DSAI 1302 Course Project

Library Management System

A. Description

The information of available books in a library are stored in "**booksInfo.txt**" file, such that each line represents a record that corresponds to a unique book. Each record contains the following information:

- Serial Number (5 digits)
- Title
- authors
- price
- number of available copies in the library
- number of borrowed copies

In each record: The above items are separated by commas, and authors are separated with colons.

The information of borrowed books is stored in "**borrowedInfo.txt**" file. Each line in this file represents a record that contains the serial number of the book and the id of the borrower. These information are separated by a comma.

You are required to develop a menu-driven program that display the following menu and keep displaying it until the user chooses the exit option.

```
Library Management System
==============================
1. Print books info
2. Search a book
3. Add new book
4. Remove a book
5. Borrow a book
6. Return a book
7. Exit
==============================
Enter your choice:
```

Below are the details for each possible choice:

1. Print books info

The following information should be displayed for all books in the library:

serial number, title, number of authors, price, total number of copies (available in library + borrowed)

2. Search a book

The user can choose to search for a book by entering either its title (or part of it), or by entering the name of one of its authors (or part of it). You should display all information of all matched books, otherwise an appropriate message is displayed to indicate that there are no matched books. Searching should be case insensitive; user can search using lowercase or uppercase letters.

3. Add a new book

To add a new book, the user should enter required information except the number of borrowed copies. User can enter multiple authors for one book, the serial number should be unique for each book in the library. The entered information should be validated as follows: book serial number should be 5 digits and it should not be equal to any other used serial number, title is not empty, at least one author name is entered, price is a valid float positive number, and number of available copies is valid positive integer number. After the user enters complete valid information for a new book, a new record should be added to the "booksInfo.txt" file (in this case, the number of borrowed copies will be equal to 0), and a message is displayed to indicate that the new book has been added successfully. Otherwise, appropriate wrong messages should be displayed about all invalid inputs.

4. Remove a book

To remove a book, a user should enter a valid existing serial number. Then, all information of the book is displayed, and the user should be asked whether he is sure about removing the book. If the user confirms removing the book, the corresponding record should be deleted from (booksInfo.txt) file. A message is displayed to indicate that the book has been removed successfully. Note that a book can be removed only if it has no borrowed copies. Appropriate error messages should be displayed if the user entered invalid/non-existing serial number, or if the book has some borrowed copies.

5. Borrow a book

A user can borrow up to 3 books, a user cannot borrow more than one copy of the same book at the same time. To borrow a book, the user should enter the serial number of the book and his id, then a new record is added to the file "borrowedInfo.txt". The corresponding record in "booksInfo.txt" file should be modified such that the number of available copies in library are decremented by 1, and the number of borrowed copies is incremented by 1. A message is displayed to indicate that the book has been borrowed successfully. Note that a book cannot be

borrowed under the following conditions: user entered invalid/non-existing book serial number, user already borrowed 3 books, user already borrowed a copy of the same book or if all copies of the book are borrowed (i.e. no available copies in the library).

6. Return a book

A user can return a book that he borrowed before. To return a book, the user should enter the serial number of the book and his id. If a matched record is found in the "borrowedInfo.txt" file, then remove that record. Also, the corresponding record in "booksInfo.txt" file should be modified such that the number of available copies in library are incremented by 1, and the number of borrowed copies is decremented by 1. A message is displayed to indicate that the book has been returned successfully. If no match is found, an appropriate error message is displayed.

If user entered an invalid menu option, the program should display an appropriate error message.

B. Deliverables:

Each team should submit the following:

1. Working code written in a **jupyter notebook file**, the file should include the names, ids, section numbers of team members at the beginning.

2. A **report** as a separate word file that includes the following:
   - Description of how the team solved the problem
   - Contribution of each team member
   - Description of the different functions with their tasks
   - Screen shots of the running code.

