

BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 4 Certificate in IT

SOFTWARE DEVELOPMENT

Monday 20th April 2026 - Afternoon

Time: TWO hours

Section A and Section B each carry 50% of the marks.
You are advised to spend about 1 hour on Section A (30 minutes per question)
and 1 hour on Section B (12 minutes per question).

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 2 questions (out of 4). Each question carries 30 marks.

A1.

- a)
- i. Explain the concept of an algorithm.
(2 marks)
 - ii. Identify **three** characteristics that an algorithm should possess to be effective for a simplified computer model.
(6 marks)
- b) Write an algorithm using pseudocode that prompts the user to enter **five** numbers. The program should then calculate and display the sum of only the even numbers entered.
(6 marks)
- c) Explain how the algorithm you wrote in part b) could be translated into program code. You can choose any programming language you like to illustrate your answer.
(8 marks)
- d)
- i. Explain the concept of a flowchart.
(2 marks)
 - ii. Identify **three** important roles that flowcharts might play in the process of developing a program.
(6 marks)

A2.

- a) Imagine you are a Quality Assurance (QA) manager for a new software project. Identify and describe **four** specific activities you would implement to ensure the quality of the software product.
(8 marks)
- b) Describe, with reasons, the differences in content and style of documentation reports aimed at different audiences (e.g. users, developers and support staff).
(8 marks)
- c) Discuss in detail the importance of early testing in the Software Development Life Cycle (SDLC) and explain how early testing contributes to the objectives of software testing.
(8 marks)
- d) Consider a function that accepts two integers and returns their Greatest Common Divisor (GCD).
- i. Would you use white-box or black-box testing to verify the correctness of this function?
(2 marks)
 - ii. Justify your choice and explain the testing approach you would take.
(4 marks)

[Turn Over]

A3.

- a)
 - i. Explain what is meant by the programming term callable units and discuss their purpose in code development.
(2 marks)
 - ii. Identify **two** types of callable units and explain the difference between them.
(4 marks)
- b)
 - i. Identify the core principles of Object-Oriented Programming (OOP) and Functional Programming (FP).
 - ii. What types of problems are best solved with OOP and what types are best solved with FP?
(8 marks)
- c)
 - i. Explain how modular programming and defensive programming complement each other in software development.
 - ii. Provide examples of how integrating these two techniques can lead to better software design.
(8 marks)
- d) Describe **three** examples of how cloud computing and emerging technologies have influenced software development practices. Provide examples of tools or services that are commonly used in cloud-based development projects.
(8 marks)

A4.

- a)
- i. Explain the concept of data abstraction in the context of data structures.
 - ii. Why is data abstraction important in software development?
(5 marks)
- b) Consider a scenario where you need to reverse a string of characters.
- i. Explain how a stack can be used to solve this problem.
(3 marks)
 - ii. Write a short program in pseudocode to demonstrate the solution.
(3 marks)
- c) In an operating system, processes are managed in a queue structure.
- Explain how a queue can be used to manage processes and provide a short program in pseudocode that simulates a process queue, where processes are added and removed.
(7 marks)
- d) You are tasked with developing a new application for photo editing and sharing.
- Describe **four** types of system software you need to consider during development and how they will support your application.
(12 marks)

[Turn Over]

Section B
Answer 5 questions (out of 8). Each question carries 12 marks.

B5.

A half adder is a logic circuit that performs binary addition of two binary digits (A, B), producing the binary sum (S) and a binary carry (C). Figure B5 shows an incomplete truth table of a half adder.

Figure B5:

A	B	SUM	CARRY
0	0	0	0
0	1	1	?
1	0	?	0
1	1	?	?

- a) Work out the **four** remaining values in Figure B5 (marked with ?) for the SUM and CARRY values. **(4 marks)**
- b) Write an expression in pseudocode or program code, using a single Boolean operator, that computes the CARRY DIGIT given two inputs, A and B. **(2 marks)**
- c) Write pseudocode or program code to compute the SUM DIGIT, given two inputs, A and B, using nested decision logic statements (IF/ELSE). **(6 marks)**

B6.

- a) Describe the structure of a linked list that contains **four** nodes (also called elements). Illustrate your answer with a diagram. **(4 marks)**
- b) Write down the processing steps needed to add a new element to the beginning of a linked list. **(4 marks)**
- c) Explain what is meant by the terms static data structure and dynamic data structure. Discuss their differences and provide **one** example of **each**. **(4 marks)**

B7.

Consider the following Object-Oriented (OO) code extract:

```
class Node {  
    int data;  
    Node next;  
  
    Node(int data) {  
        this.data = data;  
        this.next = null;  
    }  
}  
Node node1 = new Node(11);  
Node node2 = new Node(18);  
Node node3 = new Node(24);
```

a) Using examples from the code extract above, explain the following OO concepts:

- i. Class.
- ii. Attribute.
- iii. Object.

(6 marks)

b)

- i. Explain what is meant by the term encapsulation.
- ii. Describe how encapsulation is implemented.

(3 marks)

(3 marks)

B8.

a) Describe the key characteristics of the following programming paradigms:

- i. Structured programming.
- ii. Procedural programming.

(3 marks)

(3 marks)

b) Explain the following types of procedure calls, highlighting the difference between them:

- i. A procedure call by value.
- ii. A procedure call by reference.

(6 marks)

[Turn Over]

B9.

a) Describe the following types of errors in program code and provide an example of **each**:

i. Syntax error.

(2 marks)

ii. Logical error.

(2 marks)

iii. Runtime error.

(2 marks)

b) Explain in detail how you would use an Integrated Development Environment (IDE) to debug code that contains a logical error. Provide an example to support your answer.

(6 marks)

B10.

a) In the context of file organisation, explain what sequential access means.

(2 marks)

b) Describe in detail a situation in which the use of a sequential file is particularly effective.

(2 marks)

c) Describe **one** limitation of using sequential files.

(2 marks)

d) Describe the following file organisations and discuss a situation or an application where they are particularly effective:

i. Serial files.

(3 marks)

ii. Random files.

(3 marks)

B11.

Data types are a fundamental concept in programming languages.

- a) Explain what is meant by the term data type and provide **two** examples. (3 marks)
- b)
 - i. Explain the differences between weak typing and strong typing, and comment on the relative advantages and disadvantages of **each**. (4 marks)
 - ii. Identify **one** example of a weakly typed language and **one** example of a strongly typed language. (2 marks)
- c) Explain in detail what is meant by the term type inference. (3 marks)

B12.

A touch-based interface to a vending machine is required that allows users to select from a range of hot beverages (e.g. coffees, tea, hot chocolate, etc.) along with specific preferences (e.g. add sugar, milk, flavouring).

The user is to be provided with a visual representation of objects in the form of pictures or icons that they can select by touch.

- a) Describe the best practices / principles and overriding design approaches involved in creating an effective user interface for the vending machine described above. Include a diagram to support your discussion. (12 marks)

END OF EXAMINATION