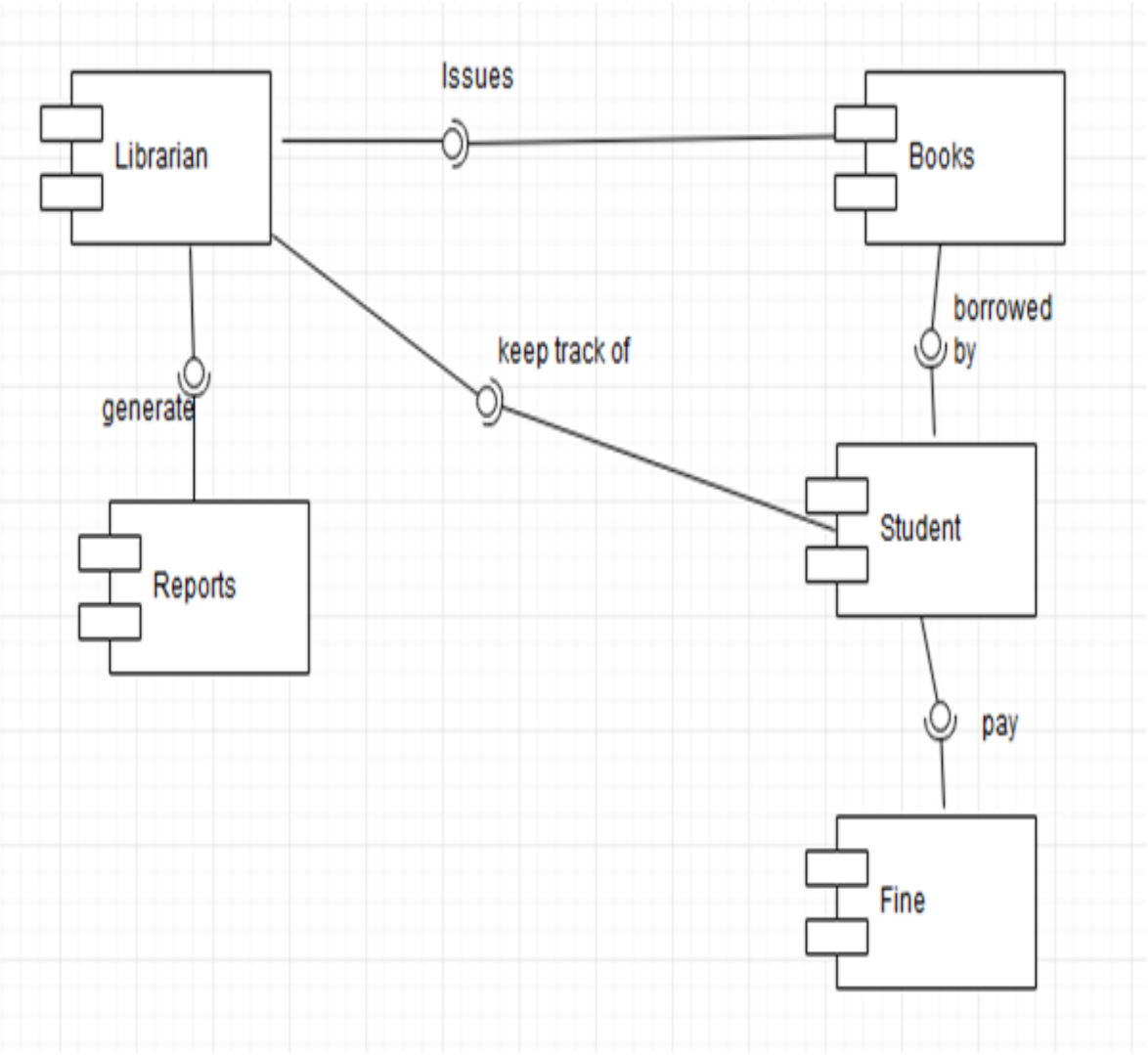
Use Case Diagram

A use case diagram is a list of steps, typically defining interaction between a role (actor) and a system to achieve a goal, depicting the specification of the use case where actors can be an actual user or an external component (system).



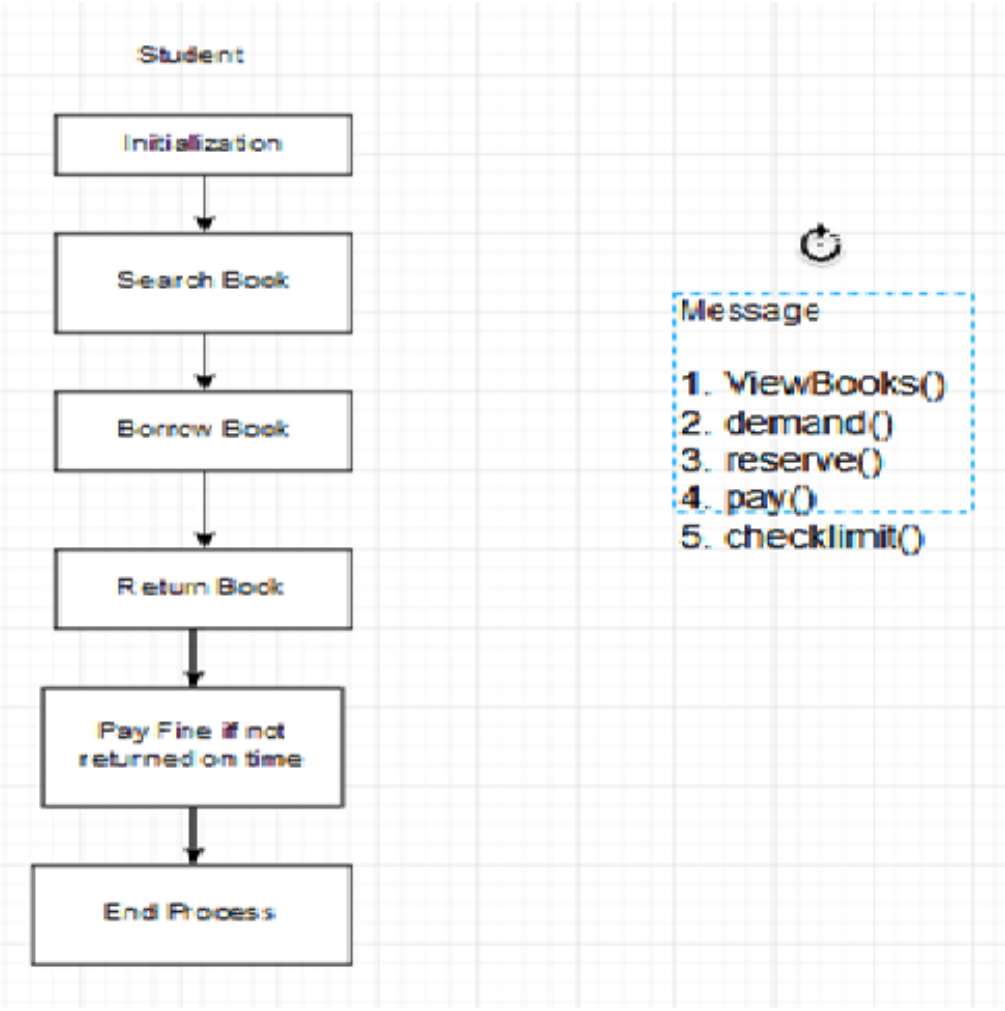
Component Diagram

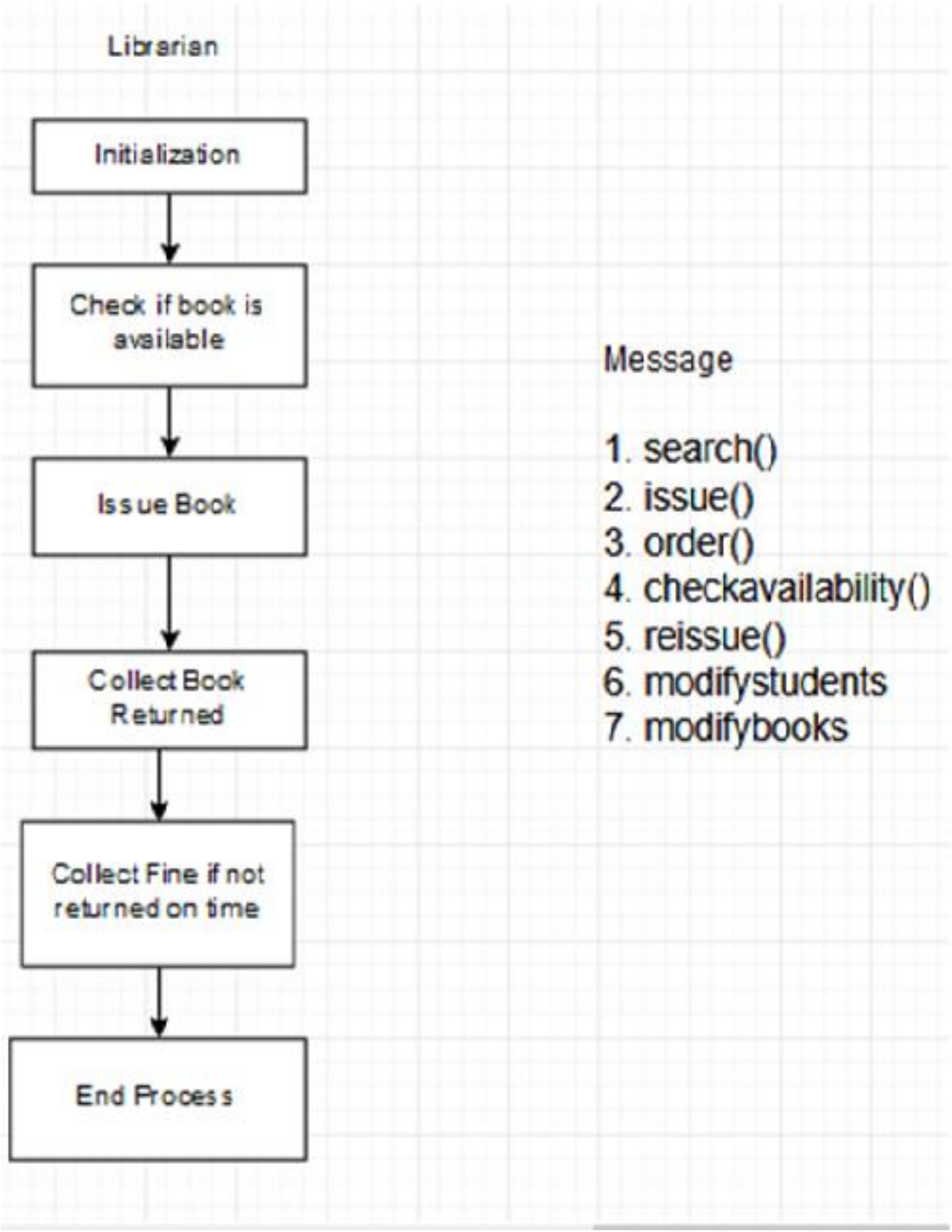
Component diagram depicts how components are wired together to form a software system. It is used to illustrate the structure of arbitrarily complex system.



