LAB REPORT

Submitted by

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BONAFIDE CERTIFICATE

Certified that this lab report titled **"Library Management System"** is the bonafide work done by **Riya Singh(RA2011031010044)** who carried out the lab exercises under my supervision. Certified further, that to the best of my knowledge the work reported herein does not form part of any other work.

SIGNATURE

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Examiner I   Examiner II

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CONTRIBUTION

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| REG. NO.	NAME	CONTRIBUTION TO THIS PROJECT
RA2011031010021	SALONI SMRITI	ALGORITHM & SOURCE CODE & TIME COMPLEXITY
RA2011031010044	RIYA SINGH	EXPLANATION OF ALGORITHM & DOCUMENTATION & TIME COMPLEXITY

PROBLEM DEFINITION

Library Management System is software that handles the entire data of the library. It makes the work of a librarian very easy instead of writing data in a notebook. In past, the librarians were using notebooks to write the data from books along with the student's name who borrowed that book. So, it was very difficult to keep track of each and every book.

If a librarian wants to search for a particular book, then that task was very time consuming. So, to make this task easy the programming languages were developed and the C++ language is one of them.
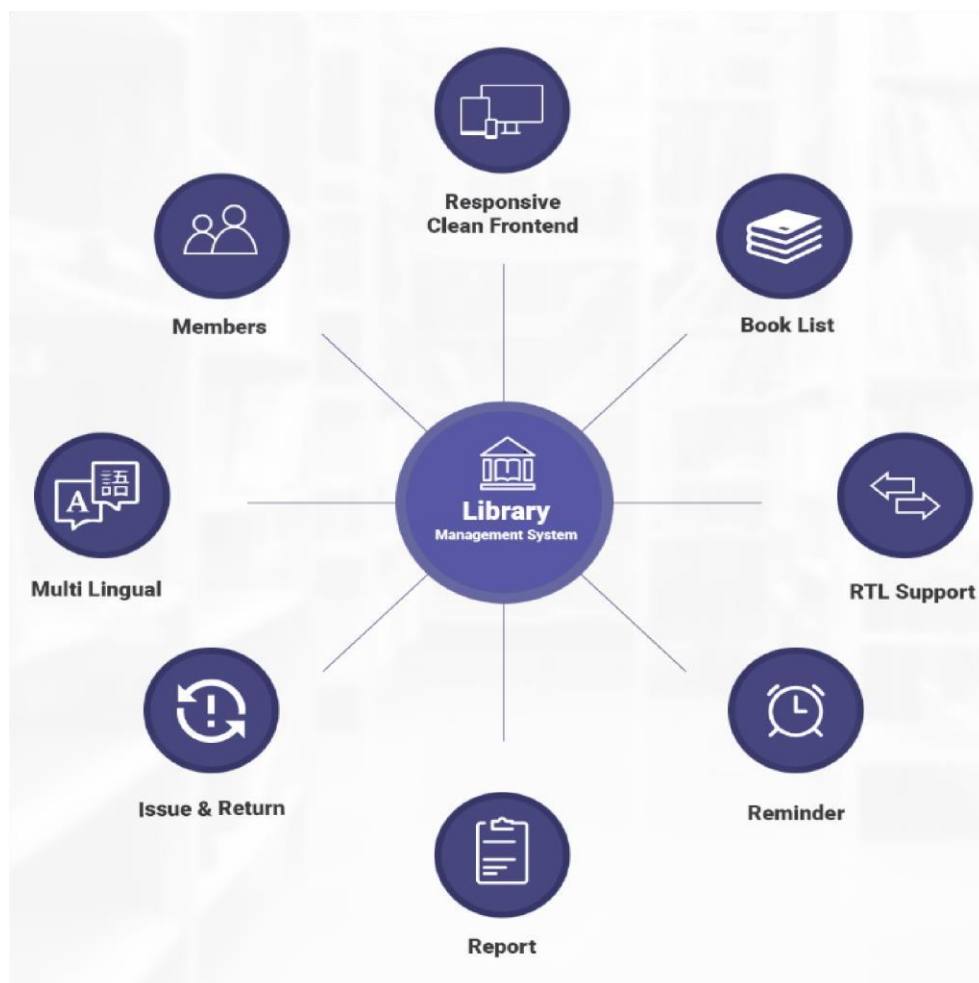
PROJECT EXPLANATION AND DIAGRAM

