University of St Andrews

DECEMBER 2018 EXAMINATION DIET

SCHOOL OF COMPUTER SCIENCE

MODULE CODE:	**CS5030**
MODULE TITLE:	Software Engineering and Principles
EXAM DURATION:	2 hours
EXAM INSTRUCTIONS	(a) Answer **three** questions. (b) Each question carries 20 marks. (c) Answer questions in the script book.
PERMITTED MATERIALS	Non-programmable calculator

YOU MUST HAND IN THIS EXAM PAPER AT THE END OF THE EXAM.

DO NOT TURN OVER THIS EXAM PAPER UNTIL YOU ARE INSTRUCTED TO DO SO.

1. Software Processes and Testing.

(a) Imagine you are a software manager responsible for the three projects listed below. For each project, suggest the most appropriate development process, and justify your choice.

(i) Develop a mobile application for personalised news feed. [2 marks]

(ii) Develop a mobile application that allows users to record their diary. [2 marks]

(iii) Develop a mobile application for a smart watch to perform fall detection on elderly people and send alerts to caregivers in case of a fall being detected. [2 marks]

(b) Human-centric design.

(i) Based on the paper that we have covered in the lecture: "Applying user centred and participatory design approaches to commercial product development", discuss why functionality of a product is not the sole determining factor for the success of a product. [2 marks]

(ii) Assume you have developed the library website for the University of St Andrews to allow university staff and students to browse the catalogue, and borrow and renew books. Discuss what techniques you might choose to perform usability testing and what data you might collect to help you analyse the usability. [4 marks]

(c) What is partitioning testing? Design partitioning test cases for a program that interacts with the search API of DBLP. DBLP is a service that provides bibliographic information on major computer science publications. The search API of DBLP allows users to search for publications, authors, and venues. The program that interacts with this search API takes 2 inputs: one is the searching category among "publication", "author", and "venue", and the other is the actual query keyword. For example, you could input "author" and "Ian Sommerville", the program will return a list of academic publications authored by Ian Sommerville. [4 marks]

(d) Give two examples of guideline-based testing. [2 marks]

(e) What is stress testing and what is its goal? [2 marks]

[Total marks 20]

2. Requirement Engineering and Dependability Engineering.

(a) Derive possible system requirements for each of the following user requirements from the gas and electricity bill management software for British Gas. British Gas is the UK energy and home services company.

(i) The system should generate monthly bills for the customers showing the energy consumed and the money due. [2 marks]

(ii) The system should send reminders to customers to submit their meter readings. [2 marks]

(b) Non-functional requirements.

(i) What are non-functional requirements? [1 mark]

(ii) Discuss the challenges of defining precise, unambiguous non-functional requirements. [3 marks]

(iii) Evaluate the quality of each of the following non-functional requirements on the Module Management System (MMS) at the University of St Andrews. If the requirement is ambiguous, please rephrase it.

(1) The MMS should be easy to use by university staff and students. [2 marks]

(2) The MMS should be reliable and robust. [2 marks]

(iv) Discuss the pitfalls of defining quantitative reliability specifications. Use the above example (iii) (2) to illustrate your answer. [2 marks]

(c) Domain requirements.

(i) What are domain requirements? [1 marks]

(ii) Give one example of domain requirements. [1 marks]

(d) What is the relationship between functional, non-functional and domain requirements? [4 marks]

[Total marks 20]

3. Software Architecture and Evolution.

(a) Describe the software architecture in MVC, in terms of its components and communications between components. [5 marks]

(b) Given the following system, answer three questions.

An online hotel booking system that allows users to browse and search hotels, and to make, revise, and cancel hotel bookings.

(i) Select an appropriate architectural pattern for the above system and draw a diagram showing the architecture. [5 marks]

(ii) Describe how you make maintenance predictions for the above system. [6 marks]

(iii) Identify the principal factors that affect the cost of reengineering the above system. [4 marks]

[Total marks 20]

4. Software and Project Management.

Consider the following table describing the tasks and milestones associated with a software project.

Task/ Milestone	Duration (Days)	Dependency	Task/ Milestone	Duration (Days)	Dependency
T1	2	-	T11	5	M1
T2	3	-	T12	7	M2
T3	6	T1	T13	7	T9
T4	4	T1	T14	5	T13
T5	1	T2	T15	10	T11
T6	9	T2	T16	4	T14, M3
T7	8	-	T17	5	T16
T8	6	T7	M1	-	T4, T5
T9	3	T7	M2	-	T6, T8
T10	10	T3	M3	-	T10, T12

Table 1. A software project is composed of a list of tasks and milestones.

(a) Draw a PERT chart showing the project schedule. [6 marks]

(b) According to the PERT chart you obtained in Question 4(a), identify the critical path of the project. [2 marks]

(c) Calculate the slack time of tasks reaching milestones M1, M2 and M3. [3 marks]

(d) Draw a diagram showing a project planning process. [5 marks]

(e) Describe experience-based and algorithmic cost modelling techniques in project schedule estimation and identify the pitfalls for both techniques. [4 marks]

[Total marks 20]

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