Exam Software Engineering (400071)
28 June 2006

Part of this exam is centered on the following case study:

An analysis laboratory of a hospital has four identical machines, each able to carry out twenty different types of analyses. These types of analyses are identified by a number (from 1 to 20). The analysis laboratory is used by a number of medical doctors. Each medical doctor is identified by an employee code, assigned when the doctor was hired. The machines can be physically located in different hospital buildings.
When a doctor wants to reserve a machine to perform a certain analysis, he or she has to specify his/her code and the number identifying the desired type of analysis.
After checking that the doctor is indeed employed by the hospital, he/she is assigned with a time slot (the nearest possible) and a machine. There is no predefined maximum number of reservations that a doctor can request per day. A machine can carry out only one analysis at a time (i.e. multiple parallel analyses are not possible).
Reservations are confirmed only if there is a free machine capable to carry out the requested analysis.
Once an analysis is completed, the corresponding bill is automatically calculated and sent via email to the department where the doctor works.

Note: this problem description may be ambiguous and incomplete. In answering the questions, you are free to complete it (if needed) and to briefly motivate your assumptions.

Questions about the theory

1. List and describe the four phases of the Rational Unified Process. [1 point]
2. In a MoSCoW classification of functional requirements, what is the meaning associated to "Should haves"? [1 point] (select one or more answers from the following possible answers):
   - 2.a) "Should have" requirements are requirements desired by the customer that will not be developed because of lack of time or resources.
   - 2.b) "Should have" requirements are requirements desired by the customer that will probably not be developed because of lack of time or resources.
   - 2.c) "Should have" requirements are requirements desirable (but not absolutely necessary) for the type of application under development. It is not decided upfront if they will be fulfilled or not.
3. When should "testing" start in the software life cycle? [1 point] (select one or more answers from the following possible answers):
   - 3.a) Testing should start as soon as possible, because the sooner bugs are identified and fixed, the cheaper.
   - 3.b) Testing should start only after programming, because only with the actual code you know how the software system will really work and what problems may occur.
   - 3.c) Testing should preferably start after design, because this is the first phase in which technology is chosen and the implementation-dependent decisions are taken.
   - 3.d) Testing should be included in every development phase, because the results of each phase must be checked.

Questions related to the case study

4. For the case study, specify the functionality of "reserving a machine for analysis" by using a UML sequence diagram. [1.5 points]
5. For the case study, provide the data model in UML. [2 points]
6. Use a UML component diagram to describe a possible design solution for the complete case study. Define in a clear way each operation offered by the interface(s) of all components. If needed, use additional text. [1.5 points]
7. Suppose now that the following new requirement is added: medical doctors can make analysis reservations from home, too. Use a UML deployment diagram to describe the new design solution. Also explain the differences between the two solutions (the one given here and that given in question 6). [2 points]

Exam rules:
- No books or reference material.
- No calculator or similar electronic device.