BCS THE CHARTERED INSTITUTE FOR IT

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

SOFTWARE ENGINEERING 2

Friday 6th October 2023 - Morning

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

Time: THREE hours

Answer any <u>Section A</u> questions you attempt in <u>Answer Book A</u>
Answer any <u>Section B</u> questions you attempt in <u>Answer Book B</u>

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

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

Case Study for section A

Case Study: Tool Hire System

A system is required for a tool hire company. The company offers tools for hire for both the general public and the building trade. The tools available for hire range from screwdriver sets, through power tools, to plant machinery (e.g. mechanical diggers). Each category of tools has a maximum hire period (e.g. electric hand drills are categorised as power tools with a maximum hire period of one week). Some categories of tool can only be hired by members of the building trade because special training is required to use them.

The system should provide:

- a catalogue of all categories of tools and an appropriate search/browse function;
- typical functions for this type of system such as:
    - hire (a tool);
    - return (a tool);
    - reserve (a tool).
- catalogue maintenance functions such as:
    - add (a tool);
    - remove (a tool).

Section A
Answer Section A questions in Answer Book A

A1.
a) Discuss the view that modern life cycle models, with their emphasis on prototyping, create systems that are:

    i.   often fragmented and difficult to integrate;
    ii. of unsatisfactory reliability, performance and functionality;
    iii. of limited longevity.

(8 marks)

b) Present arguments FOR and AGAINST the view that says: "Nowadays ALL systems should be developed using prototyping".

(7 marks)

c) Consider the Case Study -Tool Hire System on page 2. Assume that nearly all of the functional requirements are clear except the GUI (graphical user interface) for the catalogue. The management of this tool hire company wants the catalogue with search/browse function to be delivered first. Next, the hire, return, reserve, etc. functions should be delivered, followed by catalogue maintenance functions.

Which Software Life Cycle model(s) would you recommend for this project and why? Your answer should provide your recommendation, a justification of your recommendation and a clear explanation (based on the Case Study) of the recommended approach.

(10 marks)

A2.
a) Software evolution processes vary considerably depending on the type of software being maintained, the development processes used in an organization and the people involved in the process. However they include some fundamental activities. Write a report that outlines a typical software evolution process.

(12 marks)

b) Assume that the Tool Hire System (see Case Study) was successfully delivered some time ago. However the following requests have been made and either have been implemented or will be implemented in future.
   • Correct coding and design errors in reserve function;
   • Modify return function to meet changed requirements;
   • Add a new function cancel reservation;
   • Change the current software platform.

How would you categorise the above maintenance activities? In your answer clearly explain the meaning of each relevant maintenance category and justify your choices.

(8 marks)

c) Explain preventive (or preventative) maintenance and give an example of a preventive maintenance activity based on the Case Study.

(5 marks)

[Turn Over]

A3.
  a) Discuss **THREE** reasons why assertions are useful in software design.
                                                                                    (9 marks)

  b) Consider the Case Study on page 2. Your task is to develop formal (e.g. using OCL)
      specifications for this system.

Your answer should include pre- and post- conditions for the following functions/operations
together with the invariant for the System:

  - add (a tool);
  - remove (a tool);
  - return(a tool).

State all assumptions made. You may use the following functions/operations when
developing formal specifications:

  - is_in(a tool) which returns a Boolean value TRUE when the given tool is in the
    catalogue or FALSE otherwise;
  - no_of_tools which returns the total number of tools in the catalogue;
  - available(a tool) which returns a Boolean value TRUE when the given tool is
    available for hire or FALSE otherwise.
                                                                                    (16 marks)

Section B
Answer Section B questions in Answer Book B

B4.
  a) Explain the concept of design patterns in Software Engineering and discuss how
      designs can be reused through patterns in the context of new software development
      projects. Use examples to illustrate your answer.
                                                                                    (15 marks)

  b) Discuss whether reusing designs, through patterns, results in faster and better
      software maintenance. Your answer should present the case for and against
      patterns.
                                                                                    (10 marks)

B5.
  a) As a newly appointed software project manager for a well-established Virtual Reality
      games company, discuss the possible influence of people, product, process, and
      projects for success in this role, and that of the business.
                                                                                    (15 marks)

  b) Discuss how an agile approach to management might influence the choices of
      people, process, product, and project structure for this company.
                                                                                    (10 marks)

END OF EXAMINATION