

**BCS THE CHARTERED INSTITUTE FOR IT**

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

**PROGRAMMING PARADIGMS**

Monday 23<sup>rd</sup> March 2020 – 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 <b>NOT</b> allowed in this examination.
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**Section A**  
**Answer Section A questions in Answer Book A**

**A1.** This question is about event-driven programming.

- a) Discuss the main principles, characteristics and features of event-driven programming. Use examples to illustrate your answer.  
**(15 marks)**
- b) How can tools help with debugging and testing an event-driven program?  
**(10 marks)**

**A2.** A company is introducing configuration management processes in the organisation.

- a) Why is “configuration management” required in software development?  
**(8 marks)**
- b) Specify and justify the processes and tools the company should incorporate in the configuration management system.  
**(17 marks)**

**A3.** This question is about Object Orientation.

- a) As a software engineer you have been asked by your company to develop a modular program. How do the following object-oriented concepts help to make a modular program? Illustrate your answer using examples.
  - i) Encapsulation;
  - ii) Inheritance;
  - iii) Polymorphism.**(12 marks)**
- b) In computing a ‘queue’ is a data structure that holds a collection of items, which is similar to a queue in a shop. A queue has several operations, including the ability to:
  - i) add items to the end of a queue;
  - ii) remove items from the front of the queue;
  - iii) check the length of the queue, i.e. how many items are in the queue.

Using example code, discuss how a ‘queue’ can be implemented using some or all of the object-oriented concepts discussed in part a).  
**(13 marks)**

**[Turn over]**

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

**B4.** This question is about concurrent systems.

- a) When programming concurrent systems, a variety of problems can occur. One of these problems is a "race condition". What is a race condition? Use online airplane ticket booking as an example scenario to help explain the issues this problem can cause. How can this problem be addressed?

**(15 marks)**

- b) Some programming languages that support programming concurrent systems, such as Java, use shared memory for communication. Others, such as Erlang, use message passing. Describe these **TWO** approaches and identify at least **ONE** advantage and **ONE** disadvantage of each.

**(10 marks)**

**B5.** This question is about Functional Programming.

- a) What is a strict function? Give an example of a strict function that has one parameter and explain why this function is strict.

**(8 marks)**

- b) When choosing a programming language or paradigm, what would be the advantages and disadvantages of a language that allows non-strict functions?

**(7 marks)**

- c) Using a functional language of your choice, write a **recursive** function, called `final`, which should take a list as its parameter and return the last element of the list.

For example, `final [3, 5, 6, 9, 8]` should give the result 8.

**(10 marks)**

**End of Examination**