

BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

SOFTWARE ENGINEERING

Friday 19th April 2024 – Afternoon

Answer any FOUR questions out of SIX. All questions carry equal marks.

Time: TWO 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) The Chaos Report for 2020 identified less than 34% of software projects succeeded, meaning they delivered on time and on budget with the required features and functions.
- i. Give **THREE** reasons why software projects might fail due to issues relating to requirements, analysis or design. Support **each** reason with a relevant example.
(6 marks)
 - ii. For each reason in your answer to part i., describe how an engineered approach can reduce/remove the reasons for failure.
(6 marks)
- b) It has been argued that one cause of the software crisis has been the lack of industry-wide, internationally recognised, best practices. Give an example of why the changing nature of software may be a reason for this problem. You should clearly identify why you consider the example to be a contributing factor.
(5 marks)
- c) Requirements Engineering (RE), a subdiscipline of Software Engineering, is the application of an engineering approach to developing a requirements specification.
- Give **FOUR** examples of how RE applies rigour to the requirements capture and documentation activity of a project.
(8 marks)

A2.

Software Engineering has been defined as "...the application of engineering, scientific, and mathematical principles and methods to the economical production of quality software (where quality is defined as "the degree to which a product meets its users' needs")." ACM.

- a) Provide **FOUR** examples of the differences between a non-engineered and engineered approach to the software design phase.
(4 marks)
- b) Explain **THREE** examples of how the quality of a system can be measured.
(6 marks)
- c) Select **ONE** key element of the cost of software production. For the element you have selected give **TWO** examples of how a cost-driven approach may compromise quality.
(5 marks)
- d) Provide **TWO** examples of how applying Software Engineering principles might improve the effectiveness of a software development team.
(4 marks)
- e) Identify **TWO** software process models and discuss how the underlying philosophy shapes the methods and tools that support them.
(6 marks)

A3.

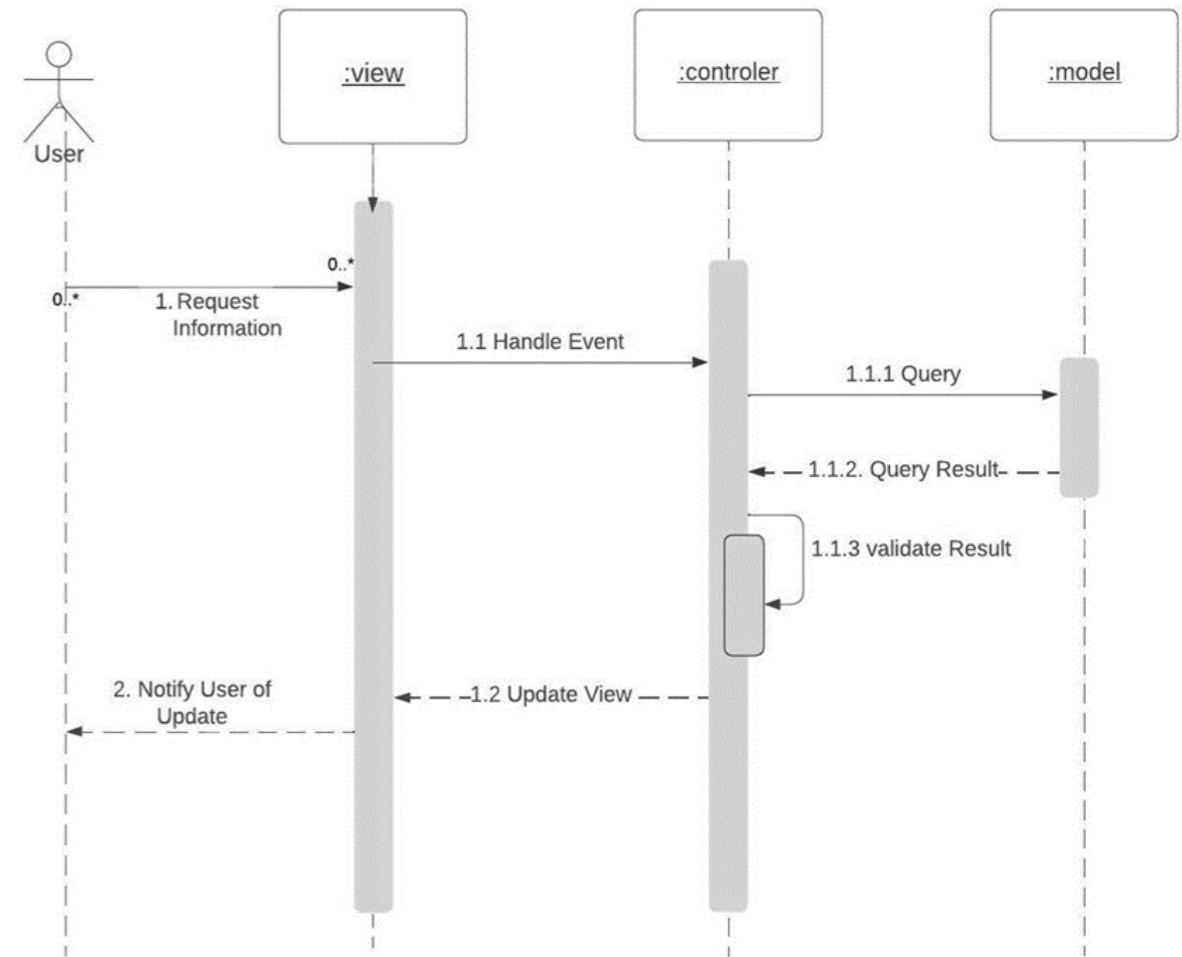
a) Separation of Concerns (SoC) is considered one of many good practices in the design of a software application. Explain what SoC means and discuss how it can be applied using a suitable example. **(5 marks)**

