THE UNIVERSITY
OF ADELAIDE
AUSTRALIA

Examination for
Bachelor of Arts, Bachelor of Science,
Bachelor of Computer Science, Bachelor of Mathematical and Computer Science, Bachelor of Computer Graphics, Bachelor of Engineering, Graduate Diploma in Computer Science,
Master of Computer Science, Master of Information Technology,
Master of Software Engineering, Master of Computing & Innovation

Main Examination, Semester 2, November 2015

Software Engineering and Project
COMPSCI 3006, 7015

Official Reading Time:	10 mins
Writing Time:	120 mins
Total Duration:	130 mins

Questions	Time	Marks
Answer all 7 questions	130 mins	120 marks 120 Total

Instructions

- Begin each answer on a new page
- Examination material must not be removed from the examination room
- Simple, Non-programmable Calculators allowed
- Text book, Lecture notes, Course handouts, Personal notes, Foreign language dictionary (paper), English language dictionary (paper) allowed

Materials

- 1 Blue book

DO NOT COMMENCE WRITING UNTIL INSTRUCTED TO DO SO

Question 1

(a) Indicate the number of your project group in your exam booklet. Describe briefly the process model used by your group for the robot prototype project undertaken this semester.

[2 marks]

(b) Consider the robot prototype that you developed this semester. Your group is trying to decide a suitable process model. Your colleagues argue that the best choice is the waterfall model because it is best at guiding the production of required documents on time. Suppose that you believe an incremental model would be better. Explain this belief, considering all points in the software life cycle. In your answer, mention in particular how documents can be produced on schedule.

[8 marks]

(c) Having the most suitable process model alone would not justify success. Do you agree? Explain your answer.

[6 marks]

(d) In the Spiral model, risk plays an important part. Explain the importance of risk analysis in this model.

[4 marks]

[Total for Question 1: 20 marks]

Question 2

(a) Demonstrations of software to clients at regular intervals is a useful technique for keeping software projects on track. The establishing of a set of significant *milestones* is also a valuable technique. During your project, *both* were used. Briefly discuss the benefits of each approach.

[5 marks]

(b) Your project this semester had weekly meetings with clients, at which some type of demonstration was required (or at least *desired*). Some software engineering process models make this task slightly difficult, others make it simple. For the process model *your* group used, discuss how you selected demonstration tasks. Keep this discussion brief, and focus on the engineering issues.

[5 marks]

(c) The stable trunk repository model is described in detail in the SVN book and is the accepted standard in how repositories are managed. While the trunk and branch aspects of the model are well understood by most, the other aspect to the model is the *Tag*. Describe how tags are used.

[3 marks]

(d) You are part of a team that is using the stable trunk repository model, and you have been tasked to implement a set of new software features that will ultimately become the next released version of the system. This development will naturally take place in a *branch* or *fork* of the system. Describe what you would in fact copy into the branch (don't give commands, describe the engineering artifacts you will be copying).

[5 marks]

[Total for Question 2: 18 marks]

Question 3

Recall the *mystery presentation* of Week 11, in which you played a part in the *Killer Robot* scenario. In this scenario, an industrial robot malfunctions and kills its operator.

(a) One of the Shneiderman's golden rules of interface design is that an interface should offer simple error handling. A report on this accident concluded that "it was the interface design and not the admittedly flawed software which should be viewed as the culprit".

Explain briefly what was bad about the interface design in relation to error handling, and how it contributed to the accident.

[7 marks]

(b) Most of the killer robot scenario concerns the responses of various participants as an attempted cover-up takes place. These responses raise many ethical issues.

Name the person whose part you played in this scenario. Briefly summarize the ethical dilemmas that this person faced, and comment on whether or not you think their response was appropriate.

[5 marks]

[Total for Question 3: 12 marks]

Question 4

(a) Suppose that you are part of the design team for the DIA (Denver International Airport) baggage system, and that design processes are about to commence.

Identify and discuss three key risks for the project. In your answer, consider the types of risk most critical for this project.

