UNIVERSITY OF EDINBURGH

COLLEGE OF SCIENCE AND ENGINEERING

SCHOOL OF INFORMATICS

SOFTWARE ARCHITECTURE, PROCESS AND MANAGEMENT (LEVEL 11)

Tuesday 1$\underline{^{st}}$ April 2014

00:00 to 00:00

INSTRUCTIONS TO CANDIDATES

Answer any **TWO** questions.
All questions carry equal weight.
This is an **OPEN BOOK** examination.
You may consult books and other documents during this examination.
The use of calculators is **NOT** permitted.

Year 4 Courses

Convener: ITO-Will-Determine
External Examiners: ITO-Will-Determine

THIS EXAMINATION WILL BE MARKED ANONYMOUSLY

1. Please read all of this question before commencing to answer. Note that the inclusion of irrelevant information in answers may be penalised.

   Suppose you are working for a company that produces telephone exchange software. The software is responsible for responding to requests to make a connection, to establish the connection, maintain the connection and then terminate the connection at the end of the conversation.

   (a) Identify two or three quality attributes that you think would be critical to the quality of the telephone exchange software developed by the company. Justify your choice in terms of the requirements of particular stakeholder groups. [*6 marks*]

   (b) Provide a brief description and justification of an architecture you think would be appropriate for the static structure of the software. [*3 marks*]

   (c) Provide a quality attribute scenario for one of your chosen quality attributes. The scenario should be *realistic* in the sense that you can argue some of the stakeholders might require the system should pass the scenario. [*8 marks*]

   (d) Suppose that the telephone exchange software failed the scenario you have devised. What architectural tactic do you think would be appropriate to improve the chances of the telephone system passing the scenario. Justify you answer by demonstrating how the change could contribute to a change in outcome for the scenario. [*8 marks*]

2. You have been asked to develop the architecture for a system that is intended to make health records available to citizens on presentation of their credentials.

   (a) Suggest an architectural pattern that is a good match for this system. You should justify your answer by pointing out two or three features that are well matched with your chosen pattern. *[6 marks]*

   (b) Provide a diagram of your high-level architecture with a brief description of the role of each component. *[6 marks]*

   (c) Provide an architectural scenario that you believe your proposed architecture could potentially fail. *[8 marks]*

   (d) Suggest an architectural tactic that could strengthen the Security Quality Attribute for the system. *[5 marks]*

3. You are responsible for setting up a team working on the development of a system that is tasked to develop a system that will shut down a complex chemical plant in the event of detecting anomalous behaviour. The components of the plant interact in a complex way and shutting down takes several hours since some processes must be allowed to terminate before other processes can begin to shut down (e.g. some reactions generate heat and the cooling systems cannot be turned off until these reactions are complete). The plant is critical to the economy of the region it operates in and employs a large number of people, staff turnover is very high at the plant and some workers are not trusted.

   (a) Identify the key Quality Attributes for such a system justifying your answer with reference to the needs of relevant stakeholders; [*6 marks*]

   (b) suggest architectures for the static and run-time aspects of this system justifying your choice in terms of the quality attributes you have chosen; [*6 marks*]

   (c) you are trying to decide on what sort of lifecycle your team should adopt provide brief notes on two potential lifecycles noting their relative strengths and weaknesses; [*8 marks*]

   (d) you are concerned to be able to predict the behaviour of the system from early stage designs. What possible approaches to the modelling of your chosen quality attributes? Provide an assessment of well your chosen attributes can be predicted. [*5 marks*]