A library is a pool of sources of information. These similar resources had made a well-defined community including readers, students, etc. to refer or to borrow the book more conveniently. The Library Management System Software for Library Management is used to find books and access journals easily. The library automation system automates the typical procedures of libraries and reduces the workload for library staff. It makes the consistency of the record and the standard quality. When people value information more and more, the information industry got developed and technology changed the expectations of library patrons. It gives both an opportunity and challenge to the libraries. The integrated library system is used to manage the more-complex activities and it enables the librarian to manage library resources in a more effective way to save time and effort.
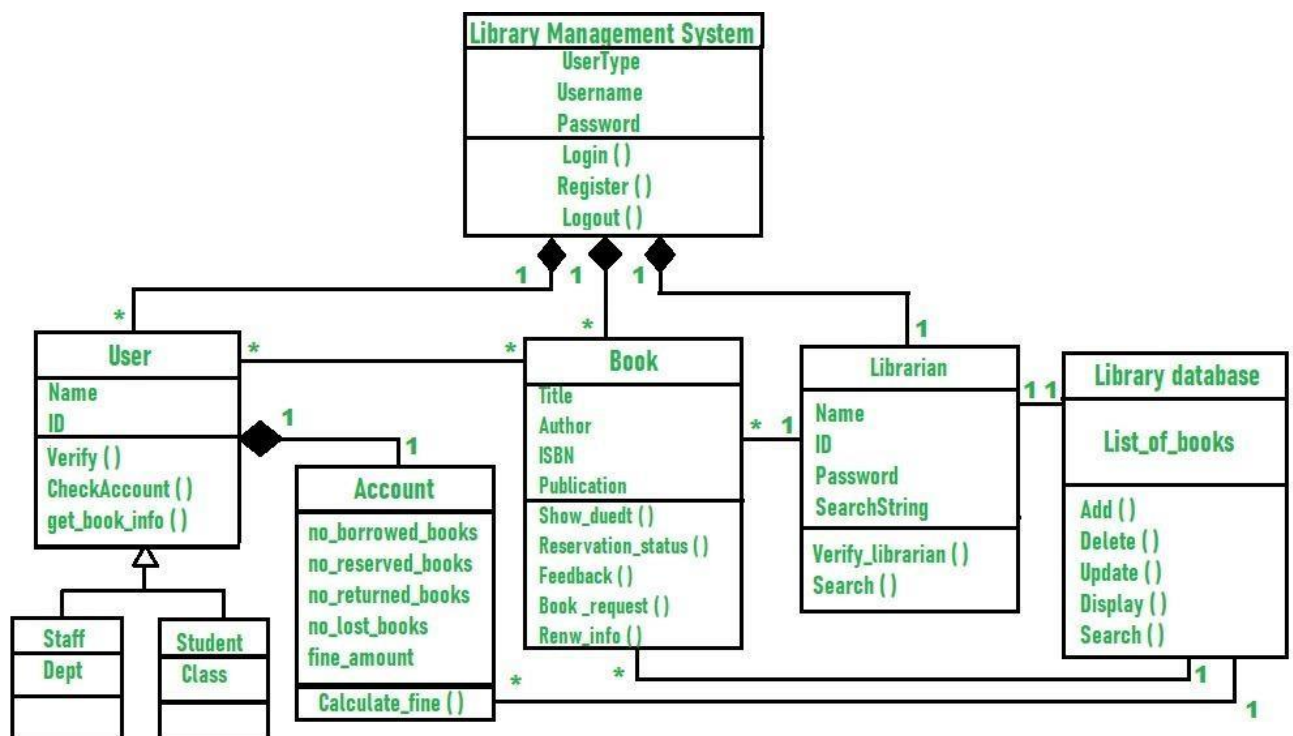
CLASS DIAGRAM FOR LIBRARY MANAGEMENT SYSTEM