Collaboration Diagram

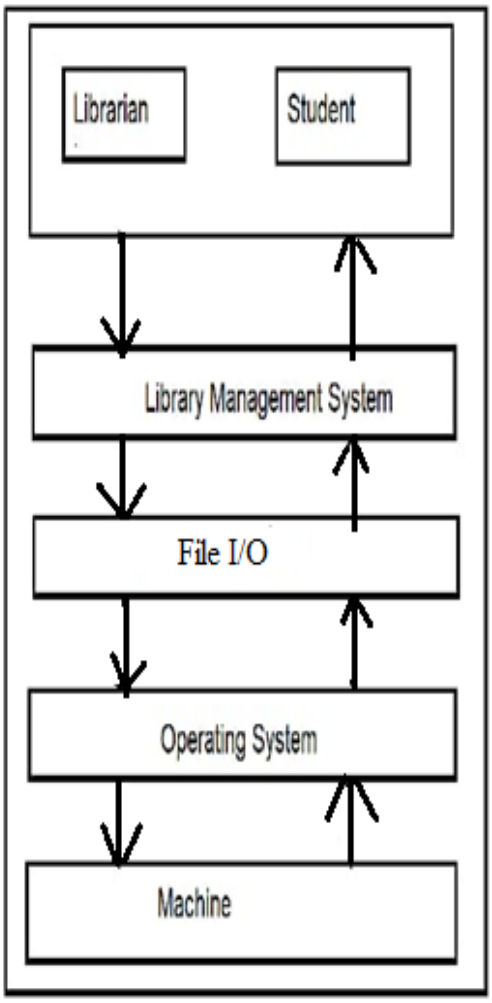
Collaboration diagram which is also known as communication or interaction diagram is aa illustration of the relationships and interactions among objects. It resembles a flowchart that portrays the functions of individual objects present in the system.




Librarian
Initialization
Check if book is available
Issue Book
Collect Book Returned
Collect Fine if not returned on time
End Process
Message
1. search()
2. issue()
3. order()
4. checkavailability()
5. reissue()
6. modifystudents
7. modifybooks

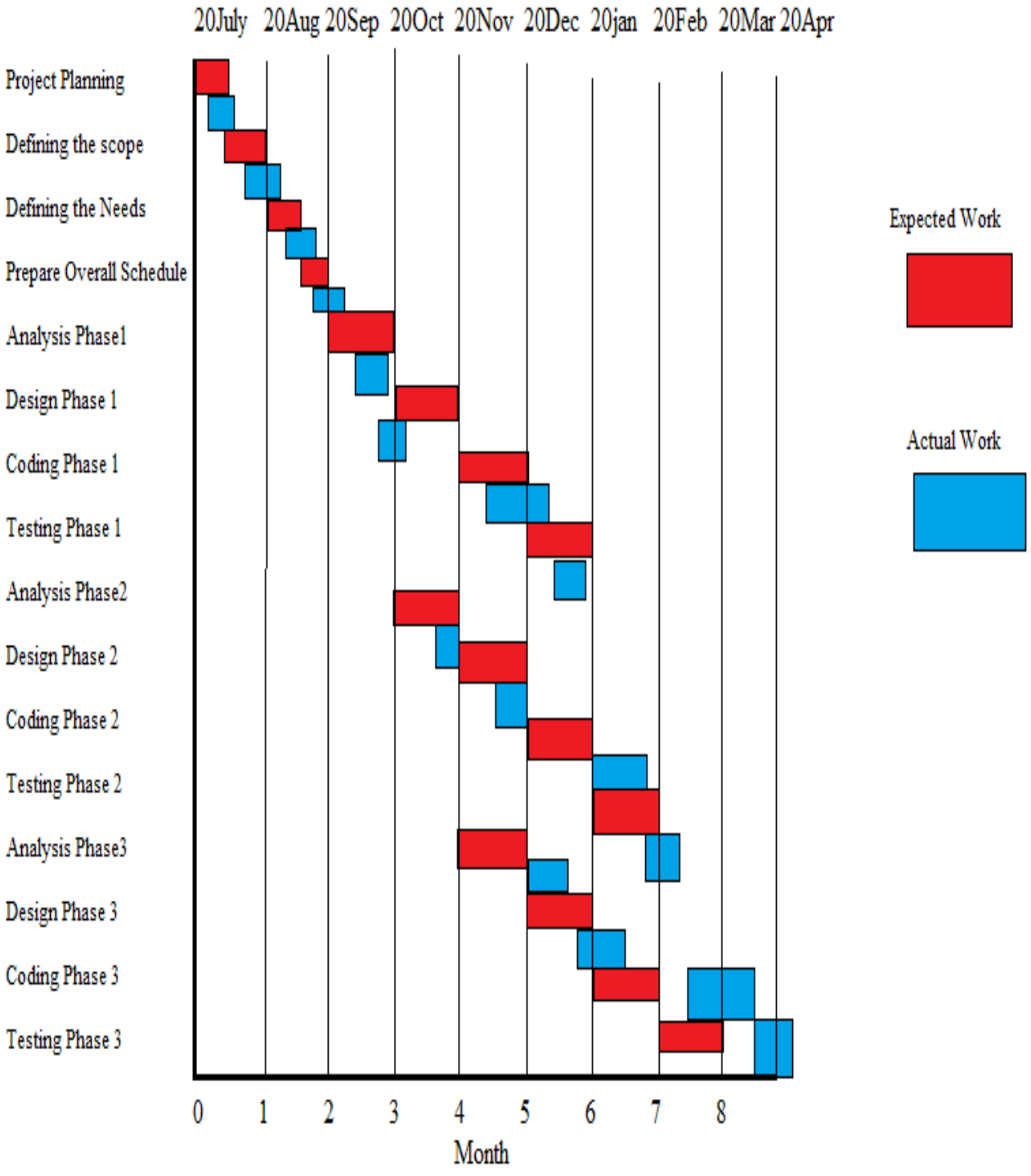
Architecture Diagram

Software Architecture Diagram is a crucial step for software and application developers to describe the basic software structures by separating functional areas into layers.



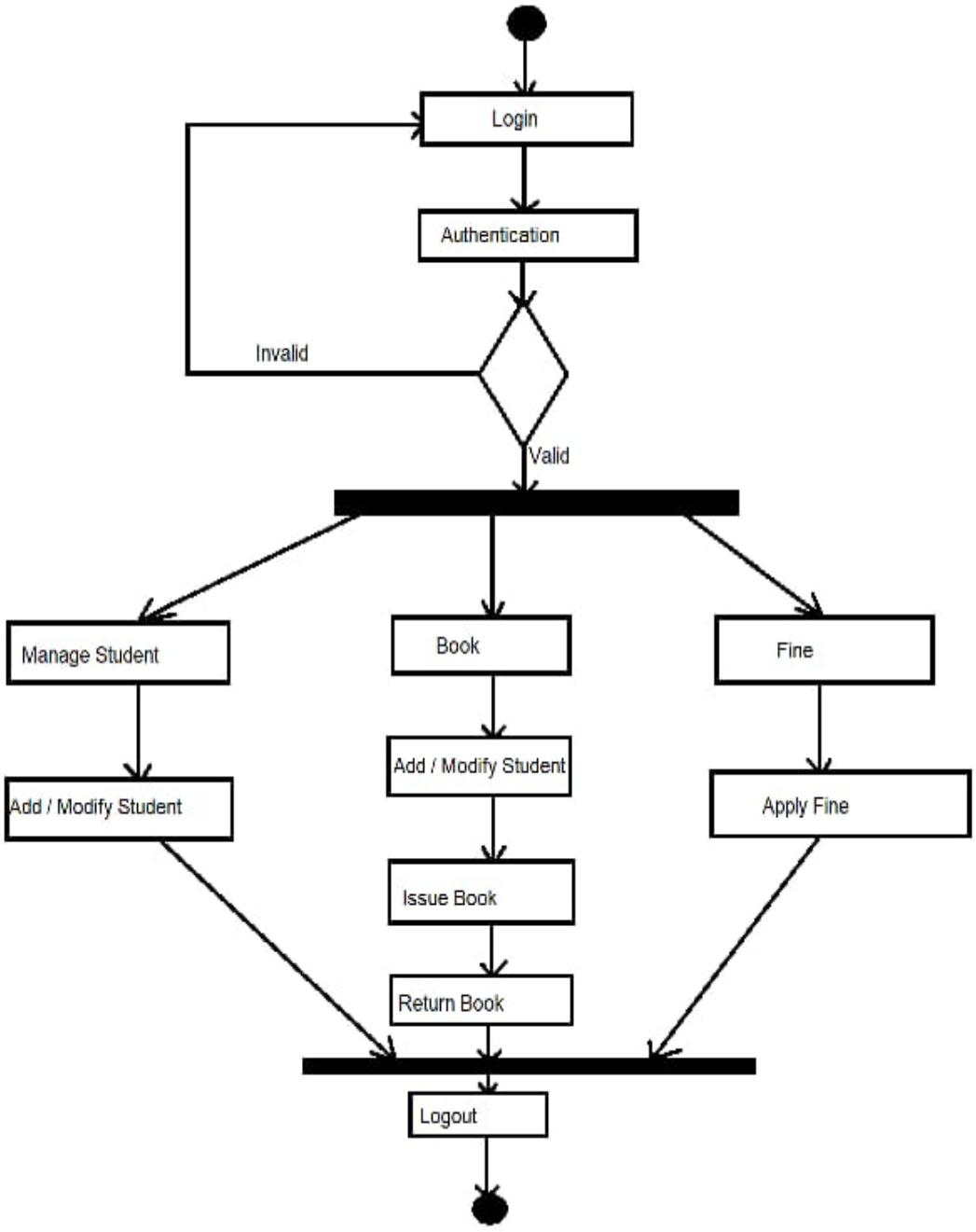
System Planning

Gantt Chart



Activity Diagram

Activity diagram describes the dynamic aspects of the system. It is basically a flowchart to represent the flow from one activity to another activity, where the activity can be described as an operation of the system.