b) Encapsulation is mechanism that can be used to support SoC in object-oriented software systems. Explain in detail how the encapsulation is achieved in Object-Oriented design approaches. You are expected to support your answer with an appropriate example using appropriate notation from the UML. **(8 marks)**

c) The following is a generic sequence diagram for the Model-View-Controller (MVC) design pattern which is frequently used in graphical systems and web frameworks.

Draw a revised sequence diagram that would represent how MVC could be applied to a customer ordering a product from an online store.

Clearly state any assumptions you have made about the systems behaviour.



(12 marks)

[Turn Over]

Section B
Answer Section B questions in Answer Book B

B4.

- a) Consider a tool for writing and editing software with which you are familiar. Discuss **FIVE** key features that you find aid your coding productivity and support your answer with examples of how the feature aids your productivity.
(5 marks)
- b) For the tool you identified in a), identify a set of appropriate metrics that could be used to provide a meaningful comparison with another editing tool to evaluate the benefits to code productivity.
(5 marks)
- c) "...not every problem is a nail and not every solution a hammer", warns Martin Fowler on the dangers of assuming any one tool will be a complete solution. Contrast the benefits and disadvantages of using a multi-tool environment versus a fully featured Integrated Development Environment. Your answer is expected to include a minimum of **TWO** points in favour and **TWO** points against for **each** option.
(8 marks)
- d) Define a repository schema and then discuss **THREE** possible issues that could occur if a bespoke software development company applied a standardised repository schema.
(7 marks)

B5.

Your software development company has been invited to tender for a new software system for a local manufacturer to enable them to offer their customers real-time delivery data. The potential client has no existing digital infrastructure to support the system and has expressed a desire for the software to be delivered within six months of contract initiation.

- a) Briefly describe the various costing techniques with which you are familiar and then select and justify which technique you believe will be the most appropriate for this tender.
(5 marks)
- b) The software maintenance manager has expressed concern over a high number of faults reported by customers relating to mobile software apps that your company has developed which use positioning technology.
- Identify **FOUR** practices from software engineering that might reduce the likelihood of potential faults being missed during the software development lifecycle. Your answer is expected to include an explanation of how the practice could bring improvement.
(8 marks)
- c) The customer requires assurances on how you will test the software.
- i. Describe the testing techniques you believe are appropriate for the software the customer requires. Give reasons for your selection of **each** technique.
(6 marks)
- ii. Give an example of how you intend to document a test for inclusion in the tender as a sample of your quality documentation.
(6 marks)

B6.

- a) Bill Gates, founder of Microsoft, once said: "Measuring programming progress by lines of code is like measuring aircraft building progress by weight." Modern systems are complex hybrids of different languages, technologies, and skill sets.

Describe **FOUR** different quality techniques that can be applied to a software development project to help measure and monitor progress during the implementation and testing of the software.

(8 marks)

- b) For **each** of the **FOUR** different types of software maintenance, give an example of a software engineering practice that can be used during development to help support and prepare for each type.

(8 marks)

- c) Consider the following: given so many software projects fail when they are delivered, how can we design and apply a suitably robust risk management strategy to the development of software systems to try and improve acceptance rates?

Write a response that describes how the **THREE** different phases of risk management can be applied to the **SIX** stages of the SDLC as defined by the BCS.

(9 marks)

END OF EXAMINATION