

Exam One

CS195-401 - Object-Oriented Design Drake University - Spring, 2003

Directions: Do all five problems. Each is worth 20 points. Please work first on problems with which you are more comfortable.

Problem 1. Give four very distinct and highly desirable (and discussed) properties that the assembled requirements should in principle possess upon completion of requirements elicitation and analysis. Carefully explain the meaning of each. Also, for each, suggest a worthwhile practice that could help to ensure the property.

Problem 2.

(a) Clearly state Demeter's Law in precise terms.

(b) State four out of seven of Abbott's Heuristics.

Problem 3. A library system: Anyone possessing a valid library card is allowed to borrow books, journals and videotapes, and can have up to ten items checked out at a time. Each can be borrowed for four weeks. However, with a faculty/staff library card, up to 20 items can be checked out at a time, and each can be borrowed for up to 20 weeks.

Each library card contains the name and social security number of the cardholder. Faculty/staff cards also contain a department/office name, while non-faculty/staff cards contain an expiration date. Additionally, cards can be temporarily suspended or permanently cancelled by the system, as required. New cards sometimes need to be created. New library items sometimes get added to the library too. Also, there are multiple copies of some books.

Using your best UML skills, design a system to handle all this, detailing it via a class diagram. This should exhibit generalization, aggregation (or composition), and include multiplicities where appropriate. For each class, identify attributes and useful methods, and include these properly in your diagram.

Problem 4. An elevator system: this controls an ordinary elevator in a building, including a memory subsystem to remember requested floors, a buttons panel, an LED displaying the current floor number, a door, a motor controller, and sensors at each floor. Consider the scenerio where somebody is already in the elevator at the third floor and uses it to go up to the fourth floor.

Using your best UML skills, detail this scenerio in a sequence diagram. Assume that the system adhere's to Jacobson's division of objects into three types: boundary, control, entity.

Problem 5. A digital watch has two buttons for setting the time. When both buttons are depressed simultaneously, the watch switches between time-display mode to set-time mode. While in set-time mode, the first button is used to switch between setting hours, minutes and seconds, cycling through these. The second button increments the hours, minutes or seconds value, depending on which is currently being set. Also, when time-set mode is entered, all three values are initialized to zero.

Using your best UML skills, detail this with a state diagram (statechart).