DESIGN TECHNIQUE (DIVIDE & CONQUER)

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In the divide and conquer approach, a problem is divided into smaller problems, then the smaller problems are solved independently, and finally, the solutions of smaller problems are combined into a solution for the large problem. Generally, divide-and-conquer algorithms have three parts :-

- Divide the problem into a number of sub-problems that are smaller instances of the same problem.
- Conquer the sub-problems by solving them recursively. If they are small enough, solve the sub-problems as base cases.
- Combine the solutions to the sub-problems into the solution for the original problem.

ALGORITHM

Main function steps

1. Start with welcome screen

2. Get the password from the user

3. Check password.

   Is password correct

   Yes:-goto step 4

   No:-print wrong message and goto step 2

4. Display main menu as below

   - 1. add books.
   - 2. delete books
   - 3. search books
   - 4. issue books
   - 5. view book list
   - 6. edit book's record
   - 7. close application

5. Get choice from user

   Choice:-1 call function addbook

   Choice:-2 call function deletebook

   Choice:-3 call function searchbook

   Choice:-4 call function Issuebooks

   Choice:-5 call frnction viewbook

   Choice:-6 call function editbooks

   Choice:-7 goto step 6

6.stop

EXPLANATION OF ALGORITHM

Addbook function

Steps

1. declare file pointer 'fp'

2. display categories of book to be added

3. Get option from user. If user wants to add books

      Yes:- goto step 3

      No:- go back to main menu

4. Open file 'fp' to write

5. Assign the pointer to the end of the file to write

6. Get data from user

7. Write input data on a file

8. Close file

9. Print option to add another books

      Yes:- goto step 1

      No:- go back to main menu

Deletebook function

Steps

1. Get book ID from user to delete

2. Declare file pointer 'ft'

3. Open file 'fp' to read

4. Assign the pointer to the beginning of the file to be read 5. Loop until 'End of file' is not encountered read data from   file.

6. Is user input book id= book ld on a file

       Yes:- a) Open 'ft' file and copy all data of 'fp' file in ft'file
       except that data which we want to delete

          b) Delete 'fp' file and rename ft file by fp' file name   and
          goto step 7

       No:- Print error message and close file and go back to
          main menu

7. Close file

8. Print option to delete another book

       Yes:- goto step l

       No:- go back to main menu

Searchbook function

Steps :-

1. Display option for search

      i.   Search by id

     ii.   Search by book name

2. Open the fie 'fp' to read

3. Assign the pointer to the beginning of the file to be read

4. If option is search by id

- Get book id from user
- Loop until 'End of file' is not encountered read data from file
- Is user input book id=book id on a file

          Yes:- Display all information about that book id and goto step 6 No:-

          Print sorry message and goto step 6

5. If option is search by book name

- Get book name from user
- Loop until 'End of file' is not encountered read data from file
- If user input book name = book name on a file