(Note: in answering, consider the design brief for, and background to, the project. Discuss the analysis that should have been done, not necessarily what was done.)

[6 marks]

(b) For each of two of the risks identified in Part (a), discuss briefly how the risk was addressed in the actual project implementation. Consider whether or not it was satisfactorily addressed, and (if necessary) how it should have been handled differently.

[6 marks]

[Total for Question 4: 12 marks]

Question 5

MesaMaps have found a deposit of rare and exotic MoonRocks on another mesa, so the company share price has rocketed, giving more capital to invest. So MesaMaps have bought another identical robot, and want to use it with the existing one on the same terrain.

MesaMaps strategy is for the terrain to be split into two parts. In each part, implementation is expected to proceed in a manner as close as possible to the original scenario. In other words, characteristics such as the communications base-station; four coloured areas representing deposits; the use of a boundary line, and so on, will be used in the revised scenario.

There will be a new boundary line close to the middle of the terrain (running from top to bottom); it will not have coloured dots, but it has one navigational black dot near its southern extremity. There will be no barrier on this line: the barrier will be used only on the outer perimeter.

It is intended that both systems will run independently and concurrently, as close as possible to the specification used for your semester project.

In particular, there will be two operators and two communications base-stations. The robots remain the same as for your project. The two operators are able to communicate with each other.

There are clearly situations where an agreed protocol is needed to handle the shared boundary; also, it is likely that there are other situations that will need to be handled differently in the new scenario.

This question is concerned with how you would change your *prototype* to address the new scenario.

(a) Identify situations that will need to be handled differently, and discuss essential elements of a protocol that could be used to resolve them safely and efficiently.

[10 marks]

(b) Specify four requirements, to be added to the SRS, reflecting the most important aspects of the changed situation.

[9 marks]

(c) For *one* of the requirements given above, describe an acceptance test suite that can be used to determine whether or not the acceptance criteria are satisfied.

[8 marks]

[Total for Question 5: 27 marks]

Question 6

In lectures, we discussed how developing a high-level view of system architecture can be a valuable adjunct to system design. We explored various examples of block diagrams, and different architectural patterns.

(a) List four fundamental questions that should be addressed in architectural design.

[3 marks]

(b) Consider the revised scenario, of Question 5.

Your colleagues, who are familiar with the original system, need to understand the implications of the changes in order to work out a new system architecture.

They have asked for a diagram to assist this. The diagram will be used by the design team, to start the process of preparing revised design documentation for the SDD.

Prepare such a diagram, to convey this information effectively.

Discuss the important elements of your diagram, explaining why you believe it achieves its purpose.

[7 marks]

(c) In lectures, we used as an example a system to administer doses of insulin. If you were asked to develop such a system, what kind of architecture would you use? Justify your choice.

[3 marks]

[Total for Question 6: 13 marks]

Question 7

(a) Your team has been selected to develop a large and complex software system that is expected to exist for at least two decades. Since it is unlikely you or any of your team will be working for the company in 10 years time, the management have (wisely) mandated that your documentation for the project must be both excellent and kept up to date as the project proceeds. Describe a process or technique you could put in place to ensure the required outcome for the documentation.

[6 marks]

(b) Give a description of the *maintainability* quality attribute. Define a non-functional requirement applicable to your project that relates to this quality attribute. The requirement must be measurable.

[3 marks]

(c) Your team has been busy implementing components of the system for a while. Each programmer has been responsible for implementing *unit level* tests; and the team has reached the point at which *integration testing* has commenced. Define both of these terms.

[4 marks]

(d) To ensure a quality outcome, the project manager has decided to run a test case coverage tool over the codebase. The tool is similar to those discussed in lectures (EMMA or corberatura). The tool highlights code that has not been executed in red, and the code that has been executed in green.

When the coverage is examined, it is clear that a large amount of the code remains coloured red, but all the tests in the test suite pass.

Discuss what this means for your project.

[5 marks]

[Total for Question 7: 18 marks]

End of exam