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.
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)
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