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

Semester 2, November 2014

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 asteroid hunting prototype project undertaken this semester.

[2 marks]

(b) Consider the asteroid hunting 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) It is often desirable to combine aspects of different process models for a given project. Explain this statement, with the use of an example.

[6 marks]

(d) It has been said that Agile methods are just an excuse for ad-hoc and undisciplined project development. Take a position on this statement, and defend your position.

[6 marks]

(e) What are the differences between Agile and Spiral models with respect to managing risks?

[4 marks]

[Total for Question 1: 26 marks]

Question 2

(a) Discuss the role of milestones in delivering project outcomes on time.

[2 marks]

(b) Do you think that the process model you used encouraged the setting of meaningful milestones? Would this influence your choice of process models in future projects?

[4 marks]

(c) The stable trunk repository model is described in detail in the SVN book. Describe the purpose of each of the following features of the stable trunk repository model:

i. Trunk

[2 marks]

ii. Branch

[2 marks]

iii. Tag

[2 marks]

(d) Consider each of the features *trunk*, *branch* and *tag* in turn. Explain how each could have best been used in your project.

[6 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) 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, 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 a 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

The following questions are about the case study that we examined during the risk analysis lectures, concerning the Denver International Airport Baggage Handling System.

This was a very ambitious system that was not only very late on delivery but also failed to achieve the functionality envisaged when it was proposed. Clearly there were many deficiencies of process in the lifetime of this system.

(a) The system did not deliver expected functionality. This suggests problems with software processes concerned with requirements. Identify and comment on what you see as the most significant deficiencies related to this aspect.

[4 marks]

(b) The case study identifies one of the serious problems associated with this project to be "failure to perform risk management". Consider the six possible types of risk (as identified in the textbook and lectures). Identify the three types most critical in the failure of the project, with a brief explanation of your choices.

[7 marks]

[Total for Question 4: 11 marks]

Question 5

In developing your asteroid hunting prototype, you could assume that the robot was able to move around without encountering people — the operator would establish a no-go zone to keep the robot away from personnel in the area.

Now imagine that you are working on location with a real robot. It is an active work site, so it is not feasible to restrict the robot from all areas where there might be people.

Hence, the system must be designed so that the robot can carry out its mapping tasks efficiently in such a situation. It must be able to recognize the presence of people, and be able to adjust its movement and actions in order to avoid contact. This is critical, as the robot is large and able to move fast, making any collision potentially fatal.

The robot is equipped with a high resolution photographic sensor so that it has access to images of its surroundings; the robot can also accurately measure distance to nearby objects. The robot incorporates advanced navigation and decision making technology.

The following questions concern the interaction between robot and people.

(a) State what you consider to be the three most important requirements that you would use to characterize this aspect of the system. Give a rationale for each requirement, in addition to the statement of the requirement.

[10 marks]

(b) How can you convince your customer that you have designed this system to achieve a very low probability of an accident?

[6 marks]

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

[8 marks]

[Total for Question 5: 24 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 types of block diagram, and architectural patterns.

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

[4 marks]

(b) The customer for your prototype asteroid hunting robot (as done during this semester) has asked for a block diagram to show to non-technical colleagues to explain the purpose and operation of the system.

Draw this diagram, with explanation of how it communicates useful information.

[5 marks]

(c) If you are asked to develop a car-safety system, what kind of architecture would you use? Justify your choice.

[4 marks]

[Total for Question 6: 13 marks]

Question 7

(a) Your group was expected to generate a large amount of documentation (including SRS, SPMP and SDD documents); you can expect this to be the case for your future projects as well. Describe a process that you would put in place to write and review documentation before it is released. Make an objective comparison of this process with that used in your project. Discuss how your new process is an improvement over the process used for your project.

[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) Suppose that you are a member of a team where code reviews have revealed a substantial portion of code that is non-compliant with coding standards required by the organization. Describe two (2) approaches that could be adopted in order to ensure compliance against such standards. Justify your answers.

[3 marks]

(d) Define what is meant by the term regression testing, and explain briefly why it is important.

[2 marks]

(e) As a project manager which of the following is preferable:

- The test suite covers 100% of the critical code, but currently a large number of these tests fail.
- The test suite covers less than 50% of the critical code, but all tests pass.

Justify your answer.

[2 marks]

[Total for Question 7: 16 marks]

End of exam