          Yes:- Display all information about that book and goto step 6

          No:- Print sorry message and goto step 7

6. Close file

7. Display option to search another book

Issuebook function

Steps :-

1. Display option as below

     i.   Issue book

     ii.   View issued book

     iii.   Search issued book

     iv.   Remove issued book

2. Open 'fs' file
3. Assign the pointer to the beginning of the file to be read
4. Get choice from user

    Choice-1

       a. Get book id from user

       b. Loop until 'End of file' is not encountered read data from file

       c. Is input book id=book id on a file

            Yes:- Get student name whom book has to issue

            No:- Print sorry message and goto step e

       d. Write information of student and issued data on a file

       e. Display option to issue another book

            Yes:-goto step a

            No:-goto step 5

Editbook function

Steps :-

1. Get book id to be edited from user

2. Open file 'fs'

3. Assign the pointer to the beginning of the file to be read

4. Loop until 'End of file is not encountered read data from

5. Call function checkid. Is checkid=1

       Yes:-goto step 6

       No:-display sorry message and goto step 7

6. i. Get new data from user of that book which to be edited

  ii. Assign the pointer to the current position

  iii. Overwrite the new data on old data of that book and goto step 7

       No:- Display sorry message and goto step 7

7. Close file

8. Display option to edit another book

       Yes:-goto step 1

       No:-goto step 8

9. Go back to main menu

Viewbook function

Steps :-

1. Open 'fs' file

2. Assign the pointer to the beginning of the file to be read

3. Loop until 'End of file' is not encountered read data from file

4. Display list of all book with complete information

5. Show total number of books in library

6. Close file

7. Go back to main menu

Getdata function

Steps :-

1. Print "Enter information below"

2. Get categories from user

3. Get book id

4. Call function checkid. Is checkid=0

       Yes:- goto step 6

       No:- goto step 5

5. Get book name, book author name, quantity, price and rack no. where that book located from the user.

6. Go back to main menu

   This function get data from the user for all information of book.

Password function

Steps :-

1. Declare two string 'pass' and password=sharda"

2. Print "Enter the password".

3. Until user entered the enter key get character for user

4. Store input character in string "pass"

5. Compare two string 'pass' and 'password' Is both equal

      Yes:- goto step 6

      No:- print error message and goto step 2

6. Print password match message

7. Goto main menu

COMPLEXITY ANALYSIS

The main problem is of size n and time to solve it is cn.
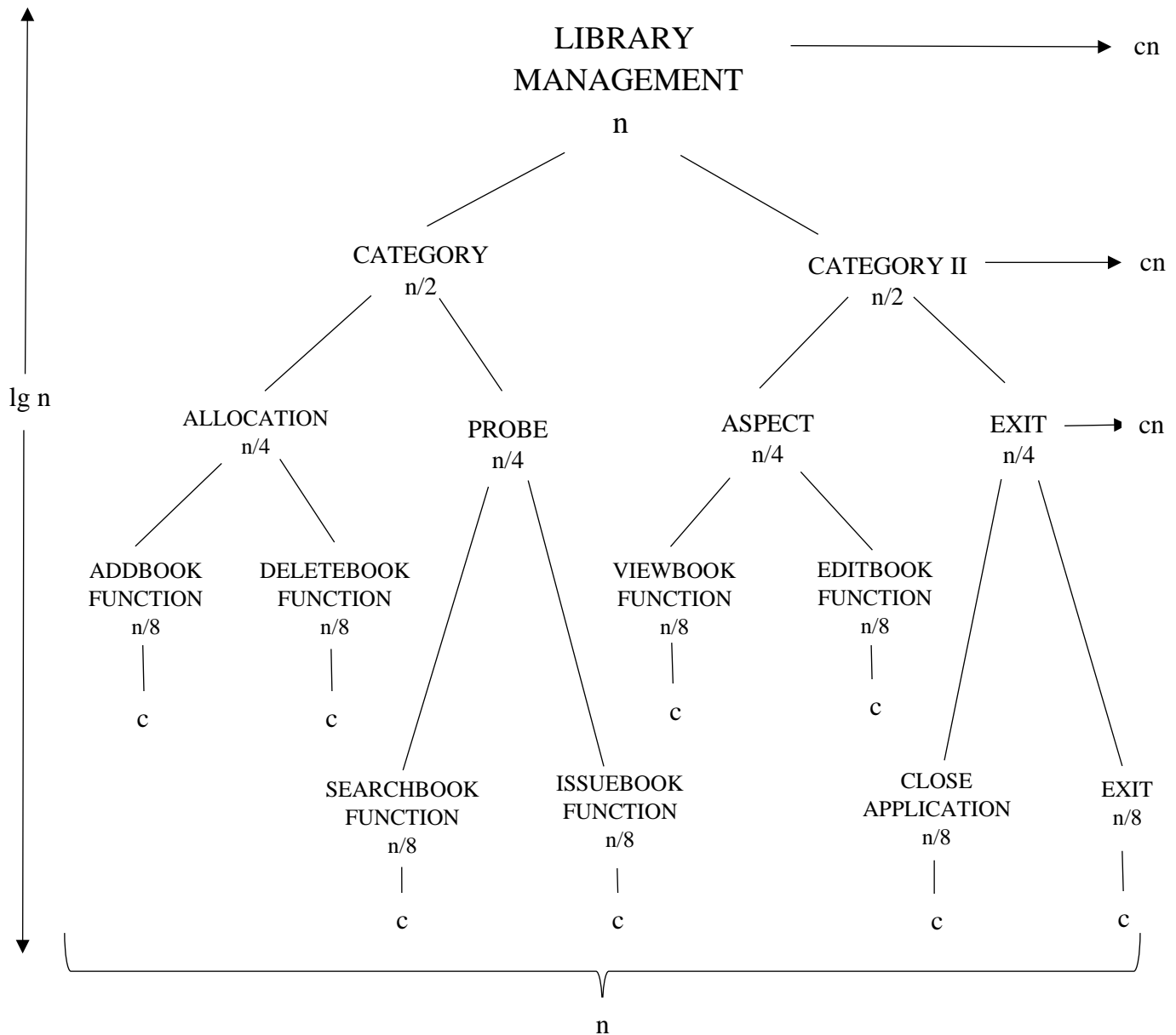The next level cut the problem in half and each problem can be solved in cn/2 ,
but there are 2 such problems so $2 \times cn/2 = cn$

