

LIBRARY MANAGEMENT SYSTEM



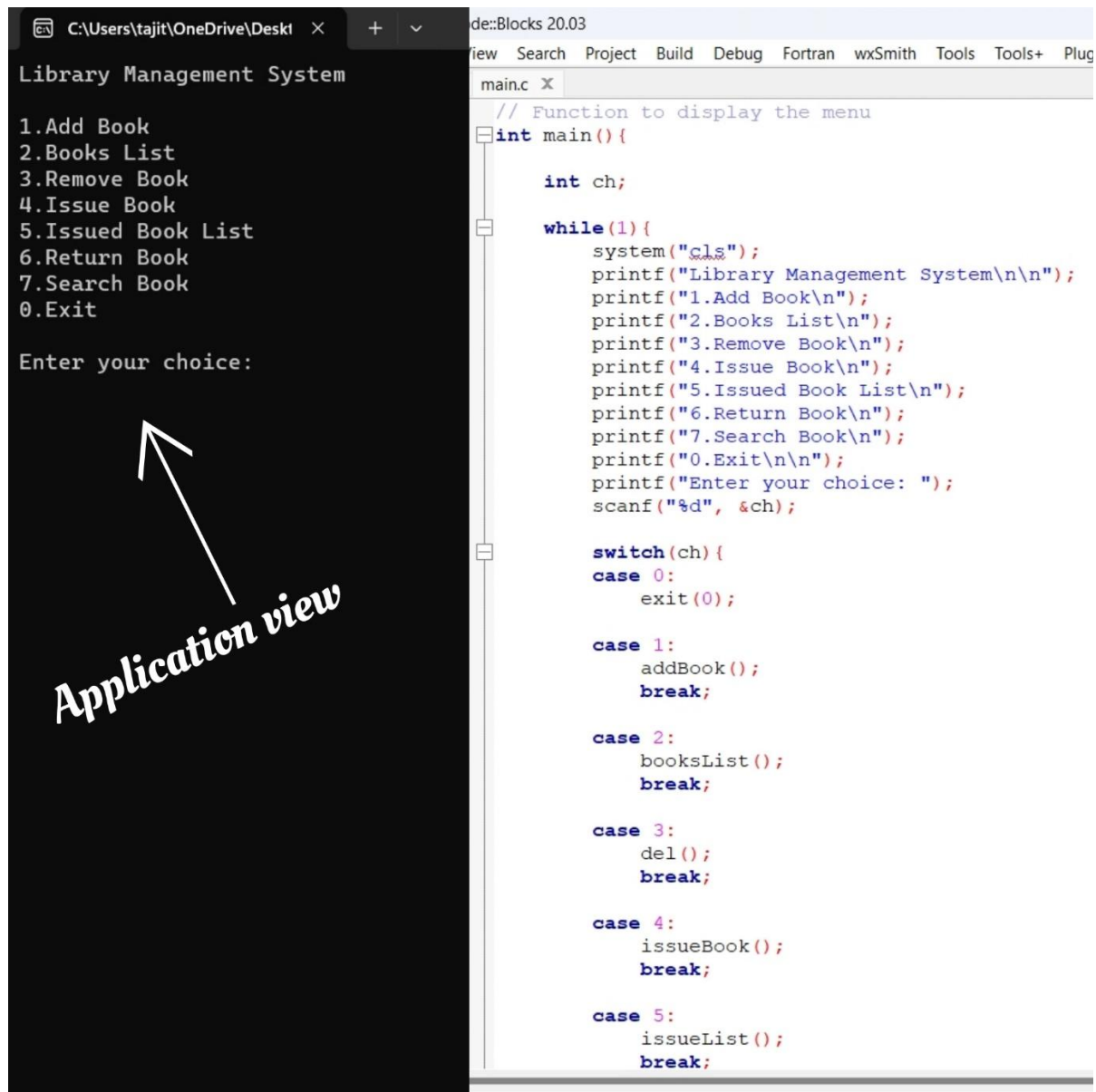
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1. Fulfilled requirements with an explanation and a screenshot of the codes.

