University of St Andrews

MARTINMAS 2022-23 EXAMINATION DIET
SCHOOL OF COMPUTER SCIENCE

MODULE CODE: **CS5030**

MODULE TITLE: Software Engineering Principles

EXAM DURATION: 3 hours

EXAM INSTRUCTIONS
a. Answer all three questions
b. Each question carries 20 marks

This assessment consists of exam-style questions and you should answer as you would in an exam. You cannot copy or paraphrase text or material from other sources and present this as your own work. Your exam answers should be entirely your own work without unacknowledged input from others. If you are in any doubt, you should clearly acknowledge the origin of any material, text passages or ideas presented (e.g. through references). You must not co-operate with any other person when completing the exam, which must be entirely your own work. You must not share any information about the exam with another person (e.g. another student) or act on any such information you may receive. Any attempt to do so will be dealt with under the University's Policy for Good Academic Practice and may result in severe sanctions.

You must submit your completed assessment on MMS within 3 hours of you downloading the exam. Assuming you have revised the module contents beforehand, answering the questions should take no more than three hours.

1. Software lifecycle and processes:

A software company has been commissioned to develop a software system to manage the logistics of a busy hospital. The purpose of this new system will be to manage patient records, staff records, patient appointments, staff schedules, hospital facility bookings, prescriptions and stock control. Staff will be employed in roles such as medical staff (doctors, nurses, and surgeons), pharmacists, janitorial staff and admin personnel. Hospital facilities can include consulting rooms, operating theatres, scan rooms, wards and recovery rooms. Stock can include any item used by the hospital including medical equipment, drugs, stationery, cleaning products and protective equipment.

Patients can register with the system to view their records and appointments. Staff will register with the system to view their records and work schedules, and to access other functionality relevant to their roles.

Currently multiple systems handle all these functionalities for the hospital. An independent review has pointed out that these systems use old languages and technologies, they are becoming harder to maintain, and that information is not shared among them in an adequate or timely manner, leading to potentially serious consequences. The new system is expected to address these concerns. It will not incorporate functionality to handle critical patient care, such as monitoring vital signs or controlling drug delivery.

Clearly state any assumptions you make about the scenario while answering the following questions.

(a) Specify 3 functional and 3 non-functional system requirements for the proposed system. [6 marks]

(b) Which software development process will you adopt for the 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) Describe the testing strategies you would use for this system. [4 marks]

[Total marks 20]

2. Software quality:

A small software company has been hired to modify a legacy system used by a number of high street banks to detect potentially fraudulent credit and debit card transactions. The current system uses a combination of data about the card holder and their transaction history to calculate a fraud score for each transaction. Any transaction with a score higher than a specified threshold is flagged up as potentially fraudulent. Customers have raised concerns that genuine transactions are flagged up by this system while fraud is not always detected.

The system is to be modified to use artificial intelligence techniques (such as machine learning) to detect fraud with the aim of improving accuracy.

(a) Explain how the different dimensions of dependability would apply to the current system. [5 marks]

(b) Briefly discuss 2 ethical concerns that might arise in the context of the modified system. [4 marks]

(c) Identify 4 kinds of security threats and give an example of each in the context of the modified system. [8 marks]

(d) Provide an example of how you might address security concerns in each of the following artefacts in the context of the modified system: requirements, software architecture and design. [3 marks]

[Total marks 20]

3. Project Management and collaborative development

Consider the scenario in which you work for a multi-national company managing software engineering projects. You have been asked to manage a project that will develop a suite of software applications designed to support the online delivery of taught postgraduate programmes by universities. The applications must support live online classes, online support for students outside class hours, discussion forums, repositories of programme resources, various assessment and feedback processes, administration of the student journey through the programme, and customisable programme structures for different universities. The applications must interact with one another seamlessly so that students and staff have a smooth experience. The suite of applications is aimed at the university sector in general.

You have been assigned 3 cross-functional development teams located in 3 different continents for the project.

(a) List the generic project management activities, giving an example of each in the context of this system. [3 marks]

(b) Discuss 3 project management challenges that can arise during the development of this system. [6 marks]

(c) Outline 3 categories of risks that may apply to this project, giving an example of each. [6 marks]

(d) List 5 strategies you can use to ensure your teams work well together. [5 marks]

[Total marks 20]

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