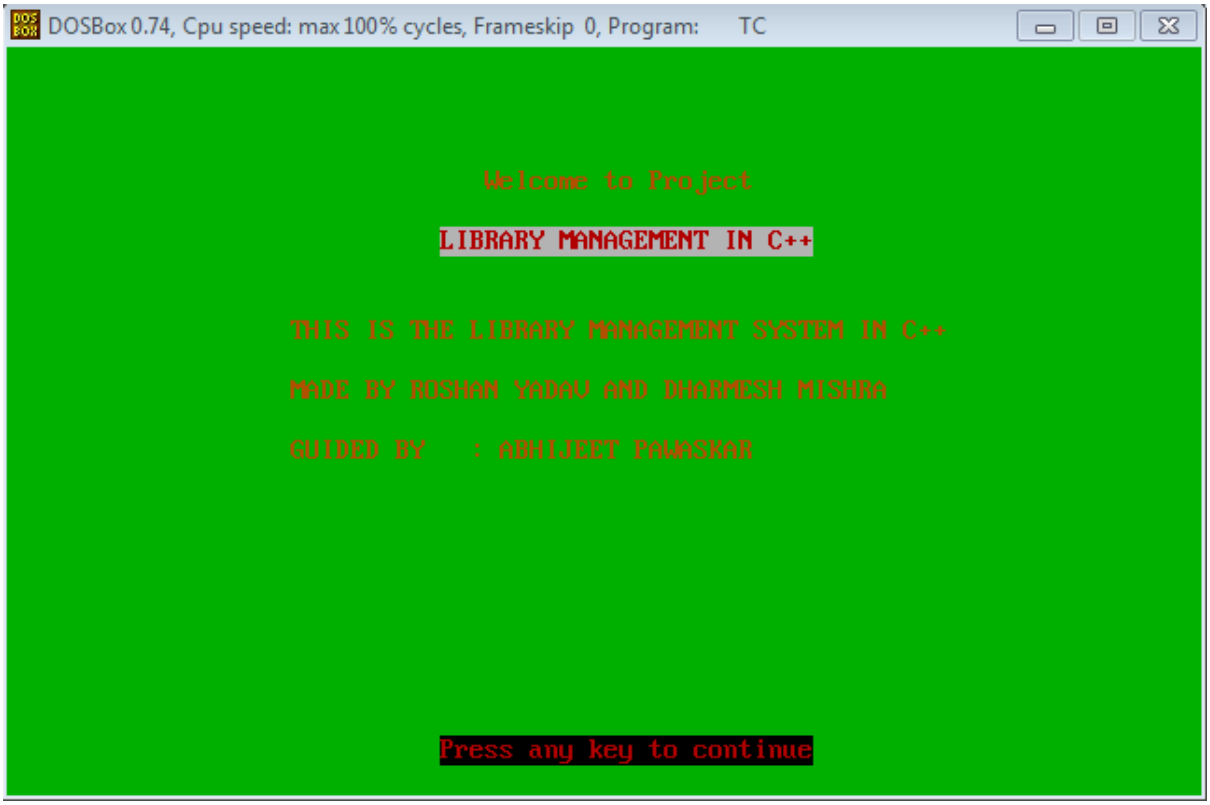


System Implementation

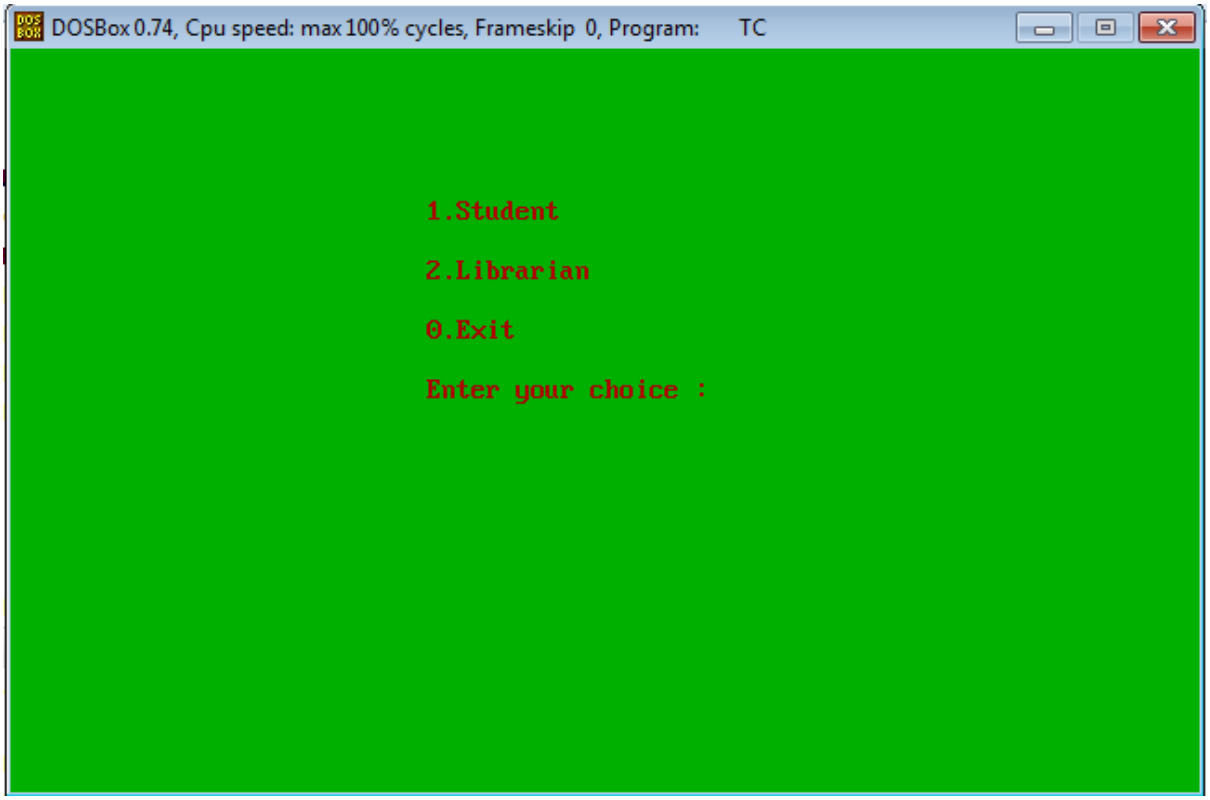
System Implementation is the construction of the new system. Library Management System Implementation is the process that actually yields the lowest-level system elements in the system hierarchy. System elements are made or reused. The purpose of the implementation process is to design and create a system element conforming to that elements design properties or requirements. Implementation uses the design document to produce code. The system is implemented on Windows. We have used file handling to manage the details on back end. Turbo C++ is used for designing the Library Management System.

System implementation is the process of defining how the information system should be built ensuring that the information system is operational and used, ensuring that the information system meets quality standard.

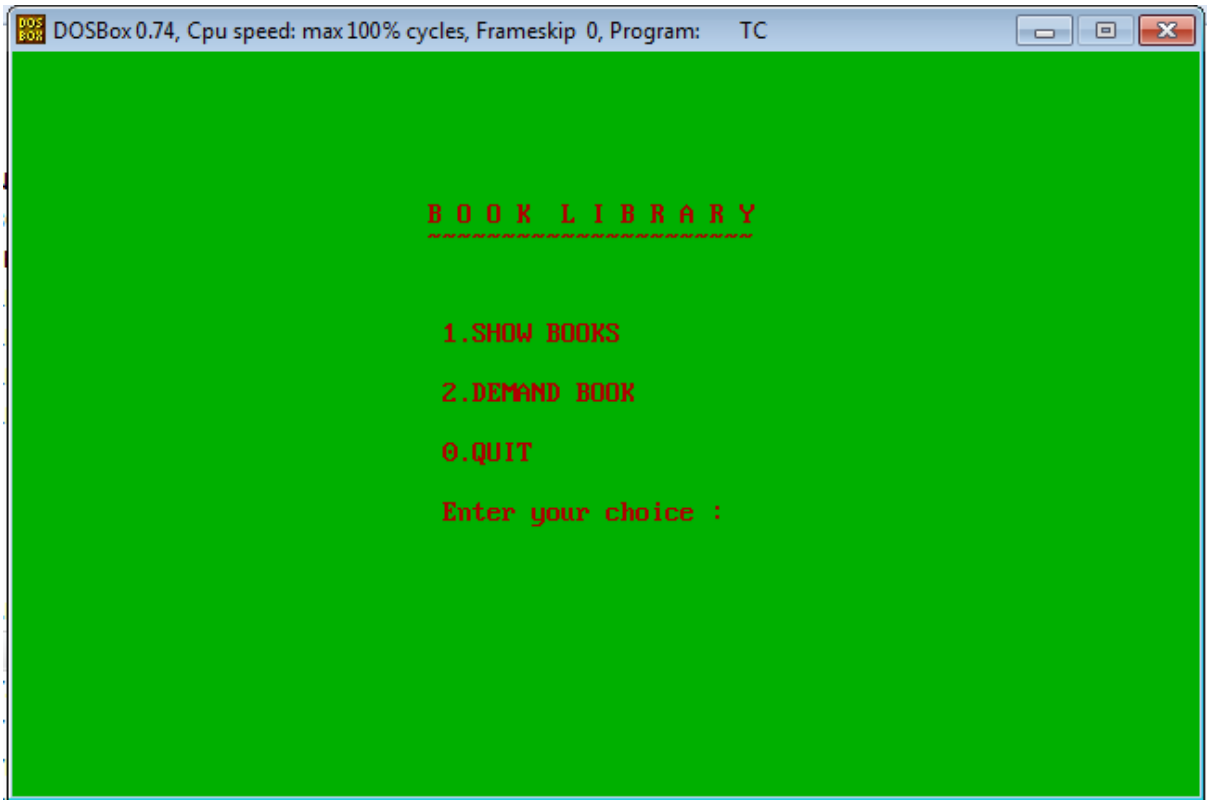
Screenshots:



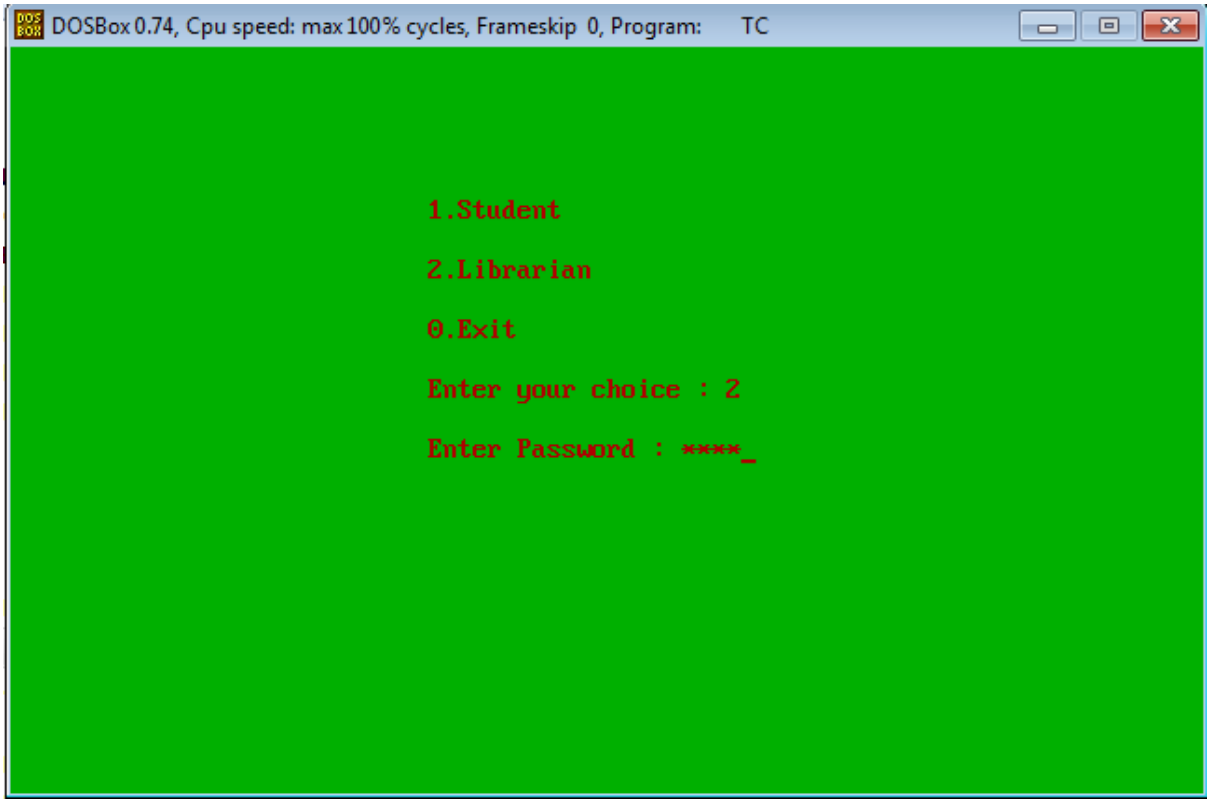
This is the introduction page which shows up when we run the system.



