CS3 Software Engineering with Objects and Components 1
2001/2002 : Specimen Exam Questions

This document provides a specimen exam paper for this year's SEOC1, which is slightly different in tone to those of previous years due to a number of small but significant syllabus changes.

In some questions you will be asked to construct UML diagrams from written descriptions. You may also be asked to describe specific techniques that you have been taught for constructing such diagrams. In addition, you may be asked about the connections between different types of diagrams (e.g. the relationships between interaction, class and use case diagrams). You should examine previous exam papers for examples of such questions.

Most questions will also require you to demonstrate your knowledge of how UML fits into the development process, and of other aspects of the course. Note that the syllabus for this course has changed slightly from previous years and thus this year's exam will differ slightly in tone from previous exams. Most notable is the addition of *Process Mangaement*, *Testing*, *Deployment* and *Maintenance and Evolution* to the syllabus this year, so you should expect some questions on most of these.

1. (a) Name four types of software maintenance. *4 Marks*

   (b) What are the main differences between the two forms of UML *Implementation Diagrams*? *4 Marks*

   (c) Use noun-phrase identification, or any other appropriate technique, to construct a class model from the following description of a Railway Network. The preliminary class model should identify the classes and their associations, but need not specify attributes or methods. You should label the associations with suitably descriptive labels and any multiplicities. *8 Marks*

   > The Railway Network consists of a number of stations and freight terminals connected by railways. Railways consist of uninterrupted sections of track connected by junctions and by crossings – both of which are places where two or more tracks coincide. Trains travel on tracks and may change from one section of track to another at a connecting junction. Every track leading to a crossing or junction has a warning signal before that crossing or junction. Trains are either passenger trains or freight trains. Passenger trains may only visit stations, while freight trains may visit both stations and freight terminals. The warning signals communicate both with all trains on nearby tracks and with one local signal controller situated at a nearby station. All signal controllers on the rail network communicate with the national signal controller.

   (d) Describe, with some details, any 3 common pitfalls of software reuse. *9 Marks*

2. (a) List any four properties you would expect of a "good" software system. *4 Marks*

   (b) Consider the following description of the operating states of a simple CD player:

   > The Player has a tray for a single CD and four buttons: *play*; *pause*; *stop*; and *load*. The Player is either playing a CD or not. When the Player is not playing, the CD tray may be open or closed by use of the *load* button. If a CD is loaded the Player automatically starts to play the first track. When a track has finished playing the Player automatically plays the next track in sequence until the final track, at which point it stops playing. The Player may be stopped at any point by pressing the *stop* button. The *pause* button merely pauses playing, and playing is resumed only when the *pause* button is pressed a second time. The *play* and *pause* button have no effect if pressed when there is no CD in the case, but the *stop* and *load* buttons will work at any time.

   Construct a UML statechart for the Player. Your statechart should illustrate the following features:

   - guarded transitions;
   - compound states;
   - decision diamonds.

   You may assume that initially the Player has no CD loaded and that the tray is closed. *8 Marks*

   (c) Describe black -box testing. Use the above description and your statechart for the CD-Player to illustrate to describe how, in general, you would construct a set of test-cases in black-box testing. *8 Marks*

   (d) Suppose that a defect is revealed during testing. Describe the activities that are involved in debugging the system. *5 Marks*

3. (a) Consider the construction of use case diagrams:

   i. Why is it necessary to consider both human and non-human actors in a system? *3 Marks*

   ii. Describe briefly how the actors in a system may be identified. *4 Marks*

   iii. Use case models help capture system requirements. Discuss briefly how else they may be used in the development process. *4 Marks*

   (b) Draw a simple collaboration diagram which illustrates the following features:

   - sequential ordering of messages;
   - return values;
   - sending messages to self.

   You should accompany your diagram with brief descriptions of how these features are represented. *6 Marks*

   (c) Estimating resource requirements for a project is an important part of the planning phase. Describe the main activities that go on during effort estimation, what kinds of resources are estimated, and what are the risks of the estimation process. *8 Marks*