



THE UNIVERSITY OF WESTERN AUSTRALIA
Achieve International Excellence

School of Computer Science and Software Engineering

SEMESTER 1, 2013 EXAMINATIONS

**CITS4401
SOFTWARE REQUIREMENTS AND DESIGN**

FAMILY NAME: _____ GIVEN NAMES: _____

STUDENT ID:

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This Paper Contains: **8 pages (including title page)**
Time allowed: **2 hours 10 minutes**

INSTRUCTIONS:

This paper contains 2 sections, 14 questions

Section A: 10 short answer questions (20 marks)

Section B: 4 questions (40 marks)

TOTAL: 60 marks

All questions are to be answered.

Answers for Section A are to be written in the spaces provided on the exam paper.

Answers for Section B are to be written in the examination answer booklets.

Please start each question on a separate page.

Exam papers are to be collected with the examination answer booklets.

PLEASE NOTE

Examination candidates may only bring authorised materials into the examination room. If a supervisor finds, during the examination, that you have unauthorised material, in whatever form, in the vicinity of your desk or on your person, whether in the examination room or the toilets or en route to/from the toilets, the matter will be reported to the head of school and disciplinary action will normally be taken against you. This action may result in your being deprived of any credit for this examination or even, in some cases, for the whole unit. This will apply regardless of whether the material has been used at the time it is found.

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Supervisors Only – Student left at:

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SECTION A**QUESTION 1****[2 marks]**

Briefly explain how a Sawtooth model differs from the Waterfall model and give an advantage and a disadvantage of each.

QUESTION 2**[2 marks]**

Draw a UML class diagram to capture the following situation at an airport: “Each passenger must have a boarding pass issued by an airline. A boarding pass can be for an international flight or for a domestic flight. A passenger taking an international flight must also have a passport.” Include in your class diagram all the associations and multiplicities.

QUESTION 3**[2 marks]**

Identify the **actors** and **objects** in the following scenario of booking a hotel room in an online room booking (ORB) system:

To book a room online, the user of ORB selects her/his arrival and departure dates. ORB passes the information to an external hotel database system to check whether there are rooms available during the dates chosen by the user. If so, ORB prompts the user to pay for one night's accommodation in advance to secure the booking. The user then supplies her/his credit card details. ORB validates the information entered by the user with a third party banking system. If the credit card details are valid, ORB despatches an email to the user to confirm the booking.

QUESTION 4**[2 marks]**

Sketch a UML sequence diagram for the scenario described in Question 3.

QUESTION 5

[2 marks]

Describe the **repository** software architecture, and give one advantage and one disadvantage of it.

QUESTION 6

[2 marks]

Describe the Proxy design pattern. Give an example to show when it would be suitable to use this pattern.

QUESTION 7**[2 marks]**

Rewrite the following prose as a structured rationale argument. The prose was drafted by a group of software developers for an online banking system:

“The main issue is what programming language to use for the underlying system. We could use Java or C++. Both have the advantages for being object-oriented. Java has the additional advantage for being portable. However, native C++ code would run faster than Java code. Security is an important feature that the online banking system must have and we have the experience in doing data encryption in Java from a previous project. We decided to use Java because of our experience in handling security issues using Java.”

QUESTION 8**[2 marks]**

An electric pump has an ON switch and an OFF switch to control the flow of water between two reservoirs. When the water is flowing from the left reservoir to the right reservoir (or from right to left), pressing the ON switch will reverse the direction of water flow. Pressing the OFF switch would simply stop the flow of water. When the pump is off, pressing the ON switch would always start the water to flow from the left reservoir to the right reservoir.

Draw a UML state-chart to show a design for monitoring the water flow direction.

QUESTION 9

[2 marks]

Give three reasons why it is difficult to build software systems that meet client requirements and are delivered on-time and on-budget.

QUESTION 10

[2 marks]

Describe how requirements negotiation in agile software development methodologies differs from requirements negotiation in traditional software development methodologies.

SECTION B

Answers for Section B are to be written in the examination answer booklets.

All Questions in Section B refer to the *Vending Machine Transaction Manager System* described below:

Suppose that you are asked to design software for a *vending machine transaction manager* (the part of the machine that accepts currency and gives change). As you are working for a large multi-national corporation, this software needs to be generic, so that it can be configured for different currencies in different parts of the world and is also able to be configured for different types of products. You do not have to worry about the mechanics of the system or the sensors that detect and deliver currency or deliver products. However, you should design the system so that it can be configured with a given set of products, accept a given currency, and instruct the mechanical system to deliver the request product and change or refund any currency inserted into the machine.

QUESTION 11**[12 marks]**

- a) Propose four functional requirements for such a system.
- b) Propose four non-functional requirements for the system.
- c) Give a prioritized list of design constraints for the system and justify your list and the ordering.

QUESTION 12**[12 marks]**

An important aspect of this system is that it should be able to be configured to accept different currencies and new denominations in a known currency. Describe two architectures that address this issue, and present rationale citing the design constraints in Question 11.

QUESTION 13**[10 marks]**

Propose a set of classes that could be used in your system and present them in a class diagram. Propose a subsystem decomposition for these classes and comments on the coupling and cohesion within this decomposition.

QUESTION 14**[6 marks]**

Identify significant risks that might prevent you from meeting the requirements of the system and suggest a mitigation or avoidance strategy for managing each risk.

END OF PAPER
