TECHNOLOGICAL UNIVERSITY DUBLIN
CITY CAMPUS - GRANGEGORMAN

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TU857: BSc. (Honours) Degree in Computer Science (Infrastructure)

Year 2
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SEMESTER 1 EXAMINATIONS 2023/24
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CMPU 2021: Systems Infrastructure and Architecture 1

Internal Examiner(s):	Mr. Ciaran O'Driscoll
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External Examiner(s):	Ms. Caroline McEnroy

Instructions to Candidates:

Answer Question (1) and ***any two*** other questions
Question (1) carries **40** marks.
Questions (2), (3), (4) carry **30** marks each

Exam Duration: Two Hours

Case Study 1: A School Management System

The objective of this system will be to support students and teachers in a secondary school environment.

The system will manage the communication between the teachers and the students in relation to homework and assignment grades. The system provides end users with an application on their smart phone to access the system.

The system will provide students with an online homework journal. The students will use journal to access required homework and see the deadlines. Students download the homework assignments from the system. The system will provide students with links and references to material related to the homework to guide their work. On completion of the homework, students will upload the work to the system. The system will confirm the work is submitted before the deadline, where it is late the student will be informed the work is late and a penalty may apply. The system will then indicate the work is complete and update the students record in a central database.

The system will indicate to teachers when homework is ready for correction and allow teachers to access the material. Teachers will then correct the material and enter the grade. The system will update the student records with the grade assigned, in a central database.

Teachers use the system to upload the homework, set deadlines and add links and references for students to assist with the homework.

1. (a) In relation to the Requirements Engineering process:

   (i) Briefly describe the three phases involved in *requirements capture*. Use a diagram to support your answer.

   (7 marks)

   (ii) Briefly describe ethnography and how it can be used for gathering requirements from key stakeholders. Include a brief discussion on whether this technique is appropriate or suitable to be used in all situations.

   (7 marks)

   (b) (i) Draw a Use Case diagram modelling main system features in Case Study 1 above. The diagram should have at least *two* Use Cases and *two* Actors.

   (3 marks)

   (ii) Describe *one* Use Case narrative for one of the Use Cases identified in the Use Case diagram. Include *one* error flow or alternative flow in the narrative.

   (9 marks)

(c) (i) Explain what is meant by functional requirements in the software requirements gathering process.

(3 marks)

(ii) Identify *four* functional requirements for the Case Study 1 above. Briefly describe each of the functional requirements.

(4 marks)

1 **(d)** (i) What is the meaning of the terms *Requirements Validation & Verification*?

(4 marks)

(ii) Describe the use of a User Manual as a requirement validation and verification technique. Use an example to support your answer.

(3 marks)

2 **(a)** (i) Explain what is meant by non-functional requirements in the software requirements gathering process.

(3 marks)

(ii) Describe the *two* non-functional requirements Memory Storage and Ethical considerations. Include a brief discussion on how each of these can be measured or identified for a system.

(6 marks)

(b) Write *two* test cases to test *two* functional requirements, and *one* test case testing *one* non-functional requirement of Case Study 1.

(15 marks)

(c) Describe the role of a feasibility study is and briefly outline why it is important to complete one as part of a software development process.

(6 marks)

3 **(a)** (i) Describe, with the aid of a diagram, the design methodology: the Spiral model as an approach for systems development.

(5 marks)

(ii) In particular discuss each of the 4 phases of this model.

(5 marks)

(iii) Identify the cost implications of using this method.

(2 marks)

(b) (i) Discuss the role of Software Architecture in the design and development of a software system.

(4 marks)

(ii) Briefly discuss *three* advantages of choosing an explicit architecture.

(6 marks)

3 (b) (iii) Choosing a suitable Architecture is an important initial phase in designing and developing a software system.

Using a diagram, describe the Client Server architecture. In particular, mention the advantages and disadvantages of this architectural pattern.

(8 marks)

4 (a) (i) In relation to object oriented programming, briefly, explain the difference between a public and private class member.

(4 marks)

(ii) An object may be used as an attribute of another class. Using a relationship diagram explain the concept of aggregation or composition.

(7 marks)

4. (b) Project Management requires a variety of elements to be properly addressed in order to plan and complete a project successfully.

(i) Identify and briefly describe the 5 key components of a successful project plan.

(10 marks)

(ii) Describe, with the aid of a diagram, the Work Breakdown Structure (WBS) and how it is used in the project planning process.

(5 marks)

(iii) Describe, briefly, the role of the Action Plan in the project planning process.

(4 marks)