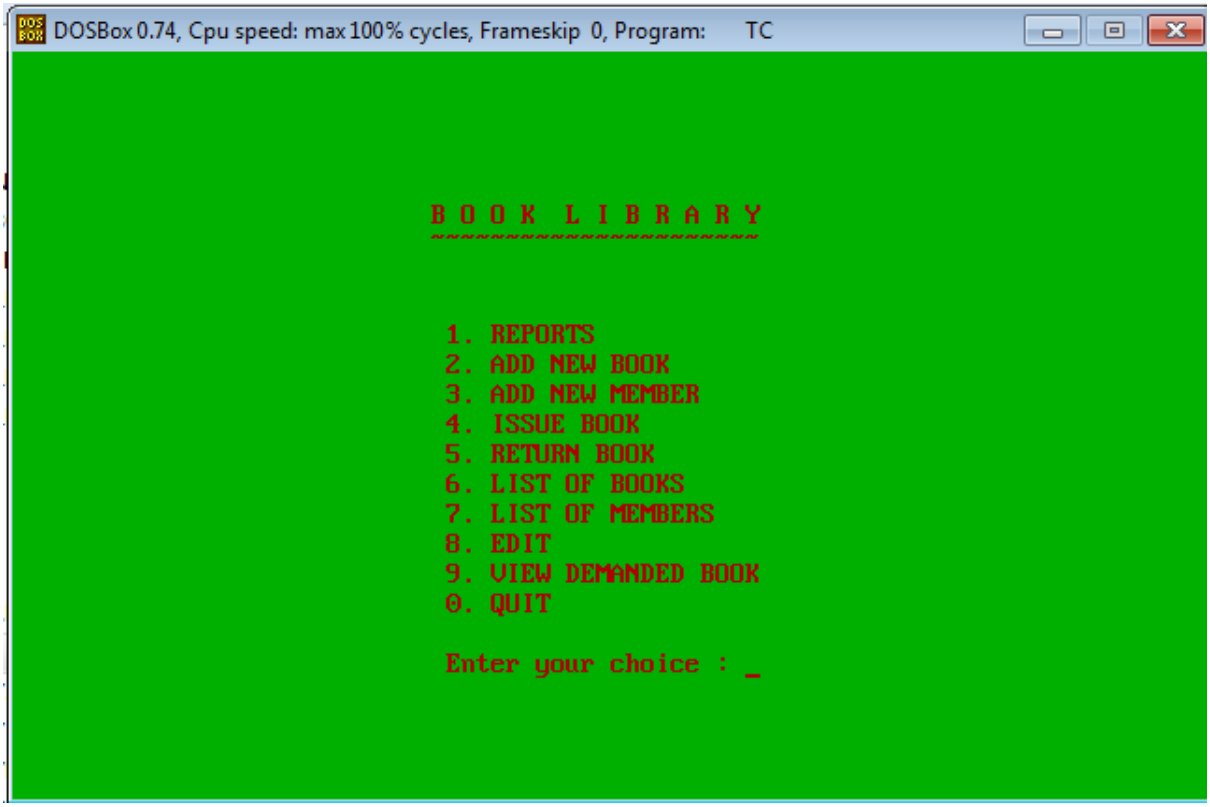
This is the home page where the students and the librarian have to choose their option accordingly



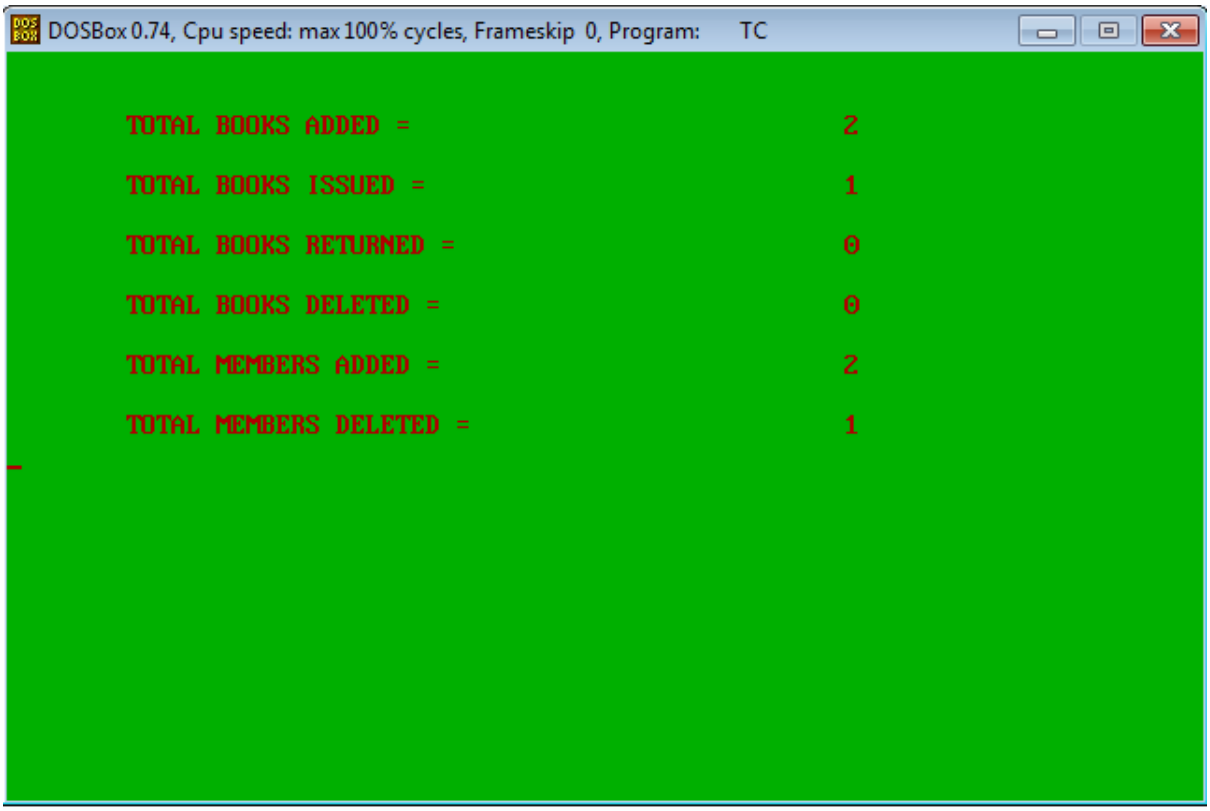
This is the home page of the student where they can either see all the books available or demand for new books if they want.



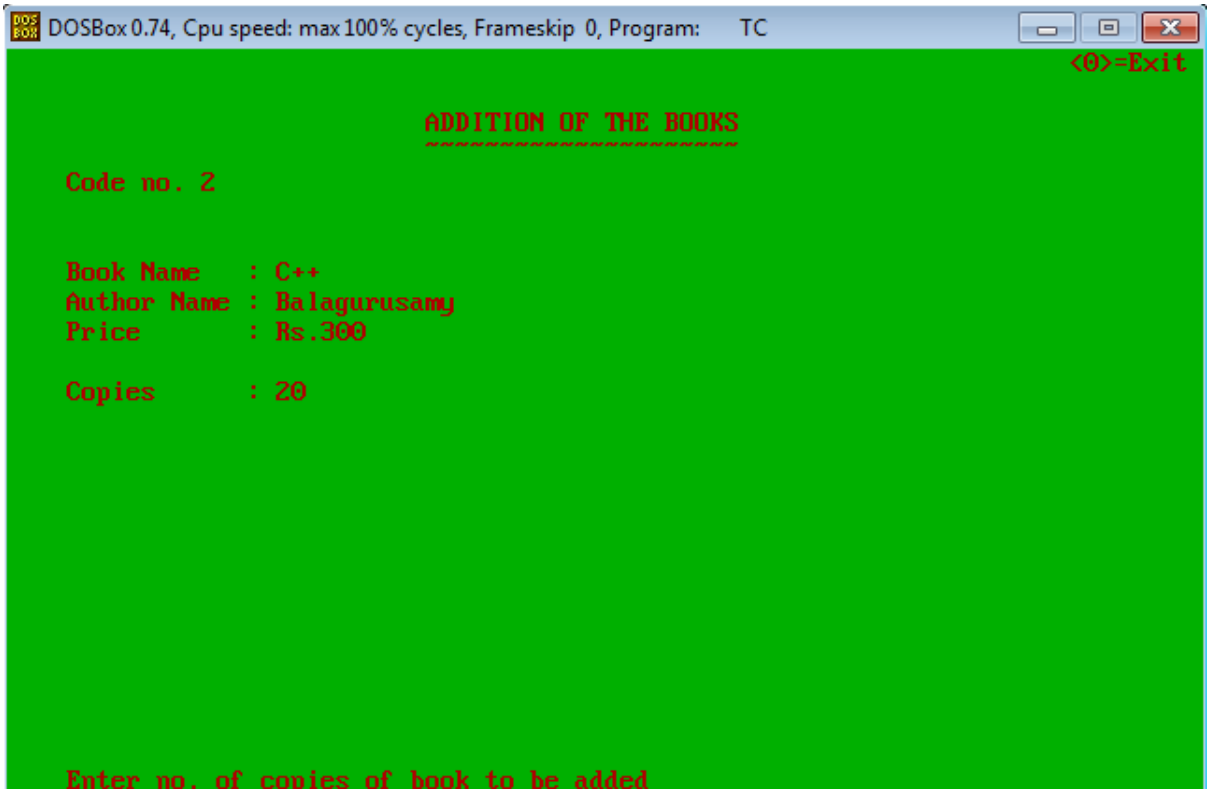
If the librarian wants to login, he first has to provide the password for verification of his authenticity.



