

**BCS THE CHARTERED INSTITUTE FOR IT**

BCS HIGHER EDUCATION QUALIFICATIONS  
BCS Level 6 Professional Graduate Diploma in IT

**SOFTWARE ENGINEERING 2**

Friday 7<sup>th</sup> October 2022 – 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**

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 A**  
**Answer Section A questions in Answer Book A**

**A1.**

a) Briefly explain the meaning of the following terms used in formal approaches to software engineering:

- i) pre- and post- conditions
- ii) invariants.

**(6 marks)**

b) Consider the following natural language description of a single element buffer:

“A buffer can hold one integer item whose value ranges from -10 to 10. If the buffer is empty a data item may be **put** into it. If the buffer is full, the data item present may be **removed**. An empty buffer is created using the **create** operation. The content of the buffer can be retrieved using the operation **get**, which returns the integer value stored in the buffer”.

Produce a formal (e.g., using Object Constraint Language – OCL) specification for the single element buffer.

**(12 marks)**

c) Discuss advantages and disadvantages of formal notations (e.g. OCL) and formal methods.

**(7 marks)**

**A2.**

a) Explain the difference between reverse engineering and re-engineering.

How would you classify the following maintenance activities?

- i) Producing a design document for a legacy program.
- ii) Producing a requirements specification document for a legacy program, amending some requirements, and re-implementing the amended requirements.
- iii) Improving the design (coupling and cohesion) of a legacy system (no change to functionality).

**(10 marks)**

b) What are the main characteristics of legacy systems?

**(6 marks)**

c) Discuss the following statement: "All legacy systems should be scrapped and replaced by new ones".

In your discussion, present arguments FOR and AGAINST this statement.

**(9 marks)**

[Turn Over]

**A3.**

- a) "Managing software projects is no different from managing projects in other business sectors" – Discuss (i.e. present arguments FOR and AGAINST this statement).  
**(8 marks)**
- b)
- i) Two common organisational structures used in big projects (involving multiple teams) are hierarchical and matrix organisations. Use diagrams to explain both organisational structures.  
**(6 marks)**
- ii) Discuss **two** approaches to organising software development teams. Analyse how these two team organisations affect team communication and personnel morale.  
**(6 marks)**
- c) Discuss the main differences between the COCOMO 1 and COCOMO 2 cost estimation models.  
**(5 marks)**

**Section B**  
**Answer Section B questions in Answer Book B**

**B4.**

- a) Outline the common ways in which software reuse takes place today and discuss the reasons why achieving the benefits of reuse and reusable software is difficult.  
**(15 marks)**
- b) Software development such as that of product lines, has traditionally required developers to perform reuse in a planned or institutionalised way. Discuss whether the availability of reusable open-source assets has changed the nature of how such systems are developed.  
**(10 marks)**

**B5.**

- a) Give an overview of Open-Source Software Engineering (OSSE) and discuss Open-Source Software (OSS) practices that have become mainstream in process models of this nature. Illustrate your answer citing appropriate methods, tools, and techniques.  
**(15 marks)**
- b) Discuss the view that the increasing scientific knowledge and experience of OSS applications, will make OSSE the process model of choice for many professionals.  
**(10 marks)**

**End of Examination**