# Charles Darwin University

Final Examination

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| Family Name | | | | | | |
| Given Name/s | | | | | | |
| Student Number | | | | | | |
| Teaching Period | Semester 1, 2019 | | | | | |

| PRT451 – Principles of Software Systems | DURATION | |
|---|---|---|
| | | |
| | Reading Time: | 20 minutes |
| | Writing Time: | 180 minutes |
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## INSTRUCTIONS TO CANDIDATES

1.1 The examination has **1** section. There are 8 questions. You must answer all questions.

| Suggested Time: | 180 minutes Marks:100 |
|---|---|

All questions must be answered in the Answer Booklet provided. Please ensure that your name and student number are clearly indicated on your Answer Booklet and at the top of this examination paper.

1.2 Note that questions **ARE NOT** of equal value.
1.3 Read **ALL** questions carefully.

## EXAM CONDITIONS

You may begin writing from the commencement of the examination session. The reading time indicated above is provided as a guide only.

This is a RESTRICTED OPEN BOOK examination

No calculators are permitted

One A4 sheet of handwritten double-sided notes permitted

No dictionaries are permitted

| ADDITIONAL AUTHORISED MATERIALS | EXAMINATION MATERIALS TO BE SUPPLIED |
|---|---|
| No additional printed material is permitted | 1 x 20 Page Book |

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# Section A

## Short Essay Questions

**Total No of Marks for this section: 100**

This section should be answered in the Answer Booklet provided.

Marks for each question are indicated. Suggested Time allocation for Section B: 180 mins

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**Question 1**

(a) It goes without saying that you should uphold normal standards of honesty and integrity. You should not use your skills and abilities to behave in a dishonest way or in a way that will bring disrepute to the software engineering profession. However, there are areas where standards of acceptable behaviour are not bound by laws but by the more tenuous notion of professional responsibility. Identify at least four areas and explain them in relation to professional responsibility.

(Marks: 5)

(b) Draw a UML activity model that illustrates how the software transforms an input blood sugar level to a sequence of commands that drive the insulin pump. If this is a safety-critical system, then what are the two essential high-level requirements that this system must met?

(Marks: 5)

**Question 2**

(a) Giving reasons for your answer based on the type of system being developed, suggest the most appropriate generic software process model that might be used as a basis for managing the development of the following systems:

- A system to control anti-lock braking in a car
- A virtual reality system to support software maintenance
- A university accounting system that replaces an existing system
- An interactive travel planning system that helps users plan journeys with the lowest environmental impact

(Marks: 8)

(b) In building the application your team used agile methodology approach for the development process. Like every other professional software development process, agile development must be managed so that the best use is made of the time and the resources available to the team. Explain in detail the approach your team has taken to agile project management.

(Marks: 5)

(c) Argue why a software system that is used in a real-world environment must change or become progressively less useful.

(Marks: 4)

**Question 3**

(a) Develop a sequence diagram showing the interactions involved when a student registers for a course in a university. Courses may have limited enrolment, so the registration process must include checks that places are available. Assume that the student accesses an electronic course catalogue to find out about available courses.

(Marks: 5)

(b) Identify the most important non-functional requirement your team addressed while developing the application assigned to your team as a part of the deliverables of this unit. Critically analyse the non-functional requirement identified and generate with explanation a number of related functional requirements that define new system services that are required.

(Marks: 8)

**Question 4**

(a) Requirements engineering process follows a standard approach to conduct requirements elicitation and analysis. Explain in detail the approach you followed in the requirements elicitation and analysis process. You can use your application's requirement gathering process as an example to explain the approach.

(Marks: 6)

(b) After gathering the user requirements, it is very important to go for requirements validation. Requirements validation is the process of checking that requirements actually defines the system that the customer really wants. Explain briefly three different types of checks which should be carried out during the requirements validation process.

