

University of St Andrews



DECEMBER 2020 48 HOUR ASSESSMENT SCHOOL OF COMPUTER SCIENCE

MODULE CODE:	CS5030
MODULE TITLE:	Software Engineering Principles
TIME TO HAND IN:	48 hours
EXAM INSTRUCTIONS	<ul style="list-style-type: none">a. Answer ALL questionsb. Each question indicates the number of marks it carries. The paper carries a total of 60 marks.

This assessment consists of exam-style questions and you should answer as you would in an exam. As such, citations of sources are not expected, but your answers should be from your own memory and understanding and significant stretches of text should not be taken verbatim from sources. Any illustrations or diagrams you include should be original (hand or computer drawn). You may word-process your answers, or hand-write and scan them. In either case, please return your answers as a single PDF. If you handwrite, please make sure the pages are legible, the right way up and in the right order. Your submission should be your own unaided work. While you are encouraged to work with your peers to understand the content of the course while revising, once you have seen the questions you should avoid any further discussion until you have submitted your results. You must submit your completed assessment on MMS within 48 hours of it being sent to you. Assuming you have revised the module contents beforehand, answering the questions should take no more than three hours.

1. Software processes and modelling

Consider the hypothetical scenario that you are part of a team tasked with developing a proof of concept medical diagnostic system for the health service based on some latest research. The system is novel in its approach but also needs to adhere to strict standards set by the government and be approved prior to deployment. The system will be used by doctors and consultants in different locations. Both doctors and consultants can enter patient data and access diagnoses. Consultants can override or refine diagnoses. The data stored or accessed by the system will include personal details of patients, their medical history and health data. The system is expected to produce diagnoses in real-time. It will interact with other systems used by the health service.

- (a) List 3 each of functional and non-functional requirements for this system.
[6 marks]
- (b) Which development process would you adopt for this system? Justify your answer.
[3 marks]
- (c) Identify an overall software architecture style that would be suitable for this system, describing its elements and interaction patterns and justifying your choice of style.
[7 marks]
- (d) Which aspects of software design are important for this system? Justify your answer and indicate the modelling notations you would use for the chosen aspects of the design.
[4 marks]

[Total marks 20]

2. Software evolution and reuse

Consider a software system used by an athletics club to manage its membership and organise coaching sessions and races. This system was developed a number of years ago by two members of the club with some experience in software development and is being maintained by one of the original developers.

- (a) List the stages of the software evolution lifecycle. [3 marks]
- (b) Identify possible circumstances that would cause the above system to move to each of these stages. [3 marks]
- (c) Describe 3 challenges in implementing changes to this system after it is deployed. [3 marks]
- (d) What factors will influence the decision whether to re-engineer this system when additional functionality is required? [3 marks]
- (e) In due course, the club decides that a new system is needed to manage club activities. Identify 4 artefacts and resources associated with the old system that may be reused in the new system. [4 marks]
- (f) You are asked to create a product line based on the system used by the athletics club. Describe 2 additional products that could be created to form such a product line. [4 marks]

[Total marks 20]

3. Software quality

Consider a software system that is used to monitor and report the health of elderly people living alone in their homes. The system integrates multiple devices in the homes of customers and the office of the care provider. The system includes cameras in the house that can be activated in the event of emergency, watches that monitor vital signs of customers and provide reminders to them of appointments and medication schedule. Customers also make emergency or regular contact with the care provide through their watch or a smartphone app. Staff at the care provider will be able to monitor the data and schedules of all their customers. Any unusual incidents will be logged in the system and appropriate support will be dispatched as necessary.

- (a) List the 5 principal dimensions of dependability and describe how they apply in the context of this system. [10 marks]
- (b) Identify two hazards in the system. [2 marks]
- (c) For each hazard from question 3 (b), specify a requirement to reduce the likelihood that the hazard will result in an accident. [2 marks]
- (d) Briefly describe the types of testing that would be particularly important for this system, justifying your choices. [6 marks]

[Total marks 20]

***** END OF PAPER *****