C. Project Demo/presentation

Each team is required to present his project:

- The project demos will be scheduled in the last week of this term.
- Students fail to appear for project demo/presentation will get ZERO in the lab project.
- During the demo, each member is expected to run the program and perform some of the functionalities.
- Team members should be ready for any question about their code.

D. Grading Policy

The project weights 100 points:

Item	Points
Report	5
Including meaningful comments in the code for all implemented functions	5
Adopting good programming practices: • Use meaningful variable names • Modularity: Your program must contain as many functions as needed. You need to divide your problem into small tasks and each task is handled by a separate function. • Global variables are not allowed	10
Code, presentation and discussion	80

E. Guidelines

- The project should be conducted by a team consists of at most **three** students
- The deadline for submitting the lab project is **Tuesday December 29** before midnight.
    - Later submissions will not be accepted
- Submission is through blackboard only; each team needs to submit a zipped file that contains the jupyter notebook file and the word file.
- You are limited to the material covered in the course lectures and labs in your code. Using uncovered material/libraries is not allowed.
- Only one member needs to submit the project. In case of multiple submissions, the latest submission will be considered.
- Team members should contribute equally to the project (as much as possible). If a member contributes significantly less than the other member, his work will not be graded out 100, rather it will be graded proportionally to his contribution amount.

APPENDIX A: Sample Runs

1. Print books info

booksInfo.txt

```
43521,Python for Everyone,Cay Horstman:Rance Necaise,89.5,8,2
67534,Exploring Data in Python,Charless Russell,67.3,5,0
```

```
Library Management System
==========================
1. Print books Info
2. Search a book
3. Add new book
4. Remove a book
5. Borrow a book
6. Return a book
7. Exit
==========================
Enter your choice: 1


Total 2 books:
---------------------------------------------------------------
serial#:   43521
title:   Python for Everyone
number of authors:   2
price:   89.5
total copies:   10
---------------------------------------------------------------
serial#:   67534
title:   Exploring Data in Python
number of authors:   1
price:   67.3
total copies:   5
---------------------------------------------------------------
```

2. Search a book

booksInfo.txt

```
43521,Python for Everyone,Cay Horstman:Rance Necaise,89.5,10,0
67534,Exploring Data in Python,Charless Russell,67.3,5,0
63254,The C Programming Language,Brian Kernighan:Dennis Ritchie,45.6,4,0
32147,Learn C the Hard Way,Zed Shaw,20.9,2,0
20014,Learn Python 3 the Hard Way,Zed Shaw,24.9,7,0
```

Run1:

```
Library Management System
==========================
1. Print books Info
2. Search a book
3. Add new book
4. Remove a book
5. Borrow a book
6. Return a book
7. Exit
==========================
Enter your choice: 2
Enter (t) to search by title or (a) to search by author name: t
Enter the title: PROG

Matched records:
serial#:   63254
title:   The C Programming Language
authors:
   - Brian Kernighan
   - Dennis Ritchie
price:   45.6
copies in library:   4
borrowed copies:  0
---------------------------------------------------------------
```

Run2:

```
Enter your choice: 2
Enter (t) to search by title or (a) to search by author name: a
Enter author name: zed

Matched records:
serial#:   32147
title:   Learn C the Hard Way
authors:
   - Zed Shaw
price:   20.9
copies in library:   2
borrowed copies:  0
-----------------------------------------------------------------
serial#:   20014
title:   Learn Python 3 the Hard Way
authors:
   - Zed Shaw
price:   24.9
copies in library:   7
borrowed copies:  0
-----------------------------------------------------------------
```

Run3:

```
Enter your choice: 2
Enter (t) to search by title or (a) to search by author name: t
Enter the title: java
No matched record found
```

3. Add a new book

booksInfo.txt

```
43521,Python for Everyone,Cay Horstman:Rance Necaise,89.5,10,0
67534,Exploring Data in Python,Charless Russell,67.3,5,0
63254,The C Programming Language,Brian Kernighan:Dennis Ritchie,45.6,4,0
32147,Learn C the Hard Way,Zed Shaw,20.9,2,0
20014,Learn Python 3 the Hard Way,Zed Shaw,24.9,7,0
```