1.1 Main Menu (main function)



```
// Function to display the menu
int main() {

    int ch;

    while(1){
        system("cls");
        printf("Library Management System\n\n");
        printf("1.Add Book\n");
        printf("2.Books List\n");
        printf("3.Remove Book\n");
        printf("4.Issue Book\n");
        printf("5.Issued Book List\n");
        printf("6.Return Book\n");
        printf("7.Search Book\n");
        printf("0.Exit\n\n");
        printf("Enter your choice: ");
        scanf("%d", &ch);

        switch(ch){
            case 0:
                exit(0);

            case 1:
                addBook();
                break;

            case 2:
                booksList();
                break;

            case 3:
                del();
                break;

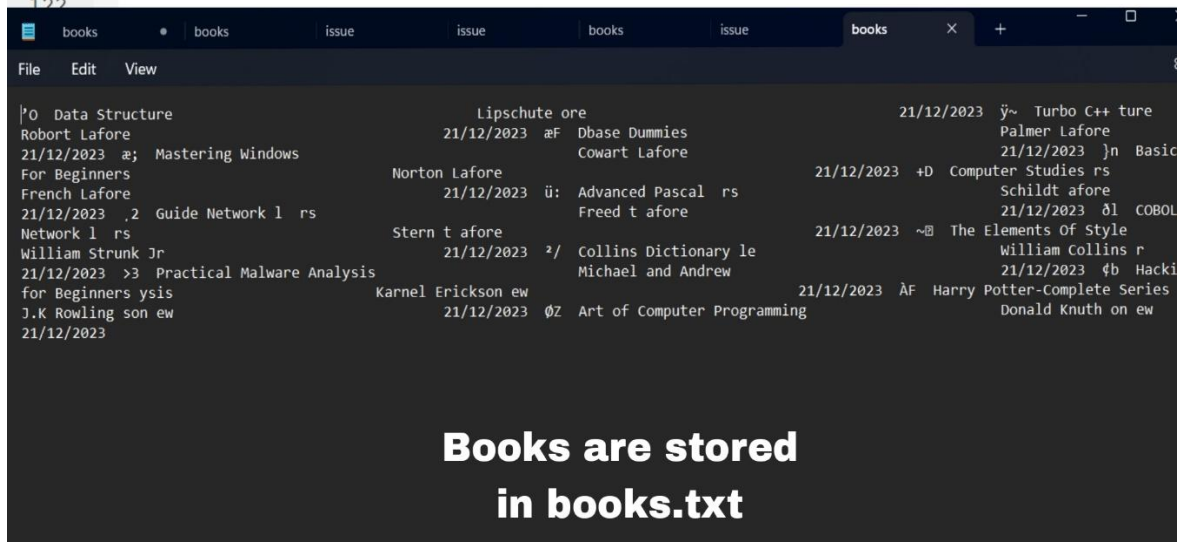
            case 4:
                issueBook();
                break;

            case 5:
                issueList();
                break;
        }
    }
}
```

- The main function displays a menu for a library management system.
- It uses a 'switch' statement to handle different user choices.
- It incorporates a perpetual loop, allowing the user to perform multiple operations until choosing to exit.

1.2 Adding a Book (addBook function)

```
96 // Function to add a book to the library
97 void addBook(){
98     char myDate[12];
99     time_t t = time(NULL);
100     struct tm tm = *localtime(&t);
101     sprintf(myDate, "%02d/%02d/%d", tm.tm_mday, tm.tm_mon+1, tm.tm_year + 1900);
102     strcpy(b.date, myDate);
103
104     fp = fopen("books.txt", "ab");
105
106     printf("Enter book id: ");
107     scanf("%d", &b.id);
108
109     printf("Enter book name: ");
110     fflush(stdin);
111     gets(b.bookName);
112
113     printf("Enter author name: ");
114     fflush(stdin);
115     gets(b.authorName);
116
117     printf("Book Added Successfully");
118
119     fwrite(&b, sizeof(b), 1, fp);
120     fclose(fp);
121 }
122
```