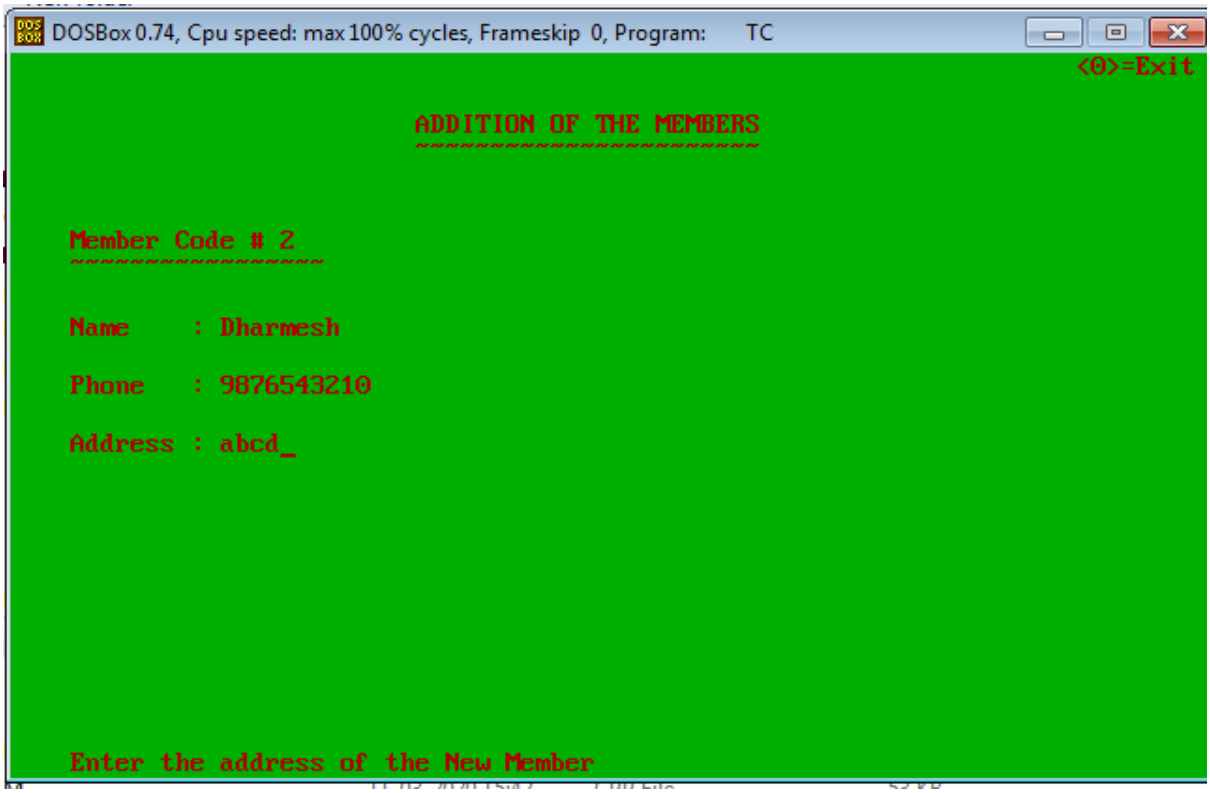
This is the home page of the librarian which shows up after validation of password. The librarian can check the reports, add books or members, issue and return books, check the books, members or demanded books and modify the books and members.



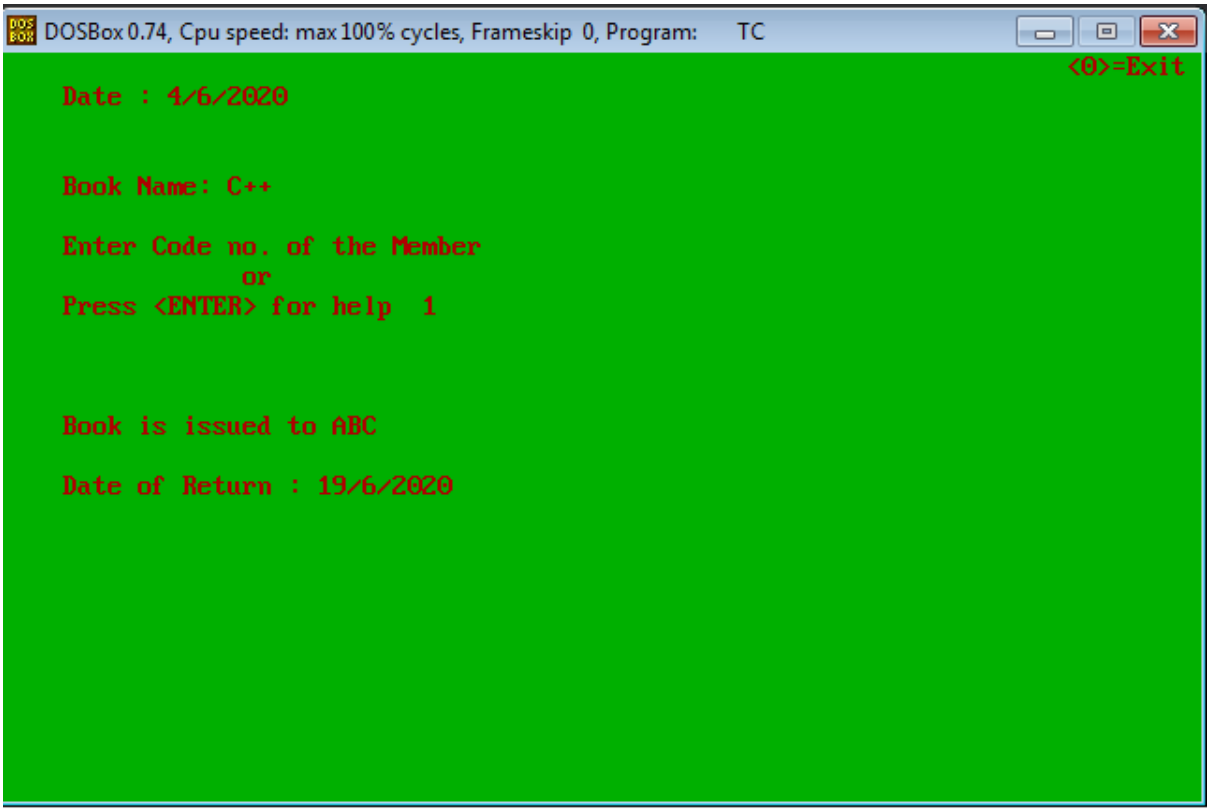
This is the reports page of the system which contains details like the total number of books added, issued, returned, deleted and also total number of members added and deleted.



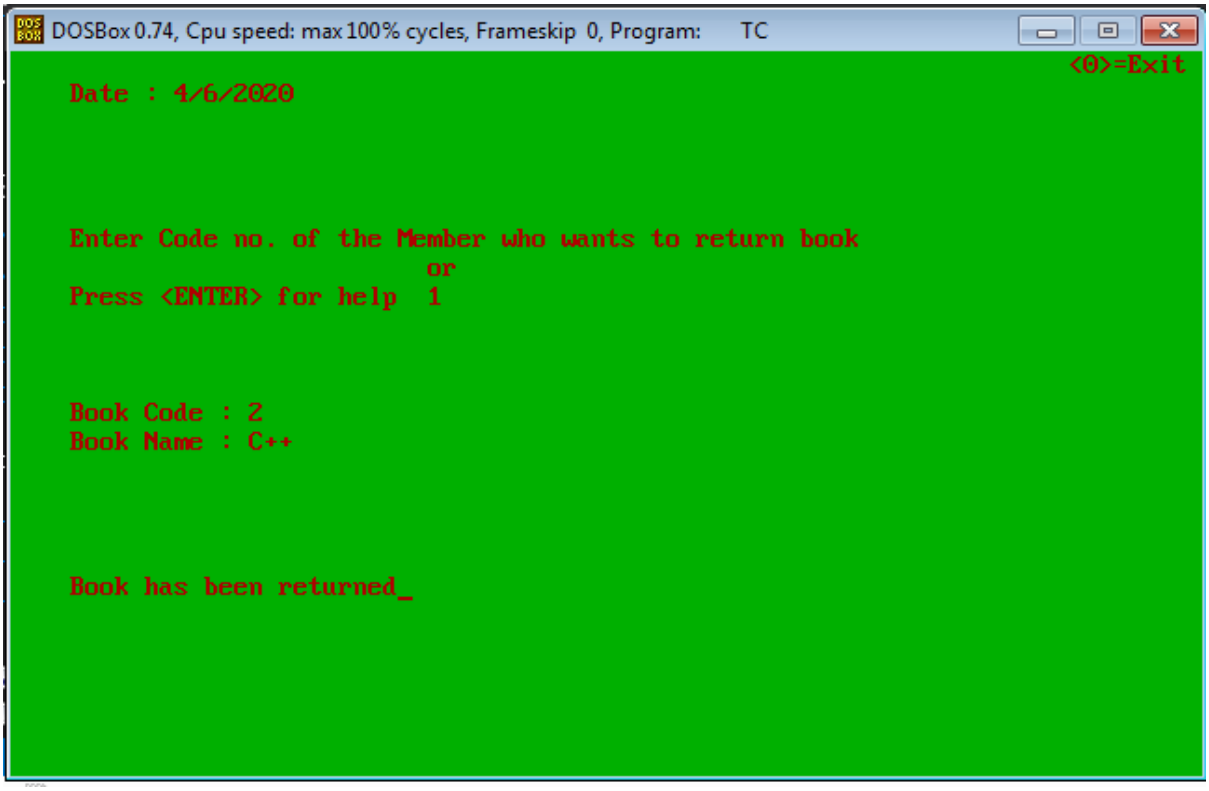
This is the page for addition of new books which contains details like book name, author name, price of the book and the number of copies available.