Run1:

```
Library Management System
=========================
1. Print books Info
2. Search a book
3. Add new book
4. Remove a book
5. Borrow a book
6. Return a book
7. Exit
=========================
Enter your choice: 3
Enter serial number: 60214
Enter book title: how to lead a winning team
Enter name of author 1: Eddy Knasel
Enter name of author 2 (Enter q to finish): Graham Willcocks
Enter name of author 3 (Enter q to finish): Steve Morris
Enter name of author 4 (Enter q to finish): q
Enter book price: 70.5
Enter number of book copies: 4

New book was added successfully
```

Note: New record should be added in *booksInfo.txt* as follows:

```
43521,Python for Everyone,Cay Horstman:Rance Necaise,89.5,10,0
67534,Exploring Data in Python,Charless Russell,67.3,5,0
63254,The C Programming Language,Brian Kernighan:Dennis Ritchie,45.6,4,0
32147,Learn C the Hard Way,Zed Shaw,20.9,2,0
20014,Learn Python 3 the Hard Way,Zed Shaw,24.9,7,0
60214,how to lead a winning team,Eddy Knasel:Graham Willcocks:Steve Morris,70.5,4,0
```

Run2:

booksInfo.txt

```
43521,Python for Everyone,Cay Horstman:Rance Necaise,89.5,10,0
67534,Exploring Data in Python,Charless Russell,67.3,5,0
63254,The C Programming Language,Brian Kernighan:Dennis Ritchie,45.6,4,0
32147,Learn C the Hard Way,Zed Shaw,20.9,2,0
20014,Learn Python 3 the Hard Way,Zed Shaw,24.9,7,0
```

```
Enter your choice: 3
Enter serial number: 63254
Enter book title:
Enter name of author 1: Eddy Knasel
Enter name of author 2 (Enter q to finish):
Enter name of author 3 (Enter q to finish): q
Enter book price: 52i
Enter number of book copies: #36

Error: serial number is already used
Error: Title should not be empty
Error: names of all authors should not be empty
Error: price should be a valid float number
Error: number of copies should be a valid int number
```

Run3:

booksInfo.txt

```
43521,Python for Everyone,Cay Horstman:Rance Necaise,89.5,10,0
67534,Exploring Data in Python,Charless Russell,67.3,5,0
63254,The C Programming Language,Brian Kernighan:Dennis Ritchie,45.6,4,0
32147,Learn C the Hard Way,Zed Shaw,20.9,2,0
20014,Learn Python 3 the Hard Way,Zed Shaw,24.9,7,0
```

```
Enter your choice: 3
Enter serial number: 1234
Enter book title: Practice Java Language
Enter name of author 1:
Enter name of author 2 (Enter q to finish): q
Enter book price: 35.3
Enter number of book copies: 20

Error: serial number should be 5 digits
Error: names of all authors should not be empty
```

4. Remove a book

Run1:

booksInfo.txt

```
43521,Python for Everyone,Cay Horstman:Rance Necaise,89.5,10,0
67534,Exploring Data in Python,Charless Russell,67.3,5,0
63254,The C Programming Language,Brian Kernighan:Dennis Ritchie,45.6,4,0
32147,Learn C the Hard Way,Zed Shaw,20.9,2,0
20014,Learn Python 3 the Hard Way,Zed Shaw,24.9,7,0
60214,how to lead a winning team,Eddy Knasel:Graham Willcocks:Steve Morris,70.5,4,0
```

```
Enter your choice: 4
Enter book serial number to remove: 32147

Matched records:
serial#:   32147
title:   Learn C the Hard Way
authors:
   - Zed Shaw
price:   20.9
copies in library:   2
borrowed copies:  0
-----------------------------------------------------------------
Deleting the book .. Are you sure (y/n): y
Book was removed successfully
```