Each level take cn time to solve the problem.

The tree has log n + 1 levels and log is used
because the problem is divided in power of two. Therefore,

$= cn (\log n + 1)$
$= cn \log n + cn + O(n)$

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lg n
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LIBRARY
MANAGEMENT
n
→ cn

CATEGORY
n/2

CATEGORY II → cn
n/2

ALLOCATION
n/4

PROBE
n/4

ASPECT
n/4

EXIT → cn
n/4

ADDBOOK
FUNCTION
n/8

DELETEBOOK
FUNCTION
n/8

VIEWBOOK
FUNCTION
n/8

EDITBOOK
FUNCTION
n/8

c

c

c

c

SEARCHBOOK
FUNCTION
n/8

ISSUEBOOK
FUNCTION
n/8

CLOSE
APPLICATION
n/8

EXIT
n/8

c

c

c

c

n

EQUATION SATISFIED BY *T(N)*.

Assume that the size of the input problem increases with an integer n. Let $T(n)$ be the time complexity of a divide-and-conquer algorithm to solve this problem. Then $T(n)$ satisfies an equation of the form:

$$T(n) = a\, T(n/b) + f(n).$$

where $f(n)$ is the cost of the combine-part, $a >= 1$ is the number of recursively calls and n/b with $b > 1$ is the size of a sub-problem.

LABELED TREE ASSOCIATED WITH THE EQUATION.

Assume n is a power of b, say $n = b^p$. To *solve* this equation we can associate a labelled tree A(n) to it as follows.

(1) If $n = 1$, then A(n) is reduced to a single leaf by labeled $T(1)$.
(2) If $n > 1$, then the root of A(n) is labeled by $f(n)$ and A(n) possesses a labeled sub-trees all equal to A(n/b).

The labelled tree A(n) associated with $T(n) = a\,T(n/b) + f(n)$ has height $p + 1$.
Moreover, the sum of its labels is $T(n)$.