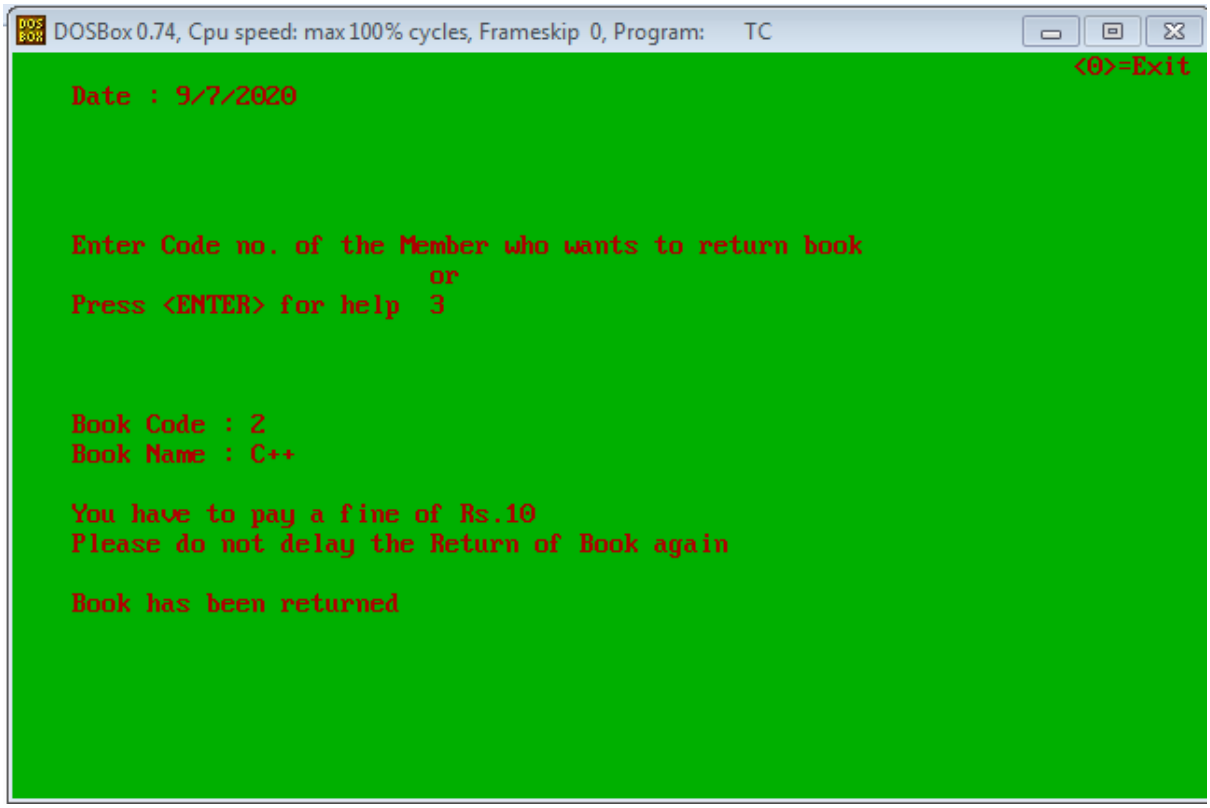
This is the page for addition of new members which contains details like member name, phone number and address.



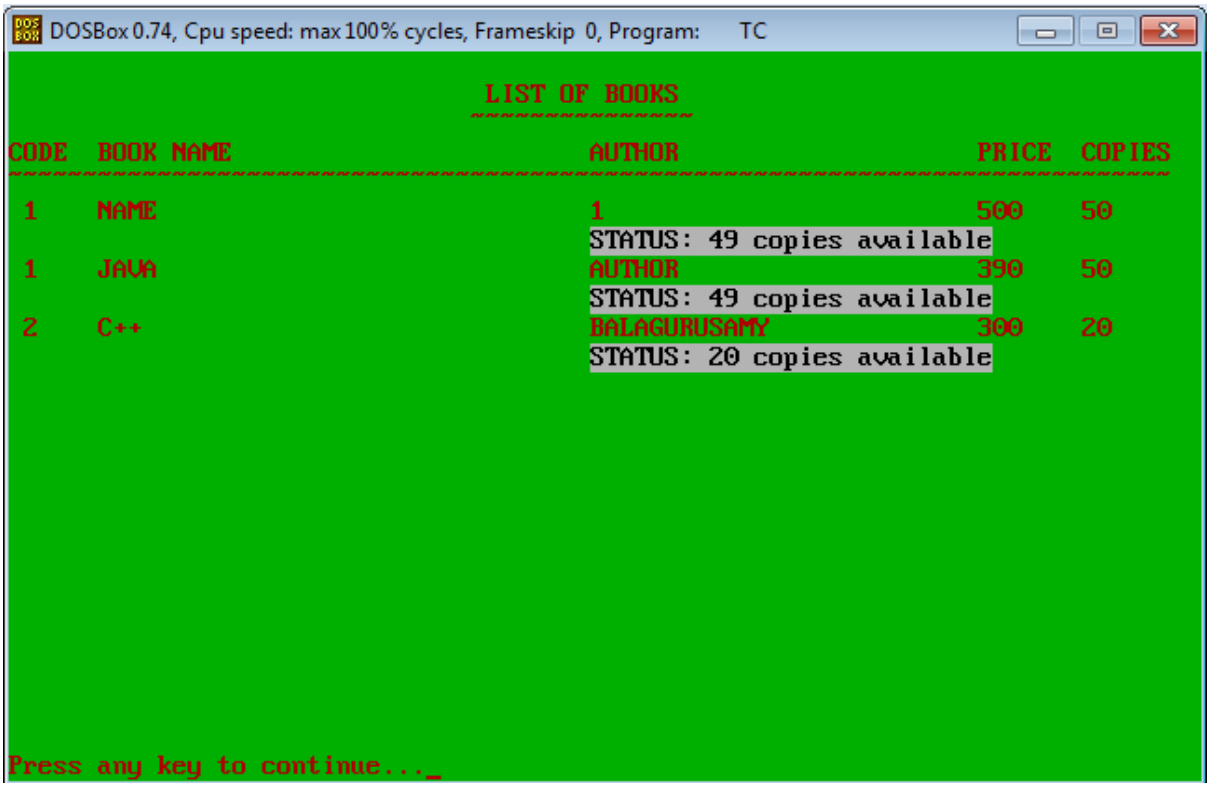
This is the page for issue books. The librarian has to specify the name of the book and the code of the member to issue him/her a book and a return date can be seen.



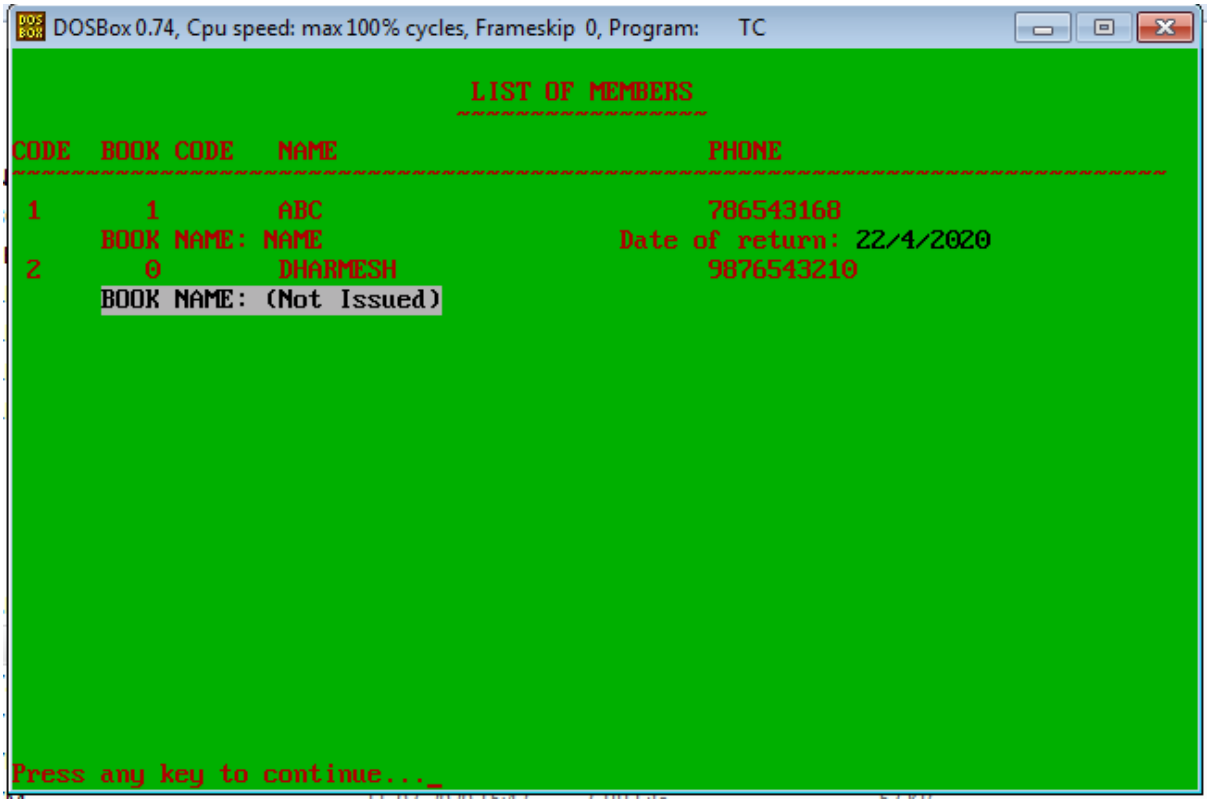
This is the page for return books. The code of the member has to be specified and then he/she can return the book before the due date.



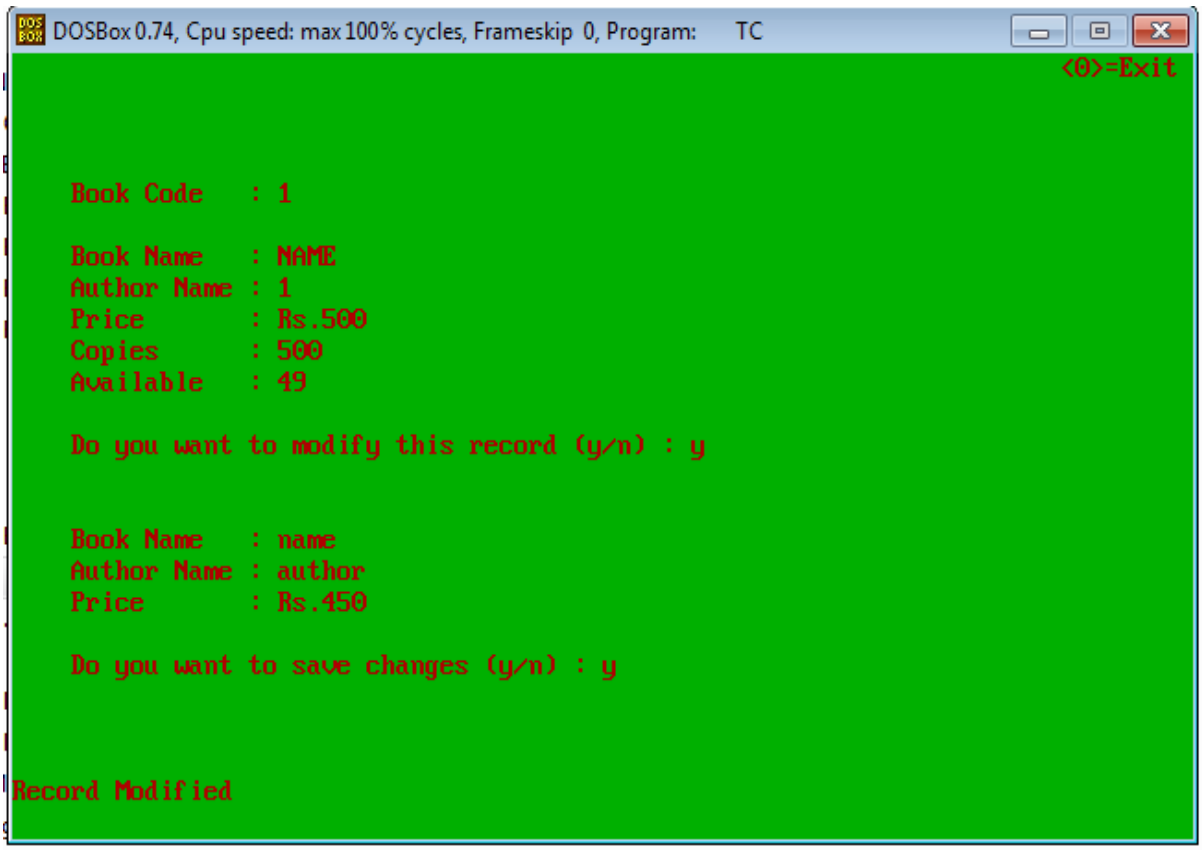
This is the fine page. If the member fails to return the book on time, he/she needs to pay a fine of rupees 5 per day.