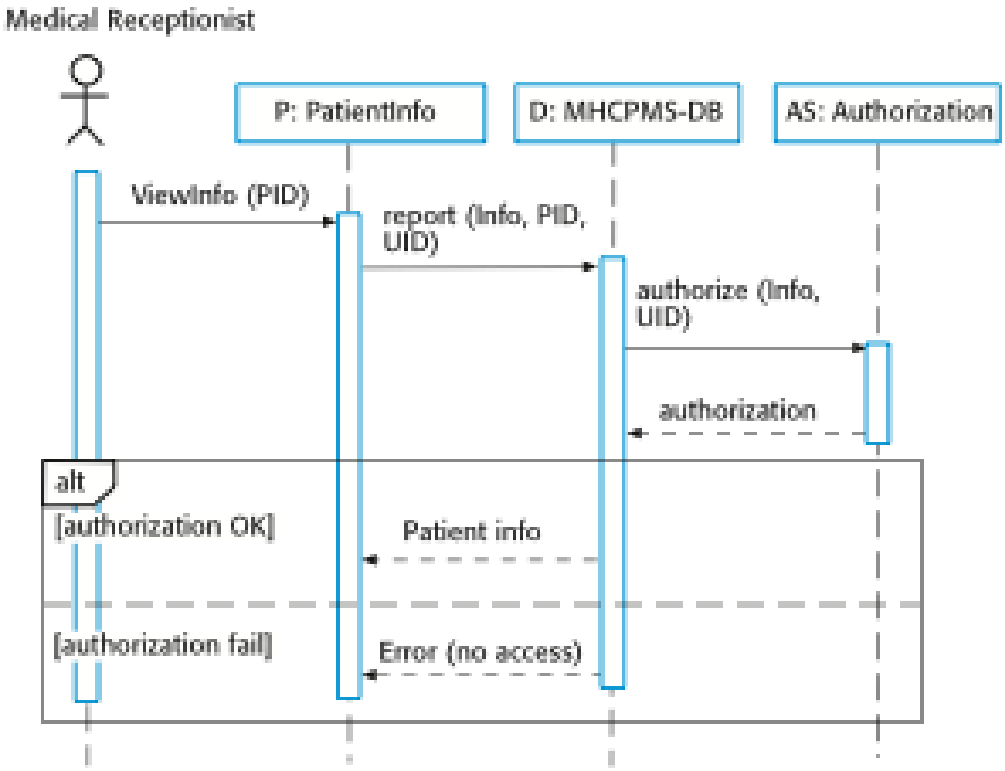
(Marks: 5)

(c) During software development, it is quite common to use open-source software as part of your software product. In this case licensing issues are important because if you use open-source software as part of a software product, then you may be obliged by the terms of the license to make your own product open source. Discuss the three most important licensing used for open source product.

(Marks: 5)

## Question 5

(a)




The figure above shows an example of a sequence diagram that illustrates the interactions involved in the View patient information use case, where a medical receptionist can see some patient information. Summarise the sequence of operations conducted by the medical receptionist for viewing the patient information.

(Marks: 5)

(b) Create the class diagram of an online ticket sale. Your diagram should accommodate the classes of all the major operations of an online ticket sale.

(Marks: 5)

## Question 6

(a) Differentiate between the proposed architectural patterns which are commonly used in different types of systems. You should also mention about the systems which used this architectural pattern:

- MVC Pattern
- Layered Architecture
- Pipe and Filter Architecture

(Marks: 6)

(b) Give the benefits of verification and validation in software development and tell about the techniques of verification and validation in the process of software development.

(Marks: 5)

## Question 7

(a) Find out the following requirements of a university online library system

- User Requirements
- System Requirements
- Functional requirements
- Non-functional Requirements

(Marks: 4)

(b) Consider the messages and mailboxes in an email system that you use. Model the object classes that might be used in the system implementation to represent a mailbox and an e-mail message.

You can use the following example in modelling the object class.

| Mail Message | Mailbox |
|---|---|
| Attributes (for example)<br>sender: | Attributes (for example)<br>name: |
| Operations / Methods<br>read() | Operations / Methods<br>create() |

(Marks: 5)

## Question 8

(a) Architectural design is a creative process where you design a system organisation that will satisfy the functional and non-functional requirements of a system. Because of the close relationship between non-functional requirements and software architecture, the particular architectural style and structure that you choose for a system should depend on the non-functional system requirements. The list below shows the critical non-functional requirements:

- Performance
- Security
- Safety
- Availability
- Maintainability

Pick any 3 from the list and for each define how the architecture should be designed if that is the critical requirement of the application.

(Marks: 6)

(b) Explain the difference between partition testing and guideline-based testing. For component testing interface testing is very crucial and test cases are required to test the component interfaces. Identify four different component interfaces of your application and summarise your testing approach in testing those interfaces.

(Marks: 8)