Note: a record should be deleted from booksInfo.txt as follows:

```
43521,Python for Everyone,Cay Horstman:Rance Necaise,89.5,10,0
67534,Exploring Data in Python,Charless Russell,67.3,5,0
63254,The C Programming Language,Brian Kernighan:Dennis Ritchie,45.6,4,0
20014,Learn Python 3 the Hard Way,Zed Shaw,24.9,7,0
60214,how to lead a winning team,Eddy Knasel:Graham Willcocks:Steve Morris,70.5,4,0
```

Run2:

booksInfo.txt

```
43521,Python for Everyone,Cay Horstman:Rance Necaise,89.5,10,0
67534,Exploring Data in Python,Charless Russell,67.3,5,0
63254,The C Programming Language,Brian Kernighan:Dennis Ritchie,45.6,4,0
20014,Learn Python 3 the Hard Way,Zed Shaw,24.9,7,0
60214,how to lead a winning team,Eddy Knasel:Graham Willcocks:Steve Morris,70.5,4,0
```

```
Enter your choice: 4
Enter book serial number to remove: 63254

Matched records:
serial#:   63254
title:   The C Programming Language
authors:
   - Brian Kernighan
   - Dennis Ritchie
price:   45.6
copies in library:   4
borrowed copies:  0
-----------------------------------------------------------------
Deleting the book .. Are you sure (y/n): n
operation is cancelled
```

Run3:

booksInfo.txt

```
43521,Python for Everyone,Cay Horstman:Rance Necaise,89.5,10,0
67534,Exploring Data in Python,Charless Russell,67.3,5,0
63254,The C Programming Language,Brian Kernighan:Dennis Ritchie,45.6,4,0
20014,Learn Python 3 the Hard Way,Zed Shaw,24.9,6,1
60214,how to lead a winning team,Eddy Knasel:Graham Willcocks:Steve Morris,70.5,4,0
```

```
Enter your choice: 4
Enter book serial number to remove: 20014

Matched records:
serial#:   20014
title:   Learn Python 3 the Hard Way
authors:
   - Zed Shaw
price:   24.9
copies in library:   6
borrowed copies:  1
-----------------------------------------------------------------
Deleting the book .. Are you sure (y/n): y
Book cannot be removed: borrowed copies must be 0
```

5. Borrow a book

Run1:

booksInfo.txt

```
43521,Python for Everyone,Cay Horstman:Rance Necaise,89.5,9,1
67534,Exploring Data in Python,Charless Russell,67.3,0,3
63254,The C Programming Language,Brian Kernighan:Dennis Ritchie,45.6,4,0
20014,Learn Python 3 the Hard Way,Zed Shaw,24.9,6,1
60214,how to lead a winning team,Eddy Knasel:Graham Willcocks:Steve Morris,70.5,4,0
```

borrowedInfo.txt

```
67534,20101111
43521,20101111
67534,20113253
67534,20113240
20014,20101111
```

```
Library Management System
==========================
1. Print books Info
2. Search a book
3. Add new book
4. Remove a book
5. Borrow a book
6. Return a book
7. Exit
==========================
Enter your choice: 5
Enter book serial number to borrow: 63254
Enter user ID: 20136325
Book was borrowed successfully
```

Records in *booksInfo.txt* and *borrowedInfo.txt* should be updated as follows:

booksInfo.txt

```
43521,Python for Everyone,Cay Horstman:Rance Necaise,89.5,9,1
67534,Exploring Data in Python,Charless Russell,67.3,0,3
63254,The C Programming Language,Brian Kernighan:Dennis Ritchie,45.6,3,1
20014,Learn Python 3 the Hard Way,Zed Shaw,24.9,6,1
60214,how to lead a winning team,Eddy Knasel:Graham Willcocks:Steve Morris,70.5,4,0
```

borrowedInfo.txt

```
67534,20101111
20014,20101111
43521,20101111
67534,20113253
67534,20113240
63254,20136325
```