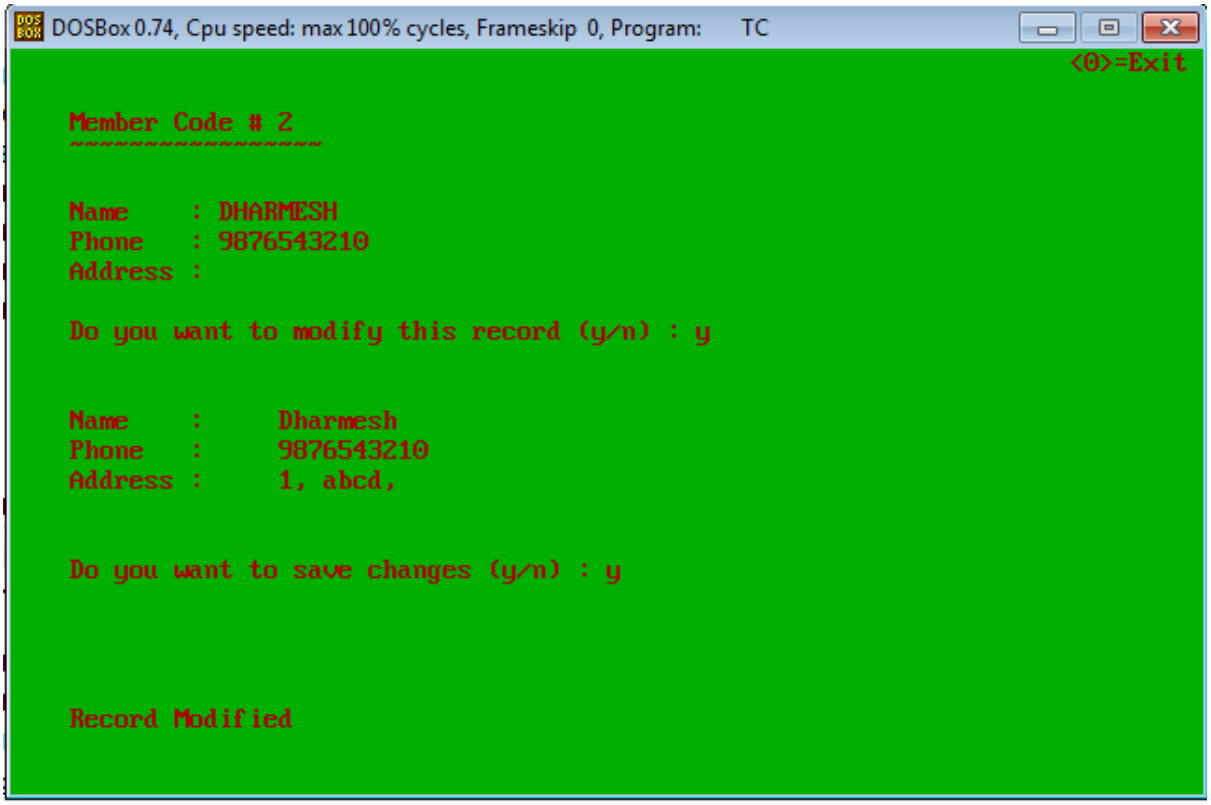
This is the book list page. It contains all the books available in the library with their code number, author name, price and the number of copies available.



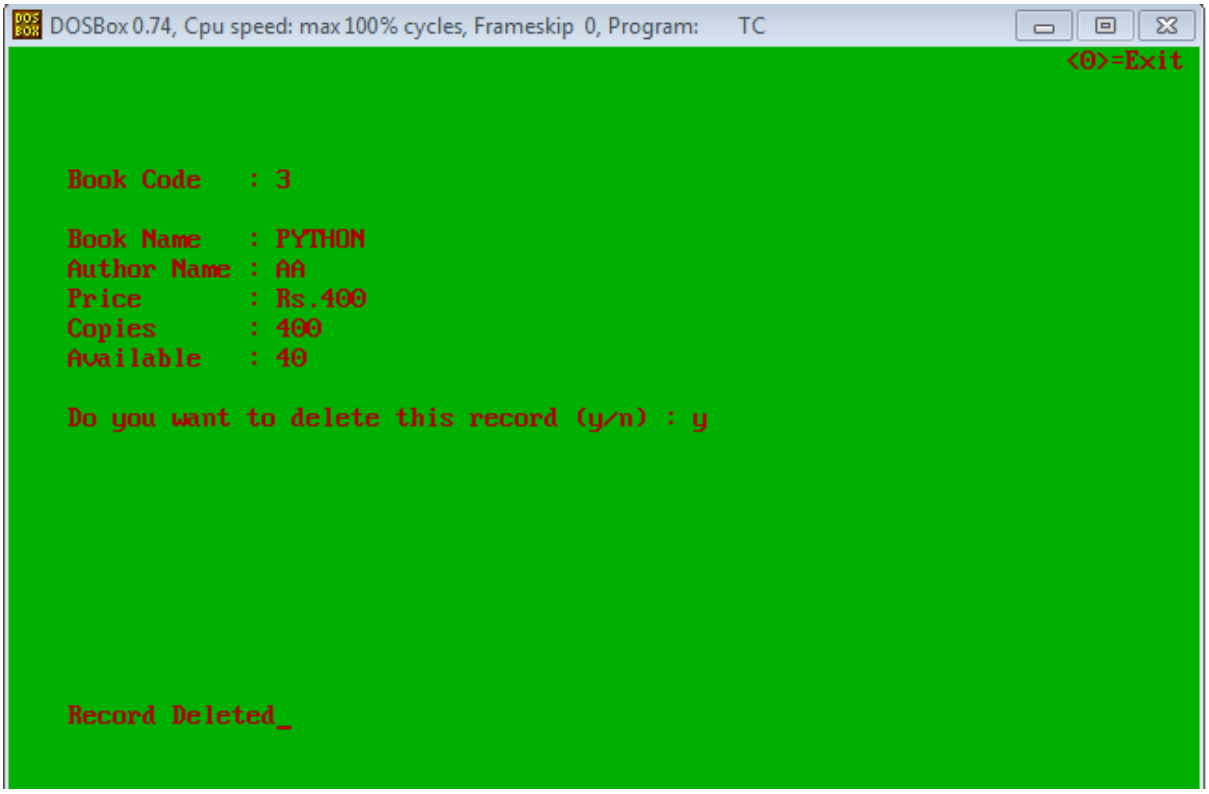
The members list page. It contains the list of members with their code, phone number, book they have borrowed and its code along with the return date of the book.



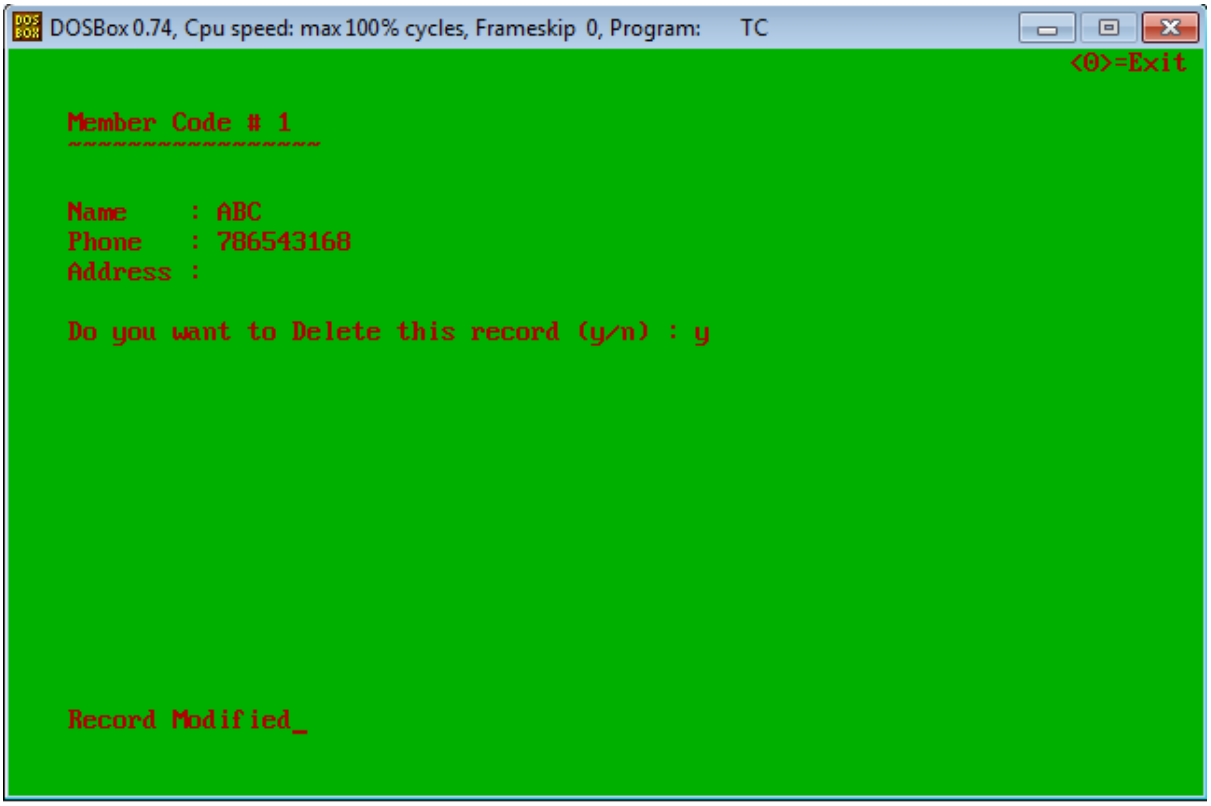
This is the page for modification of books. The code of the books which is to be modified has to be provided. Then it shows all the details of the book. Then the librarian has to provide the new details which should be shown after the modification and save the changes.



This is the page for modification of members. Like modification of books, the member code has to be provided and then the member details would be shown and then the librarian can modify the necessary details and save the changes.



This is delete book page. The librarian mentions the name of the book which he has to delete. Then the detail of the book pops outs and then he has to confirm the deletion.



This is the delete member page. The librarian ahs to mention the code of the member after which his details will be shown and he needs to confirm the deletion.

SYSTEM TESTING

Testing is a process of executing a program with the intent of finding errors.

A good test case is one that has a high probability of finding an as yet undiscovered error.

A successful test is one that uncovers an as yet undiscovered error.

