CSE 460
Software Analysis and Design
(Fall 2022)

Homework #3
Assigned: October 5, 11:59 pm
Due: October 15, 11:59 pm

Posting ID |__|__|__|__|-|__|__|__|

Note 1: Your submission to **Gradescope** must include the above header shown in maroon color. Do not include your name in your submission.
Note 2: Homework is to be done individually. You may discuss the homework with your fellow students, but you are NOT allowed to copy – either in part or in whole – anyone else's answers. You are also encouraged to meet the TA, UGTA, and instructor.
Note 3: All submitted materials must be legible. Text-based answers must be typed. Figures/diagrams must follow the given instructions.
Note 4: Please check the Canvas Discussions for further instructions, questions, answers, and hints.
Note 5: The format Hw#-PostingID.pdf (e.g., Hw1-1234-987.pdf) should be used for naming homework assignment files.

1. [70 points] Students, staff, and faculty at a university are eligible to use its libraries. The library has an online system where its patrons can find information for many items they might be interested in. The online system manages the information of all its patrons. The library has computers, scanners, and printers that can communicate using wired and wireless connectivity. Barcode is used to keep track of library holdings. Suppose John Doe borrows a book on a certain date with a given return due date. He can borrow items from other libraries using interlibrary services. The library has seven Self-Checkout Register (SCR) machines. These are similar to self-checkout registers found at grocery stores. Patrons can use these machines to "self-checkout" library items.

   Consider a common scenario below where John uses the self-checkout to borrow two books and a DVD.

   1. Scan authorized ID card
   2. Accept the library terms of agreement for borrowing
   3. Scan the items one at a time
   4. Demagnetize the items
   5. Receive an email receipt of the checked-out items

   (a) [36 points] Identify actors and use-cases for borrowing items. Provide four actors and six use-cases. These are to be used for part (c).

   Rubric: 3 points for each actor; 4 points for each use-case.

   (b) [10 points] Define use-cases for the items that cannot be checked out of the library. These are to be used for part (c).

(c) [24 points] Develop use-case diagrams that have at least one *extend*, two *generalized*, and two *include* relationships. The use-case diagram (or diagrams) should have appropriate *association* relationships.

Rubric: 18 points for relationships, 6 points for one or more use-case diagrams.

2. [30 points] The Classical Categorization and Conceptual Clustering classification approaches may be used for identifying and classifying objects and classes. Consider the above library software system.

(a) [20 points] Identify and define two categories of objects using Classical Categorization. Provide explanations for your choices. The description for each group of objects should be limited to 50 words.

(b) [10 points] Following Conceptual Clustering, identify and describe collaborating objects that do not lend themselves to be directly identified using the Classical Categorization approach. Describe how you arrived at your answer. Limit your answer to 100 words.