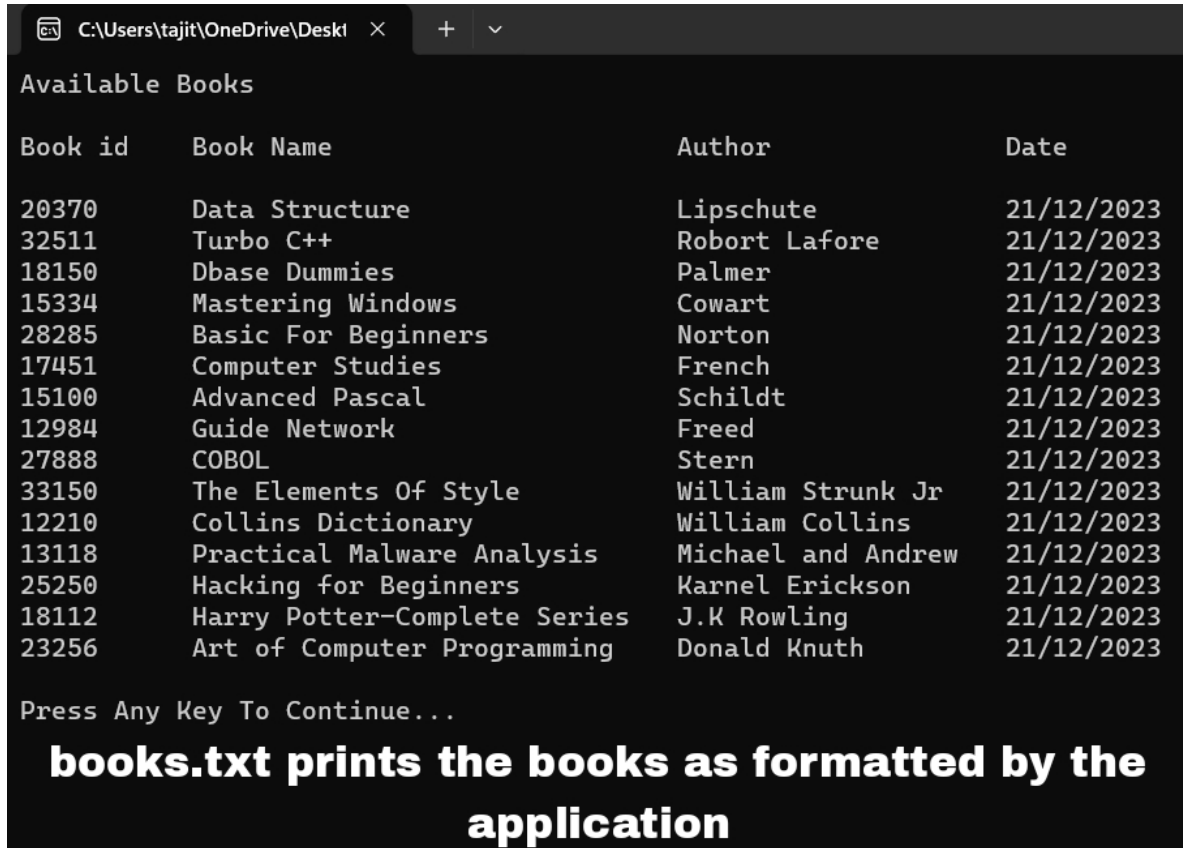


- To add a book to the library, use the 'addBook' function.
- It captures current date and time and associates it with the book.
- Book details are entered by the user and saved in a binary file called ("books.txt").
- Uses 'sprintf' and 'strcpy' functions to format and copy date information.

1.3 Displaying Books (booksList function)

```
123
124 // Function to display all books in the library
125 void booksList(){
126
127     system("cls");
128     printf("Available Books\n\n");
129     printf("%-10s %-30s %-20s %s\n\n", "Book id", "Book Name", "Author", "Date");
130
131     fp = fopen("books.txt", "rb");
132     while(fread(&b, sizeof(b), 1, fp) == 1){
133         printf("%-10d %-30s %-20s %s\n", b.id, b.bookName, b.authorName, b.date);
134     }
135
136     fclose(fp);
137 }
```

- The 'booksList' function displays all available books.
- Reads book details from the "books.txt" file and prints them in a formatted manner.



```
Available Books
```

Book id	Book Name	Author	Date
20370	Data Structure	Lipschute	21/12/2023
32511	Turbo C++	Robert Lafore	21/12/2023
18150	Dbase Dummies	Palmer	21/12/2023
15334	Mastering Windows	Cowart	21/12/2023
28285	Basic For Beginners	Norton	21/12/2023
17451	Computer Studies	French	21/12/2023
15100	Advanced Pascal	Schildt	21/12/2023
12984	Guide Network	Freed	21/12/2023
27888	COBOL	Stern	21/12/2023
33150	The Elements Of Style	William Strunk Jr	21/12/2023
12210	Collins Dictionary	William Collins	21/12/2023
13118	Practical Malware Analysis	Michael and Andrew	21/12/2023
25250	Hacking for Beginners	Karnel Erickson	21/12/2023
18112	Harry Potter-Complete Series	J.K Rowling	21/12/2023
23256	Art of Computer Programming	Donald Knuth	21/12/2023

Press Any Key To Continue...

