

SOFTWARE ENGINEERING 2

Tuesday 18th April 2023 - Morning

Answer **any** THREE questions out of FIVE. All questions carry equal marks.

Time: THREE hours

**Answer any Section A questions you attempt in Answer Book A
Answer any Section B questions you attempt in Answer Book B**

For all questions, illustrate your answers with diagrams where appropriate.

The marks given in brackets are **indicative** of the weight given to each part of the question.

Calculators are **NOT** allowed in this examination.

Section B

Answer Section B questions in Answer Book B

B3.

- a) Discuss how Software Process Improvement (SPI) with models and frameworks like Capability Maturity Model Integration (CMMI), Software Process Improvement and Capability Determination (SPICE) can contribute to organisational objectives of achieving best practices in software development, reducing the cost, and improving the quality of software.

(15 marks)

- b) Discuss how a software process assessment model (such as CMMI) would assess an organisation that lacks any implementation of best practices, void of standards, and disorganised in its software processes. Briefly explain what steps might be taken to improve its rating.

(10 marks)

B4.

A telecommunications company is planning to introduce organisation-wide continuous integration and continuous delivery to customers. These relate in particular to communicating and managing knowledge about customers and the system under development.

- a) As a Requirements Engineer in this organisation, discuss the methods, tools and techniques of requirements engineering that might be used to promote a shared understanding of the system required, and build and maintain the commitment of stakeholders throughout a project's lifetime.

(15 marks)

- b) Briefly discuss what changes, if any, would be made to the traditional requirements engineering model, in response to the large-scale systems development challenges of today.

(10 marks)

B5.

- a) Define the concept of software architecture. Discuss the weakness, strength, and application areas of the following architectural styles.

- i) Client-Server;
- ii) Component-Based;
- iii) Service Oriented.

(15 marks)

- b) Briefly outline the relationship between architectural styles and design patterns as mechanisms for encapsulating design.

(10 marks)

END OF EXAMINATION

Section A
Answer Section A questions in Answer Book A

A1.

- a) Explain briefly the nature of the following approaches to software systems development/software life cycle models:

- i) Waterfall;
- ii) Throw-away prototyping;
- iii) Evolutionary prototyping.

What are the disadvantages of the waterfall approach?

(9 marks)

- b) Discuss the appropriateness of the waterfall and prototyping approaches for developing:

- i) An order processing system for one of the local businesses with a website for customers to place orders. Requirements are vague but stable;
- ii) A complex embedded system for a local chemical plant;
- iii) A website providing information about local tourist attractions.

(9 marks)

- c) Discuss the following statement:

“These days, all systems should be developed using an agile approach”.

In your discussion, present arguments for and against this statement.

(7 marks)

A2.

- a) Give brief outlines of the following categories of software product complexity metrics.

- i) Metrics for the analysis model;
- ii) Metrics for the design model;
- iii) Metrics for source code.

Also, give specific examples of metrics in **each** category.

(15 marks)

- b) Assume that your company is developing systems using an object-oriented approach and UML for documenting deliverables of analysis and design.

Suggest complexity metrics based on UML diagrams suitable for quantification/measurement of:

- i) High level specification of functional requirements (by means of use case diagrams);
- ii) More detailed specification of functional requirements (by means of sequence diagrams).

Give justifications for your suggested complexity metrics.

(10 marks)

[Turn Over]