Runs (2 - 6)

booksInfo.txt

```
43521,Python for Everyone,Cay Horstman:Rance Necaise,89.5,9,1
67534,Exploring Data in Python,Charless Russell,67.3,0,3
63254,The C Programming Language,Brian Kernighan:Dennis Ritchie,45.6,4,0
20014,Learn Python 3 the Hard Way,Zed Shaw,24.9,5,2
60214,how to lead a winning team,Eddy Knasel:Graham Willcocks:Steve Morris,70.5,4,0
```

borrowedInfo.txt

```
67534,20101111
43521,20101111
67534,20113253
67534,20113240
20014,20101111
20014,20143324
```

Run 2

```
==========================
Enter your choice: 5
Enter book serial number to borrow: 67534
Error: no available copies in the library
```

Run 3

```
==========================
Enter your choice: 5
Enter book serial number to borrow: 42517
Error: no matched serial number
```

Run 4

```
==========================
Enter your choice: 5
Enter book serial number to borrow: 2310224
Error: serial number should be 5 digits
```

Run 5

```
==========================
Enter your choice: 5
Enter book serial number to borrow: 60214
Enter user ID: 20101111
Error: user cannot borrow more than 3 books
```

Run 6

```
==========================
Enter your choice: 5
Enter book serial number to borrow: 20014
Enter user ID: 20143324
Error: user already borrowed a copy of the book
```

6. Return a book

Run 1:

booksInfo.txt

```
43521,Python for Everyone,Cay Horstman:Rance Necaise,89.5,9,1
67534,Exploring Data in Python,Charless Russell,67.3,0,3
63254,The C Programming Language,Brian Kernighan:Dennis Ritchie,45.6,4,0
20014,Learn Python 3 the Hard Way,Zed Shaw,24.9,5,2
60214,how to lead a winning team,Eddy Knasel:Graham Willcocks:Steve Morris,70.5,4,0
```

borrowedInfo.txt

```
67534,20101111
43521,20101111
67534,20113253
67534,20113240
20014,20101111
20014,20143324
```

```
Library Management System
=========================
1. Print books Info
2. Search a book
3. Add new book
4. Remove a book
5. Borrow a book
6. Return a book
7. Exit
=========================
Enter your choice: 6
Enter book serial number to return: 67534
Enter user ID: 20113253
Book was returned successfully
```

Records in *booksInfo.txt* and *borrowedInfo.txt* should be updated as follows:

booksInfo.txt

```
43521,Python for Everyone,Cay Horstman:Rance Necaise,89.5,9,1
67534,Exploring Data in Python,Charless Russell,67.3,1,2
63254,The C Programming Language,Brian Kernighan:Dennis Ritchie,45.6,4,0
20014,Learn Python 3 the Hard Way,Zed Shaw,24.9,5,2
60214,how to lead a winning team,Eddy Knasel:Graham Willcocks:Steve Morris,70.5,4,0
```

borrowedInfo.txt

```
67534,20101111
43521,20101111
67534,20113240
20014,20101111
20014,20143324
```

Run 2:

booksInfo.txt

```
43521,Python for Everyone,Cay Horstman:Rance Necaise,89.5,9,1
67534,Exploring Data in Python,Charless Russell,67.3,0,3
63254,The C Programming Language,Brian Kernighan:Dennis Ritchie,45.6,4,0
20014,Learn Python 3 the Hard Way,Zed Shaw,24.9,5,2
60214,how to lead a winning team,Eddy Knasel:Graham Willcocks:Steve Morris,70.5,4,0
```

borrowedInfo.txt

```
67534,20101111
43521,20101111
67534,20113253
67534,20113240
20014,20101111
20014,20143324
```

```
Library Management System
==========================
1. Print books Info
2. Search a book
3. Add new book
4. Remove a book
5. Borrow a book
6. Return a book
7. Exit
==========================
Enter your choice: 6
Enter book serial number to return: 20014
Enter user ID: 20103253
Error: no matched record found in borrowedInfo.txt
```