Name:_____ Section: _____CM: _____

CSSE 220---Object-Oriented Software Development

Exam 2 -- Part 2, October 22, 2021

Allowed Resources on Part 2. Open book, open notes, and computer. Limited network access. You may use the network only to access your own files, the course Moodle and Piazza sites (but obviously do not post on Piazza) and web pages, the textbook's site, Oracle's Java website, and Logan Library's online books. You may only use a search engine (like Google) to search within Oracle's Java website - all others uses or accessing websites other than those mentioned above are not allowed.

Instructions. You must disable Microsoft Lync, IM, email, and other such communication programs before beginning part 2 of the exam. Any communication with anyone other than the instructor or a TA during the exam may result in a failing grade for the course.

You must actually get these problems working on your computer. Almost all of the credit for the problems will be for code that actually works. If you get every part working, comments are not required. If you do not get a method to work, comments may help me to understand enough so that you can earn (possibly a small amount of) partial credit.

Submit all modified files via Moodle.

Problem Descriptions

Recursion Problems (21 points)
The class Recursion contains 4 recursion problems (JUnit test cases are also included). **You only need to solve 3 of the 4 problems**. For the problem you chose not to do, leave it blank and insert a comment saying that you skipped it. These problems must be solved with recursion - a working solution with loops is worth no credit. If you have time and want to do a fourth one for fun, that's fine, but we suggest saving it until you finish the rest of the exam.

Refactoring Problem (16 points)
You are given a working solution to a Java program that RHIT's Logan Library uses to generate printed reports that which books are currently held and who the books are checked out to. To see the output run Java Application *DriverMain.java.* The copy of the output appears at the end of this document in Listing 1.

Unfortunately, this design and implementation has an unacceptable amount of code duplication some of which can be determined from its UML diagram in Figure 1 (below).

Your job is to use either (1) *inheritance with a class* or (2) *inheritance with an abstract class* to remove as much code duplication as you from *DriverMain.java* and also in the 3 book classes (*AudioBook.java*, *HardCover.java*, *PaperBack.java*).

Make any other small changes needed so that the output from your refactored implementation looks identical to what is shown in Listing 1 (below).

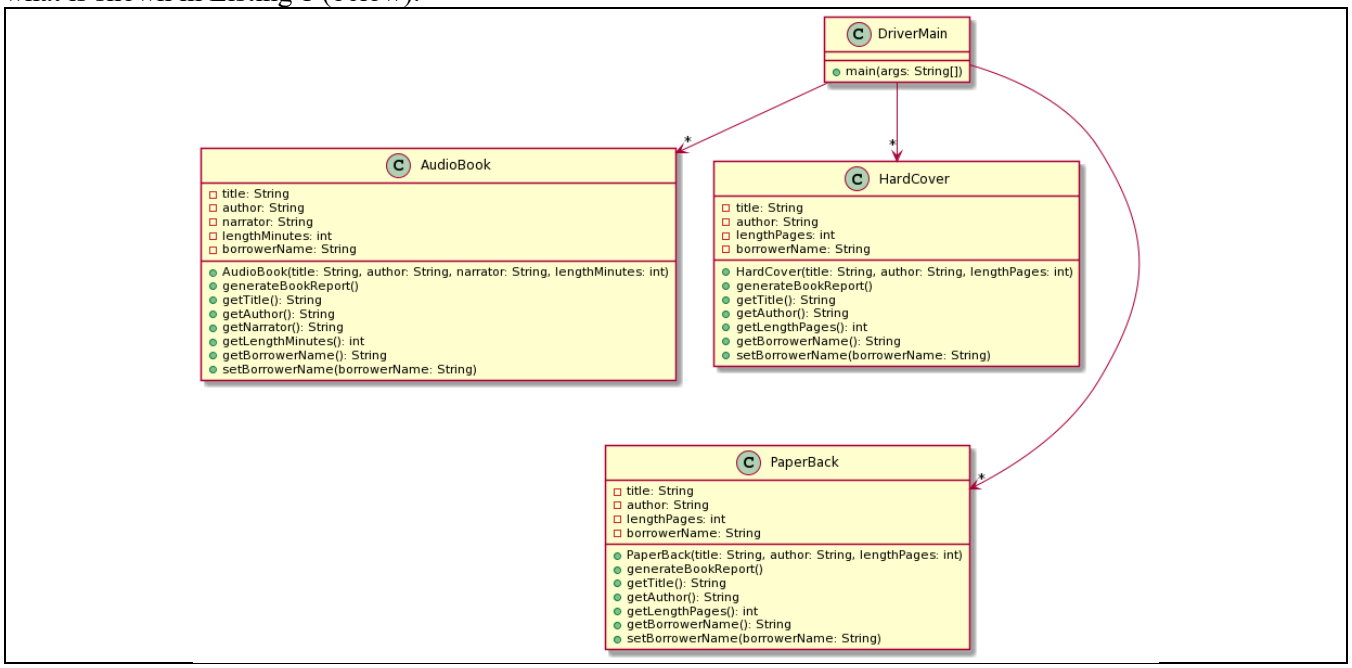

Figure 1 – UML for Starter Code

Part 1 (10 points)

- Refactor the 3 book classes (*HardCover*, *AudioBook*, and *PaperBack*)
  Note: do not use a Java *Interface*, that will result in 0 points for this part

Part 2 (6 points)

- Utilize the refactoring done in Part 1 in *DriverMain*

```
|++++++++++++++++++++++++++++++++++++++++++++|
|+ Audiobook ++++++++++++++++++++++++++++++++|
|                                            |
|    Title: The Fellowship of the Ring       |
|   Author: J. R. R. Tolkien                 |
| Narrator: Rob Inglis                       |
|   Length: 19 hours 7 minutes               |
|   Status: Checked in                       |
|                                            |
|+ End Report ++++++++++++++++++++++++++++++++|
|++++++++++++++++++++++++++++++++++++++++++++|


|++++++++++++++++++++++++++++++++++++++++++++|
|+ Hard Cover Book +++++++++++++++++++++++++++|
|                                            |
|    Title: Altered Carbon                   |
|   Author: Richard K. Morgan                |
|    Pages: 375                              |
|   Status: Checked in                       |
|                                            |
|+ End Report ++++++++++++++++++++++++++++++++|
|++++++++++++++++++++++++++++++++++++++++++++|


|++++++++++++++++++++++++++++++++++++++++++++|
|+ Hard Cover Book +++++++++++++++++++++++++++|
|                                            |
|    Title: The Three-Body Problem           |
|   Author: Cixin Liu                        |
|    Pages: 400                              |
|   Status: Checked out to Dr. Holly         |
|                                            |
|+ End Report ++++++++++++++++++++++++++++++++|
|++++++++++++++++++++++++++++++++++++++++++++|


|++++++++++++++++++++++++++++++++++++++++++++|
|+ Paperback Book ++++++++++++++++++++++++++++|
|                                            |
|    Title: I, Robot                         |
|   Author: Isaac Asimov                     |
|    Pages: 256                              |
|   Status: Checked in                       |
|                                            |
|+ End Report ++++++++++++++++++++++++++++++++|
|++++++++++++++++++++++++++++++++++++++++++++|


All authors:
   J. R. R. Tolkien
   Richard K. Morgan
   Cixin Liu
   Isaac Asimov
```

Listing 1 – Console Output from *DriverMain.java*