Concordia University
Department of Computer Science and Software Engineering

SOEN 341 — Software Process
Fall 2007 — Section H
Homework Assignment Number 3

Instructions

This is an individual assignment. Even if some questions are related to your group project, all answers from individuals in the same group must be individual contributions.

Grading value is indicated with each question.

Similar questions (among others) will be asked in the quizzes.

Submit your answers electronically.

Question 1 [65 marks] Consider the following problem:

Book orders, as initiated by professors and library managers, create all book entries in the system. When a book ordered is received, it is made available for borrowing. Upon receiving, all books are o be attached a bar code label (to be printed by the system) to be used as identifier for all operations. All library cards (also to be printed by the system) also have a bar code to identify the card holder in all operations. Available books can be put on reserve by a professor, where they can be consulted on site but not borrowed. Books are on reserve for a limited time. They can be either made available or put back on reserve following a request for reserve extension by that professor. Available books can be borrowed for a fixed amount of time, after which the borrowing can be extended. Books returned after borrowing are made available automatically. When a book is borrowed and its borrowing time is up, a warning is sent to the client by mail. After that, the book is considered lost and the client is billed for compensation. Lost books can be reinstated and made available if they are given back. In any case, if a book is missing for more than six months, it is marked as deleted from the inventory (though it still stays in the database).

(a) [25 marks] Provide a state transition diagram representing all the possible states and changes of states for books in the preceding problem statement.

(b) [15 marks] Provide the state transition table corresponding to your solution in (a). Using this table, explicitly demonstrate that your diagram is complete and consistent.

(c) [25 marks] Provide a UML class diagram representing the design of a solution to the above problem statement. Include attributes and function names for all members of all your classes. All external system interactions (i.e. with other systems/hardware) must be designed using explicit <<interface>> classes.

Question 2 [10 marks] Find three different forms of coupling in the design or code of the class project. For each case, explain what kind of coupling it is (see course notes for a classification of kinds of coupling), and discuss whether this is good or bad coupling and why. If it is bad coupling, explain how it could be made better.

Question 3 [25 marks] For the following program, derive a set of test cases that will cover branch testing and loop testing. You should demonstrate that the branch testing and loop testing is covered by your set of test cases. For each test case identify values for input variables someArray, and itsSize, as well as the expected result. A sample test case is: someArray=(5,2,4), itsSize=3, and the expected result is someArray=(2,4,5).

```
void selectionSort(int someArray[], int itsSize)
{
  int indexMin;
  for (int i = 0; i < itsSize-1; i++)
  {
    indexMin = i;
    for (int j = i+1; j < itsSize; j++)
      if (someArray[j] < someArray[indexMin])
      indexMin = j;
    if (indexMin != i)
      swap(someArray[indexMin], someArray[i]);
  }
}
```