IMPLEMENTATION OF THE GIVEN RELATION:

- Consider the relation:

$$T(n) = 2\,T(n/2) + n^2.$$

- We obtain:

$$T(n) = n^2 + n^2/2 + n^2/4 + n^2/8 + \cdots + n^2/2p + n\,T(1).$$

- Hence, we have:

$$T(n) \in \Theta\,(n^2).$$

- Consider the relation:

$$T(n) = 3T(n/3) + n.$$

- We obtain:

$$T(n) \in \Theta(\log_3(n)n).$$

(i)　　$S(2\,n) \geq 2S(n)$ **and** $S(n) \geq n.$

(ii)　　**If** $n = 2^p$ **then** $T(n) \leq a\,T(n/2) + S(n).$

Then for $n = 2^p$ we have

(1) if $a = 1$ then

$$T(n) <= (2 - 2/n) \, S(n) + T(1) \in \Theta \; (S(n)),$$

(2) if $a = 2$ then

$$T(n) <= S(n) \log_2(n) + T(1) \, n \in \Theta \; (\log_2(n) \, S(n)),$$

(3) if $a >= 3$ then

$$T(n) <= 2/(a-2) \; (\, n^{\log_2(a)-1} - 1 \,) \, S(n) + T(1) \, n^{\log_2(a)} \quad \in \Theta \qquad (S(n) \, n^{\log_2(a)-1}).$$

Indeed,

$T(2^p)$	$<=$	$a \, T(2^{p-1}) + S(2^p)$
	$<=$	$a[aT(2^{p-2}) + S(2^{p-1})] + S(2^p)$
	$=$	$a^2 \, T(2^{p-2}) + a \, S(2^{p-1}) + S(2^p)$
	$<=$	$a^2[a \, T(2^{p-3}) + S(2^{p-2})] + a \, S(2^{p-1}) + S(2^p)$
	$=$	$a^3 \, T(2^{p-3}) + a^2 \, S(2^{p-2}) + a \, S(2^{p-1}) + S(2^p)$
	$<=$	$a^p \, T(1) + \sum_{j=0}^{j=p-1} a^j \, S(2^{p-j})$

Moreover,

$S(2^p)$	$\geq$	$2\,S(2^{p-1})$
$S(2^p)$	$\geq$	$2_2\,S(2_{p-2})$
$\vdots$	$\vdots$	$\vdots$
$S(2^p)$	$\geq$	$2_j\,S(2_{p-j})$

Thus,

$$\sum_{j=0}^{j=p-1} a^j\,S(2^{p-j}) \;\leq\; \sum_{j=0}^{j=p-1} S(2^p)$$

(a/2)^j

Hence,

$$T(2^p) \;\leq\; a^p\,T(1) + \sum_{j=0}^{j=p-1} S(2^p) \qquad \textbf{(a/2)\textasciicircum j}$$

For $a = 1$ we obtain

$T(2^p)$	$\leq$	$T(1) + S(2^p) \displaystyle\sum_{j=0}^{j=p-1} (1/2)\text{\textasciicircum}j$
	$=$	$T(1) + S(2^p)\,((1/(2\text{\textasciicircum}p)\text{-}1)/(1/2)\text{-}1)$
	$=$	$T(1) + S(n)\,(2 - 2/n).$

For $a = 2$ we obtain

$$T(2^p) \leq 2^p\,T(1) + S(2^p)\,p \;\; = \boldsymbol{n}$$
$$\boldsymbol{T(1) + S(n)\,\log_2(n).}$$

CONCLUSION

This System of Library Management provides a computerized version of the library management system which will benefit the students as well as the staff of the library.

It makes the entire process online where students can search books, staff can generate reports, and do book transactions. It also has a facility for student login where students can log in and can see the status of books issued as well as request books or give some suggestions. It has a facility of teacher's login where teachers can add lecture notes and also give necessary suggestions to the library and also add info about workshops or events happening in our college or nearby college on the online notice board.

There is the future scope of this facility has many more features such as online lectures and video tutorials that can be added by teachers as well as online assignments submission facility with different sections. Thus making it more interactive, and more user-friendly. Thus this project fulfills each user's need in the best way possible.

REFERENCES

In order to successfully complete this project, I took help from a number of resources which helped me throughout the project Following are the list of references that were required in order to document the project successfully: -

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