THE AUSTRALIAN NATIONAL UNIVERSITY

First Semester Final Examination 2015

SYSTEMS ENGINEERING FOR SOFTWARE ENGINEERS

(COMP3530 and COMP6353)

Take Home Examination

MAKE SURE YOU READ EVERYTHING IN THIS EXAMINATION PAPER

ANSWER ALL QUESTIONS BY EDITING THIS DOCUMENT

MAKE SURE YOU INSERT YOUR STUDENT NUMBER IN THE BOX BELOW AND COMPLETE THE TWO DECLARATIONS ON PAGE TWO.

Student Number	

This section for examiner's use only

Q1 [10]	Q2 [20]	Q3 [40]	Q4 [30]

Total [100]

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In submitting this examination paper and entering your student number in the box below, you declare that:

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QUESTION ANSWER GUIDELINES

All questions must be answered in this document. You must use *OpenOffice*, *LibreOffice* or *MSWord* to edit this document.

Do not make any changes to this document other than on the answer and reference pages.

Do not write by hand on any part of this document – you must submit this document using Wattle.

Make sure that you do not exceed any specified page limits. Penalties may apply if you exceed these limits.

Make sure that you use a font size of 12pt and single line spacing.

You may include images and other diagrams within any specified page limits.

REFERENCES

The questions in this examination refer to papers and other publications listed in the references section at the end of this document. These documents are also available on the COMP3530/6353 Wattle site.

REFERENCING REQUIREMENTS

All referencing is to comply with the following:

- IEEE Citation Reference [3]

Add all of your references to the *References* section at the end of this document.

When referencing web sources, you should consider the following guidelines:

- ANU Webpage Evaluation Criteria [4]

QUESTION 1
(10 marks, Maximum of one page)

In 1992 a new *London Ambulance Service (LAS) Computer Aided Dispatch (CAD)* system failed within hours of going live and was abandoned within days. A detailed report on the project can be found at [6]. More concise summaries of the project can be found at [7] and [8].

a) Summarise the objectives of the LAS CAD System project from a systems perspective including the broader context within which the system was developed and intended to operate.

b) Using concepts covered in COMP3530/6353, explain why you think the LAS CAD project failed.

QUESTION 2
(20 marks, Maximum of two pages)

Bar-Yam [5] describes *Enlightened Evolutionary Engineering,* an approach to engineering large complex systems like the LAS CAD system. The approach aims to address limitations of traditional approaches to systems engineering.

a) Summarise the limitations of traditional systems engineering approaches being addressed by Bar-Yam's approach.

b) Explain the key characteristics and features of the *Enlightened Evolutionary Engineering* approach to complex systems engineering.

c) What evidence is provided by Bar-Yam as to the effectiveness of *Enlightened Evolutionary Engineering*.

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QUESTION 3
(40 marks, Maximum of four pages)

In COMP3530/6353 we looked at several aspects of systems engineering including Systems Thinking and Cause-Effect loops, Engineering Context, Design Thinking, Systems Engineering life-cycles, Requirements Engineering, Sustainability, Commercial aspects and Human aspects.

a) Compare and contrast *Enlightened Evolutionary Engineering* with traditional approaches to systems engineering in terms of the topics we covered in COMP3530/6353.

b) Can you think of any limitations of the *Enlightened Evolutionary Engineering* approach? For example, would it work in any situation? What barriers would there be to implementing the approach?

c) How would you improve the *Enlightened Evolutionary Engineering* approach?

QUESTION 4
(30 marks, Maximum of three pages)

Bar-Yam [5] explains how *Enlightened Evolutionary Engineering* can be applied to implement effective change in an existing Air Traffic Control system.

a) By drawing on Bar-Yam's paper and making connections with your answers to Questions 1, 2 and 3, explain how failure of the LAS CAD system might have been averted by applying the *Enlightened Evolutionary Engineering* approach to systems engineering.

b) Are there any alternative approaches covered in the course that might be used to avoid the problems experienced by the LAS CAD system project? Compare and contrast the use of such approaches with the use of *Enlightened Evolutionary Engineering*.

REFERENCES

Add all of your references to the end of this list using the format described in the *IEEE Citation Reference* [3].

Note that references [1] through [8] are also available directly from the COMP3530/6353 Wattle site.

[1]   ANU, Academic honesty & plagiarism [Online],
        Available: http://www.anu.edu.au/students/program-administration/assessments-exams/academic-honesty-plagiarism

[2]   ANU, Academic Misconduct Rules 2014 [Online],
        Available: http://www.comlaw.gov.au/Details/F2014L01785

[3]   IEEE, Citation Reference [Online].
        Available: http://www.ieee.org/documents/ieeecitationref.pdf

[4]   ANU, Webpage Evaluation Criteria [Online],
        Available: http://www.anu.edu.au/files/resource/webpage-evaluation-criteria-29052014.pdf

[5]   Bar-Yam, Y. (2003), When systems engineering fails-toward complex systems engineering, *IEEE International Conference on Systems, Man and Cybernetics 2003*

[6]   Page D, Williams P and Boyd D (1993) *Report of the Public Inquiry into the London Ambulance Service*. HMSO, London. [Online].
        Available: http://www0.cs.ucl.ac.uk/staff/A.Finkelstein/las/lascase0.9.pdf

[7]   Sommerville, I. (2004), The London Ambulance Fiasco [Online].
        Available: http://ifs.host.cs.st-andrews.ac.uk/Resources/CaseStudies/LondonAmbulance/LASFailure.ppt

[8]   McDougall, M. (1999), The Failure of the London Ambulance Service [Online].
        Available: ftp://ftp.cis.upenn.edu/pub/cis573/public_html/slides/las.ppt