



THE UNIVERSITY OF
**WESTERN
AUSTRALIA**

Computer Science and Software Engineering

SEMESTER 1 2018 EXAMINATIONS

CITS4401

Software Requirements and Design

FAMILY NAME: _____ GIVEN NAMES: _____

STUDENT
ID:

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SIGNATURE: _____

This Paper Contains: **9 pages (including title page)**

Time allowed: **2:00 hours (including reading time)**

INSTRUCTIONS:

- This examination paper comprises 2 sections.
- Section I contains 9 short answer questions which are required to be attempted on the examination paper (24 marks).
- Section II contains 4 questions which are required to be answered in the examination answer booklets (31 marks).
- Attempt all questions and total marks are 55.
- Marks for each question are mentioned in examination paper.
- **Examination paper must be handed in with answer booklets at the end of the exam.**

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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SECTION I

Answers for Section I are to be written on the examination paper.

Question 1:

2 marks

Briefly explain the limitations of Waterfall and V models. How can we overcome these limitations?

Question 2:

2 marks

Briefly explain the importance of negotiation in Agile Software Development. How it is different to traditional software development methods?

Question 3:

3 marks

Draw a use case diagram for a ticket distributor for a train system. The system includes two actors: a traveler who purchases different types of tickets, and a central computer system that maintains a reference database for the tariff. Use cases should include `BuyOneWayTicket`, `BuyWeeklyCard`, `BuyMonthlyCard`, and `UpdateTariff`. Also include the following exceptional cases: `TimeOut` (i.e., traveler took too long to insert the right amount), `TransactionAborted` (i.e., traveler selected the cancel button without completing the transaction), `DistributorOutOfChange`, and `DistributorOutOfPaper`.

Question 4:

3 marks

Draw a class diagram representing a book defined by the following statement:

A book is composed of a number of parts, which in turn are composed of a number of chapters. Chapters are composed of sections. A book includes a publisher, publication date, and an ISBN. A part includes a title and a number. A chapter includes a title, a number, and an abstract. A section includes a title and a number.

You must add an abstract class and an inheritance relationship to factor out common attributes into the abstract class.

Question 5:

3 marks

Draw a sequence diagram for the warehouseOnFire scenario provided below. Include the objects bob, alice, john, FRIEND (First Interactive Emergency Navigational Database), and instances of other classes you may need

<i>Scenario name</i>	<u>warehouseOnFire</u>
<i>Participating actor instances</i>	<u>bob, alice:FieldOfficer</u> <u>john:Dispatcher</u>
<i>Flow of events</i>	<ol style="list-style-type: none">1. Bob, driving down main street in his patrol car, notices smoke coming out of a warehouse. His partner, Alice, activates the “Report Emergency” function from her FRIEND laptop.2. Alice enters the address of the building, a brief description of its location (i.e., northwest corner), and an emergency level. In addition to a fire unit, she requests several paramedic units on the scene given that area appears to be relatively busy. She confirms her input and waits for an acknowledgment.3. John, the Dispatcher, is alerted to the emergency by a beep of his workstation. He reviews the information submitted by Alice and acknowledges the report. He allocates a fire unit and two paramedic units to the Incident site and sends their estimated arrival time (ETA) to Alice.4. Alice receives the acknowledgment and the ETA.

Question 6:

2 marks

An electric fan can be in one of the following modes when it is switched on: slow rotation and fast rotation. The electric fan is controlled by an ON switch and an OFF switch. If the electric fan is already on, then pressing the ON switch will toggle between the two speed modes. Pressing the OFF switch turns off the electric fan. Whenever the electric fan is first turned on, it is always in the slow rotation mode.

Draw a UML statechart diagram to show a design for the electric fan which allows full control of the electric fan from the two switches.

Question 7:

2 marks

Briefly explain Requirements Elicitation. Mention four different techniques of requirements elicitation.

Question 8:

2 marks

Describe the Layered System Software Architecture, and give one advantage and disadvantage of it.

Question 9:

5 marks

Write the name of the software design pattern in front of each of the following situations? You need to mention the most optimal software design pattern which should be for each of the following situations.

- Allowing for alternate implementation
- Encapsulating subsystems
- Encapsulating algorithms
- Encapsulation control flow
- Wrapping around legacy code

SECTION II

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

All questions in Section II refer to the Gas Station System described below:

A filling station (gas station) is to be set up for fully automated operation. Drivers swipe their credit card through a reader connected to the pump; the card is verified by communication with a credit company computer, and a fuel limit is established. The driver may then take the fuel required. When fuel delivery is complete and the pump hose is returned to its holster, the driver's credit card account is debited with the cost of the fuel taken. If the card is invalid, the pump returns it before fuel is dispensed.

Question 10:

3*3 marks

- a) Describe three functional requirements for the system
- b) Describe three 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 11:

4*2 marks

- a) Describe a software architecture that would be suitable for the system.
- b) Present a structured rationale argument for your software architecture using the design constraints that you identify in Question 10 (c) above.

Question 12:

5*2 marks

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

Question 13:

4 marks

Identify two design patterns that would be suitable for the system. Briefly justify your selection.

END OF EXAM