books.txt prints the books as formatted by the application

1.4 Removing a Book (del function)

```
138 // Function to remove a book from the library
139 void del() {
140     int id, f = 0;
141     system("cls");
142     printf("Remove Books\n\n");
143     printf("Enter Book id to remove: ");
144     scanf("%d", &id);
145
146     FILE *ft;
147
148     fp = fopen("books.txt", "rb");
149     ft = fopen("temp.txt", "wb");
150
151     while (fread(&b, sizeof(b), 1, fp) == 1) {
152         if (id == b.id) {
153             f = 1;
154         } else {
155             fwrite(&b, sizeof(b), 1, ft);
156         }
157     }
158
159     if (f == 1) {
160         printf("\n\nDeleted Successfully.");
161     } else {
162         printf("\n\nRecord Not Found !");
163     }
164
165     fclose(fp);
166     fclose(ft);
167
168     remove("books.txt");
169     rename("temp.txt", "books.txt");
170 }
```

- A book is removed by the 'del' function in response to user input.
- It reads books from "books.txt," and doesn't write them to a temporary file if the given book ID is located.
- The temporary file is used in place of the original file following processing.

1.5 Issuing a Book (issueBook function)

```
// Function to display issue book
void issueBook(){
    char myDate[12];
    time_t t = time(NULL);
    struct tm tm = *localtime(&t);
    sprintf(myDate, "%02d/%02d/%d", tm.tm_mday, tm.tm_mon+1, tm.tm_year + 1900);
    strcpy(s.date, myDate);

    int f=0;

    system("cls");
    printf("Issue Books\n\n");

    printf("Enter Book id to issue: ");
    scanf("%d", &s.id);

    fp = fopen("books.txt", "rb");

    while(fread(&b, sizeof(b), 1, fp) == 1){
        if(b.id == s.id){
            strcpy(s.bookName, b.bookName);
            f=1;
            break;
        }
    }

    if(f==0){
        printf("No book found with this id\n");
        printf("Please try again...\n\n");
        return;
    }

    fp = fopen("issue.txt", "ab");

    printf("Enter Student Name: ");
    fflush(stdin);
    gets(s.sName);

    printf("Enter Student Class: ");
    fflush(stdin);
    gets(s.sClass);

    printf("Enter Student Roll: ");
    scanf("%d", &s.sRoll);

    printf("Book Issued Successfully\n\n");

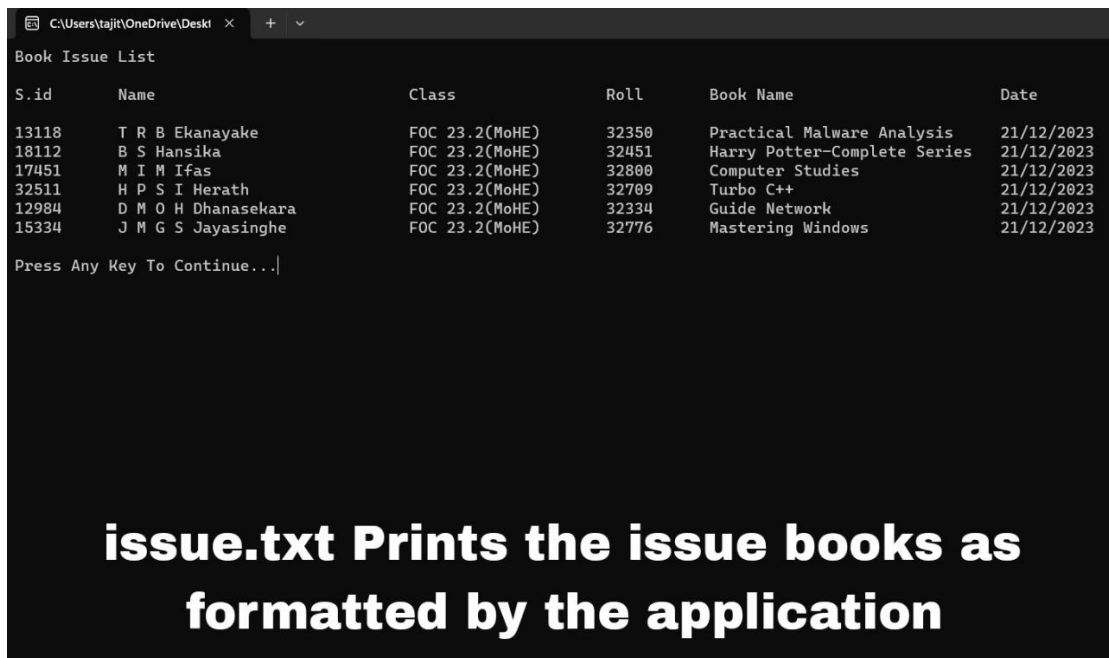
    fwrite(&s, sizeof(s), 1, fp);
    fclose(fp);
}
```

- The 'issueBook' function issues a book to a student.
- It reads the book details from "books.txt," captures the current date, and records the transaction in "issue.txt."