If testing is conducted successfully it will uncover error in the software and testing demonstrates that software functions appear to be working according to specification, that behaviour and performance requirement appear to have been met.

In addition, data collected as testing provide good indication of software reliability and some indication of software quality whole.

But testing cannot show the absence of errors and defects, it can only shows that errors and defects are present.

Testing Principles:

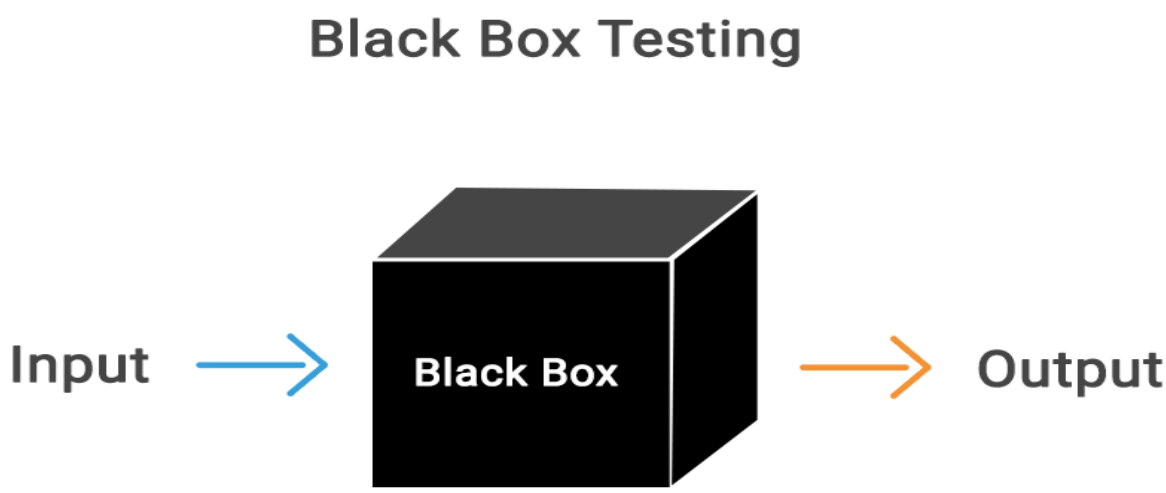
- All the tests should be traceable to customer requirements. Test should be planned long before testing begins.
- Testing should begin in small scale and progress towards large scale.
- Exhaustive testing is not possible.
- Testing should be conducted by independent third party.

Testing Methods:-

There are two methods to design the test cases:

1. Black Box Testing
2. White Box Testing

1. Black Box Testing:-

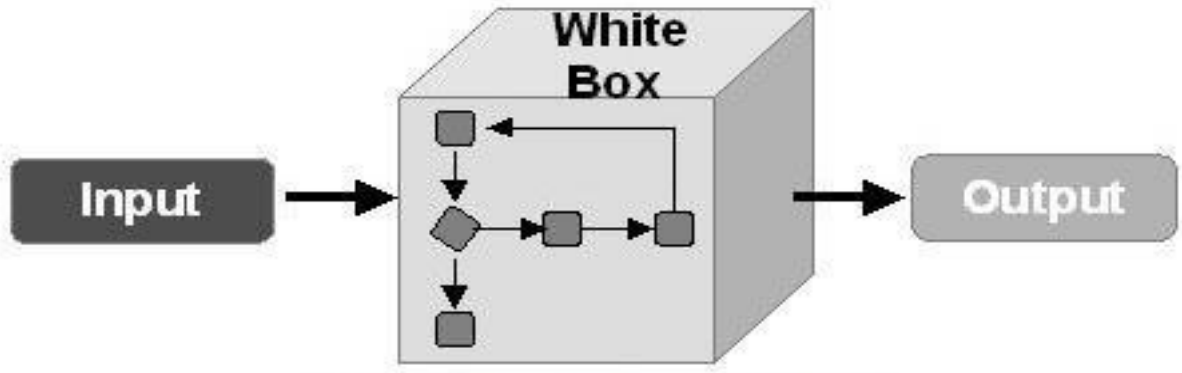


The black box is powerful technique to check the application under test from the users prospective. Black box testing is used to test the system against external factor responsible for software failures. This testing approach focuses on the input that goes into the software, and the output that is produced. Testing team does not cover the inside detail such as code, logic and development methods. It is used for validation. Here, the internal working mechanism is ignored and the main focus is on the output.

2. Whit Box Testing:-

White Box Testing is also known as Structural Testing is a software testing method in which internal structure, design of the item being tested is known to the testers. The tester chooses input to exercise path through the code and determines the appropriate output. It is used for verification.

Testing Strategies:-



1. Unit Testing

A unit is the smallest testable part of an application like functions, classes, procedures, interfaces. A unit is the smallest testable part of any software. Unit testing is a method by which individual units of source code are tested to determine if they are fit for use.

Unit tests are basically written and executed by software developers to make sure that code meets its design and requirements and behaves as expected.

The goal of unit testing is to segregate each part of the program and test that the individual parts are working correctly.

This means that for any function or procedure when a set of inputs are given then it should return the proper values. It should handle the failures gracefully during the course of execution when any invalid input is given.

2. Integration Testing

The objective is to take unit tested components and build a program structure that has been dictated by design. Integration testing is the testing in which a group of components are combined to produce output. Integration testing is a level of software testing where individual unit are combined and tested as a group. The purpose of this level of testing is to expose faults in the interaction between integrated units. Test drivers and test stubs are used to assist in Integration Testing. Bottom Up is an approach to Integration Testing where bottom level units are tested first and upper level units step by step after that. This approach is taken where bottom-up development approach is followed. Test Drivers are needed to simulate higher level units which may not be available during the initial phases.

Test case	Expected Result	Actual Result	Remark
Librarian Login	The Homepage of librarian opens.	Librarian's homepage opens after checking password.	Successful
Student Login	The Homepage of student opens.	Student's homepage opens.	Successful
Password check	Librarian's page opens if the password is correct.	Librarian's page opens.	Successful
Librarian adds new student	New user and their details get added to the system.	Student gets added.	Successful
Librarian adds new book	New book and its details get added to the system.	Book gets added.	Successful
Issue Books	A book is issued to the student according to their ID.	Books get issued.	Successful
Student demand books.	A new file for demanded books gets created.	Books are demanded which librarian can see.	Successful
Librarian manages the students.	Librarian gets to update students.	Students get modified	Successful
Librarian manages the books.	Librarian gets to update books.	Books get modified	Successful
Librarian deletes the book	Librarian gets to delete the records of the book	Books get deleted	Successful
Librarian deletes the student	Librarian gets to delete the records of the student	Student's record get deleted	Successful

Fine	A fine of rupees 5 per day is generated if the student fails to return the book on time	Fine gets generated	Successful
Reports	A reports is generated according to the books issue, returned, added, deleted, members added, deleted, etc.	A Report is created	Successful

Cost and Benefit Analysis

Function Point Analysis

Function Point Analysis provides standardized method to functionally size the software work product. This work product is the output of software new development and improvement projects for subsequent releases. The Function Point Analysis technique is used to analyze the functionality delivered by the software and Unadjusted Function Point is the unit of measurement.

Counting Function Point (FP):

- Step 1:

  F = 14 * scale

  Scale varies from 0 to 5 according to character of Complexity Adjustment Factor (CAF). Below data shows scale:

  0- No Influence
  1- Incidental
  2- Moderate
  3- Average
  4- Significant
  5- Essential

  Our Project complexity is Moderate so scale = 2

  F = 14*2

  F= 28

- Step 2:
  Calculate Complexity Adjustment Factor
  CAF = 0.65 + (0.01 * F)
  CAF = 0.65 + (0.01 * 28)
  CAF = 0.65 + 0.28
  CAF = 0.93

- Step 3:
  Calculate Unadjusted Function Point (UFP)

  1. EI (External Input) – EI processes data or control information that comes from outside the application's boundary. The EI is an elementary process.
  2. EO (External Output) – EO is an elementary process that generates data or control information sent outside the application's boundary.
  3. EQ (External Inquiries) – EQ is an elementary process made up of an input-output combination that results in data-retrieval.
  4. ILF (Internal Logical File) – A user identifiable group of logically related data or control information maintained within the boundary of the application.
  5. EIF (External Interface File) – A group of user recognizable logically related data allusion to the software but maintained within the boundary of software.

Function Units	Low	Avg	High
EI	3	4	6
EO	4	5	7
EQ	3	4	6
ILF	7	10	15
EIF	5	7	10

  Multiply each individual function point to corresponding values in the table.
  In our Project the following estimates have been obtained:
  EI: 1 low (Login) and 8 avg (Search book, add, update, delete, etc.)
  EO: 1 low (Login) and 4 avg (Show Book Details, Display Fine, Show Available Books, etc.)
  EQ: 2 avg (Validate Student information, Student Lists)
  ILF: 2 low (All Files)
  EIF: 1 high (Application to files)

Function Units	Low	Avg	High	Total
EI	1*3=3	8*4=32	0*6=0	35
EO	1*4=4	4*5=20	0*7=0	24
EQ	0*3=0	2*4=8	0*6=0	08
ILF	2*7=14	0*10=0	0*15=0	14
EIF	0*5=0	0*7=0	1*10=20	10

  Total Unadjusted Function Points = 91

- Step 4:

Calculate Function Point
FP = UFP * CAF
FP = 91*0.93
FP = 84.63

Function Point = 84.63

Source Lines of Code (SLOC) = FP * LF
Where, LF is the Language Factor.
Language Factor for C++ is 53
So,
SLOC = 84.63* 53
SLOC = 4485
So,
KSLOC = 4

For Application Programs,
Programmer Productivity = 2.4*(KLOC) ^1.05 PM
= 2.4*4.485 ^1.05 PM
= **11.60 PM**

Development Time = 2.5 * (PM) ^ 0.38
= 6.34 Months
= **6 Months**

Since this is an academic project and we work around 4 hours per week for it,

So, we work around 16 hours per month

So, considering the amount of work done, suppose cost of Programmer per Month = 1800

Total Cost of Programmers = 2* 1800 = 3600

Total Cost of the Project = 3600*6

= **Rs 21600**

Conclusion

- The proposed system works fine as planned.
- The Library Management System allows the user to store the book details and also the details of the students.
- The System also allows storing the details of all the data related to the library.
- The implementation of the system reduces the time of the entry of data and provides readily faster outputs.
- The system also provides readily calculated reports.
- The software takes care of all the requirements of a library and is capable to provide easy and effective storage of information related to books and users.
- The performance of the system turned out to be good. In future, the application can be implemented in larger library systems.

FUTURE WORK

1. The entire project of “Library Management System” is a Desktop application project. We can make this project as an Android application which is very helpful to the user and library authority.
2. Project can be further enhanced with the facility to run project on multiple machines (LAN), so that more than one library for the same institutions can be connected through same database and controlled by same mechanism.
3. We can use barcode scanner for scanning books and student's ID card.
4. Various features such as online lecture video tutorial can be added by teachers as well as online assignment submission facilities, a feature of group chat where students can discuss various study related problems.

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