1.6 Displaying Issued Books (issueList function)

```
222
223 // Function to display issue list
224 void issueList(){
225     system("cls");
226     printf("Book Issue List\n\n");
227
228     printf("%-10s %-30s %-20s %-10s %-30s %s\n\n", "S.id", "Name", "Class", "Roll", "Book Name", "Date");
229
230     fp = fopen("issue.txt", "rb");
231     while(fread(&s, sizeof(s), 1, fp) == 1){
232         printf("%-10d %-30s %-20s %-10d %-30s %s\n", s.id, s.sName, s.sClass, s.sRoll, s.bookName, s.date);
233     }
234
235     fclose(fp);
236 }
237
```

- A list of books that have been issued, along with student information and the issue date, is shown by the 'issueList' function.
- reads information from "issue.txt" and outputs structured data.



S.id	Name	Class	Roll	Book Name	Date
13118	T R B Ekanayake	FOC 23.2(MoHE)	32350	Practical Malware Analysis	21/12/2023
18112	B S Hansika	FOC 23.2(MoHE)	32451	Harry Potter-Complete Series	21/12/2023
17451	M I M Ifas	FOC 23.2(MoHE)	32800	Computer Studies	21/12/2023
32511	H P S I Herath	FOC 23.2(MoHE)	32709	Turbo C++	21/12/2023
12984	D M O H Dhanasekara	FOC 23.2(MoHE)	32334	Guide Network	21/12/2023
15334	J M G S Jayasinghe	FOC 23.2(MoHE)	32776	Mastering Windows	21/12/2023

Press Any Key To Continue...

issue.txt Prints the issue books as formatted by the application

1.7 Returning a Book (returnBook function)

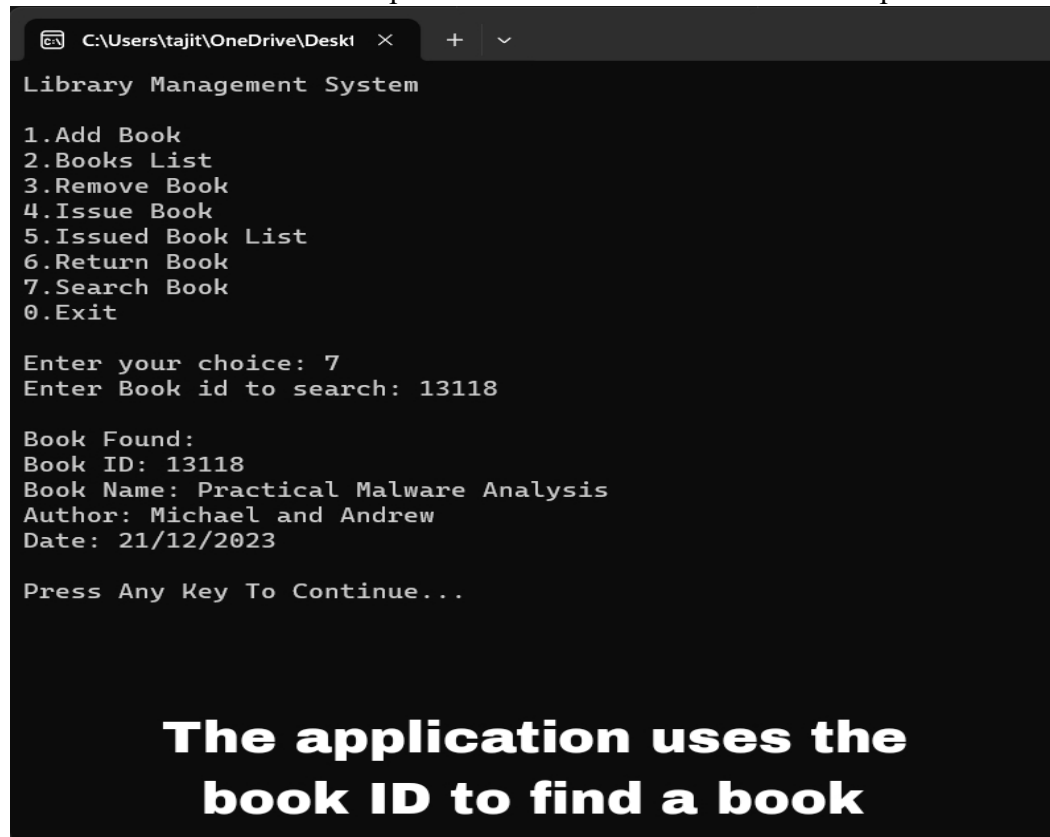
```
238 // Function to return a book
239 void returnBook() {
240     int id, f = 0;
241     system("cls");
242     printf("Return Books\n\n");
243     printf("Enter Book id to return: ");
244     scanf("%d", &id);
245
246     FILE *ft;
247
248     fp = fopen("issue.txt", "rb");
249     ft = fopen("temp_issue.txt", "wb");
250
251     while (fread(&s, sizeof(s), 1, fp) == 1) {
252         if (id == s.id) {
253             f = 1;
254             printf("\n\nBook Returned Successfully.");
255         } else {
256             fwrite(&s, sizeof(s), 1, ft);
257         }
258     }
259
260     if (f == 0) {
261         printf("\n\nBook ID Not Found !");
262     }
263
264     fclose(fp);
265     fclose(ft);
266
267     remove("issue.txt");
268     rename("temp_issue.txt", "issue.txt");
269 }
270
```

- The 'returnBook' function processes the return of a book.
- It reads from "issue.txt," and it doesn't write to a temporary file if the given book ID is located.
- The temporary file is used in place of the original file following processing.

1.8 Searching for a Book (searchBook function)

```
271 // Function to search book
272 void searchBook() {
273     int id, found = 0;
274
275     printf("Enter Book id to search: ");
276     scanf("%d", &id);
277
278     fp = fopen("books.txt", "rb");
279
280     while (fread(&b, sizeof(b), 1, fp) == 1) {
281         if (id == b.id) {
282             found = 1;
283             printf("\nBook Found:\n");
284             printf("Book ID: %d\nBook Name: %s\nAuthor: %s\nDate: %s\n", b.id, b.bookName, b.authorName, b.date);
285             break;
286         }
287     }
288
289     fclose(fp);
290
291     if (!found) {
292         printf("\nBook not found with ID: %d\n", id);
293     }
294 }
295
```

- The 'searchBook' function allows the user to search for a book by its ID.
- It reads from "books.txt" and prints the details if the book with the specified ID is found.



```
C:\Users\tajit\OneDrive\Desktop > Library Management System
1.Add Book
2.Books List
3.Remove Book
4.Issue Book
5.Issued Book List
6.Return Book
7.Search Book
0.Exit

Enter your choice: 7
Enter Book id to search: 13118

Book Found:
Book ID: 13118
Book Name: Practical Malware Analysis
Author: Michael and Andrew
Date: 21/12/2023

Press Any Key To Continue...
```

The application uses the book ID to find a book

2. Where and How to Use Best Practices

2.1 Modularization

- The code is modularized using functions, which improves readability and maintainability. Each function serves a specific function.

2.2 Switch Statement

- Using a 'switch' statement instead of several if statements improve readability and maintainability in the main menu.

2.3 Best Practices for File Handling

- File operations ('fopen', 'fclose', 'fwrite', 'fread') are enclosed in appropriate blocks and error handling is minimal but present, ensuring robust file handling.

2.4 Time Handling

- To ensure correct timestamping, it's a good idea to capture and format the current date using 'time.h'.

2.5 User Input Handling

- By properly handling and validating user input, the possibility of unexpected behavior is decreased.

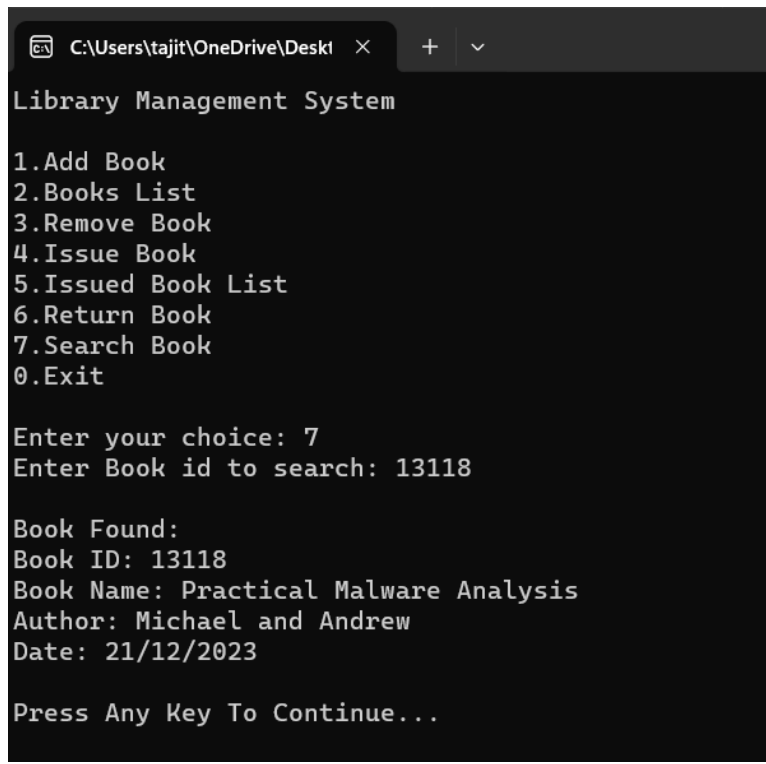
2.6 Formatted Output

- Readability is improved when book and issue details are displayed using prepared output.

3. Additional Features Added

3.1 Search Book (searchfunction)

- Allows users to search for a book by its ID, providing details if found.



```
C:\Users\tajit\OneDrive\Desktop > Library Management System

1.Add Book
2.Books List
3.Remove Book
4.Issue Book
5.Issued Book List
6.Return Book
7.Search Book
0.Exit

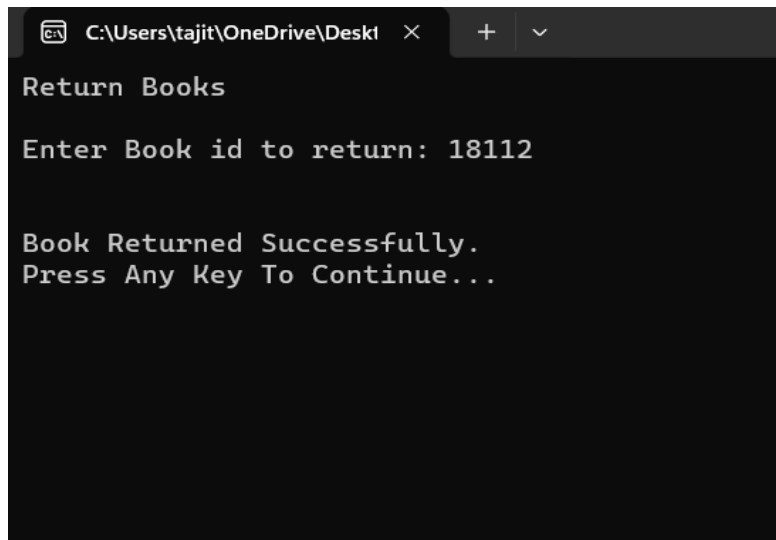
Enter your choice: 7
Enter Book id to search: 13118

Book Found:
Book ID: 13118
Book Name: Practical Malware Analysis
Author: Michael and Andrew
Date: 21/12/2023

Press Any Key To Continue...
```

3.2 Return Book (returnBook function)

- Enables users to return a book, updating the issue records.



```
C:\Users\tajit\OneDrive\Desktop > Return Books

Enter Book id to return: 18112

Book Returned Successfully.
Press Any Key To Continue...
```

C:\Users\tajit\OneDrive\Desktop

Book Issue List

S.id	Name	Class	Roll	Book Name	Date
13118	T R B Ekanayake	FOC 23.2(MoHE)	32350	Practical Malware Analysis	21/12/2023
18112	B S Hansika	FOC 23.2(MoHE)	32451	Harry Potter-Complete Series	21/12/2023
17451	M I M Ifas	FOC 23.2(MoHE)	32800	Computer Studies	21/12/2023
32511	H P S I Herath	FOC 23.2(MoHE)	32709	Turbo C++	21/12/2023
12984	D M O H Dhanasekara	FOC 23.2(MoHE)	32334	Guide Network	21/12/2023
15334	J M G S Jayasinghe	FOC 23.2(MoHE)	32776	Mastering Windows	21/12/2023

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Before returning the book

C:\Users\tajit\OneDrive\Desktop

Book Issue List

S.id	Name	Class	Roll	Book Name	Date
13118	T R B Ekanayake	FOC 23.2(MoHE)	32350	Practical Malware Analysis	21/12/2023
17451	M I M Ifas	FOC 23.2(MoHE)	32800	Computer Studies	21/12/2023
32511	H P S I Herath	FOC 23.2(MoHE)	32709	Turbo C++	21/12/2023
12984	D M O H Dhanasekara	FOC 23.2(MoHE)	32334	Guide Network	21/12/2023
15334	J M G S Jayasinghe	FOC 23.2(MoHE)	32776	Mastering Windows	21/12/2023

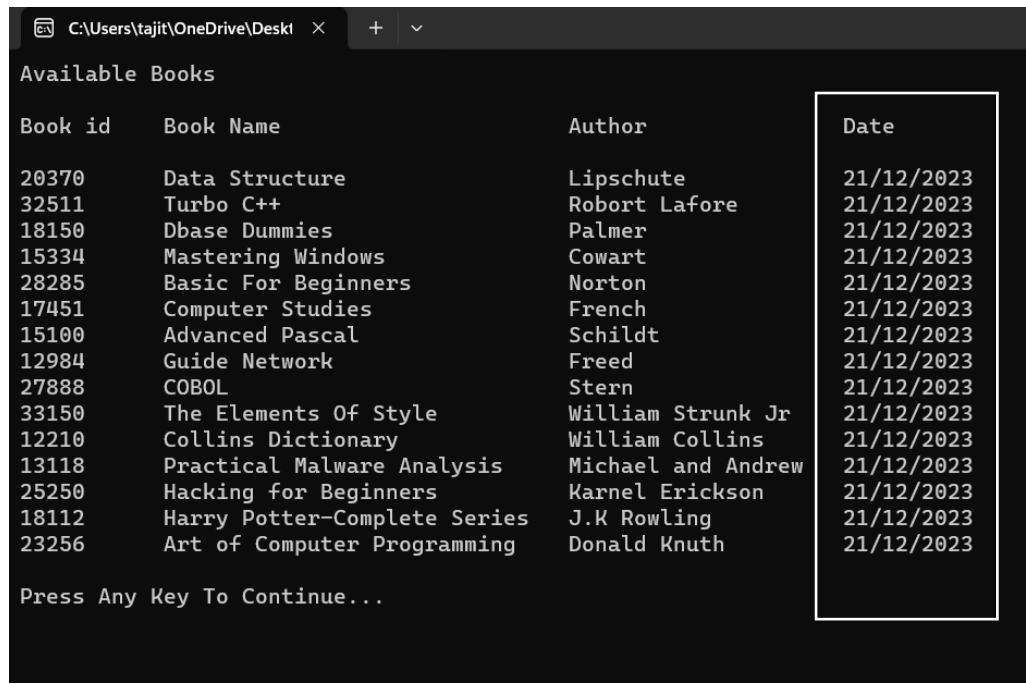
Press Any Key To Continue...

After returning the book

- Following the book's return, Book id 18112 is automatically removed from the list of issued books.

3.3 Timestamping

- Timestamps are added for both book addition and book issuance, providing a record of when actions were performed.



The screenshot shows a Windows terminal window with the title bar "C:\Users\tajit\OneDrive\Deskt". The terminal displays a table titled "Available Books". The table has four columns: "Book id", "Book Name", "Author", and "Date". The "Date" column is highlighted with a white border. The table contains 18 rows of book data, all with a date of "21/12/2023". Below the table, the text "Press Any Key To Continue..." is displayed.

Book id	Book Name	Author	Date
20370	Data Structure	Lipschute	21/12/2023
32511	Turbo C++	Robert Lafore	21/12/2023
18150	Dbase Dummies	Palmer	21/12/2023
15334	Mastering Windows	Cowart	21/12/2023
28285	Basic For Beginners	Norton	21/12/2023
17451	Computer Studies	French	21/12/2023
15100	Advanced Pascal	Schildt	21/12/2023
12984	Guide Network	Freed	21/12/2023
27888	COBOL	Stern	21/12/2023
33150	The Elements Of Style	William Strunk Jr	21/12/2023
12210	Collins Dictionary	William Collins	21/12/2023
13118	Practical Malware Analysis	Michael and Andrew	21/12/2023
25250	Hacking for Beginners	Karnel Erickson	21/12/2023
18112	Harry Potter-Complete Series	J.K Rowling	21/12/2023
23256	Art of Computer Programming	Donald Knuth	21/12/2023

Press Any Key To Continue...

3.4 File Handling

- The new features are handled appropriately, upholding consistency and dependability.

3.5 Validation of User Input

- Data integrity is ensured by applying input validation to stop invalid entries.

Reference table

#	Author(s)	Year	Title	Publisher/URL	In-text Reference
1	Stroustrup, B.	2013	Programming: Principles and Practice Using C++	Addison-Wesley	(Stroustrup, 2013)
2	Kernighan, B. W. & Ritchie, D. M.	1988	The C Programming Language	Prentice Hall	(Kernighan & Ritchie, 1988)
3	cplusplus.com	n.d.	C Standard Library Documentation	cplusplus.com	(cplusplus.com)

Reference List

- Stroustrup, B. (2013) *Programming: Principles and Practice Using C++*. Addison-Wesley.
- Kernighan, B. W., & Ritchie, D. M. (1988) *The C Programming Language*. Prentice Hall.
- cplusplus.com (n.d.) *C Standard Library Documentation*. [Online] Available at: cplusplus.com