

BCS THE CHARTERED INSTITUTE FOR IT
BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

OBJECT ORIENTED PROGRAMMING

Wednesady 23rd March 2016 – 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.

Describe the following design patterns:

- i) Adapter
- ii) Decorator
- iii) Singleton

For each pattern, state the motivation for the pattern, give a UML class diagram for the pattern and an explanation of the classes which participate in the pattern.

(25 marks)

A2.

- a) Give the object oriented terminology for each of the following object oriented features and supply an example of code that illustrates the feature:
- i) A blueprint for an object which defines all the data items contained in the object and the operations that are permitted for the data
 - ii) A representation of something within the domain that the program models which contains values of data and which implements operations on that data
 - iii) An operation which will manipulate the data contained in an object
 - iv) A variable which holds data that describes an individual object
 - v) A variable which holds data that is relevant to all the objects created from the same template.

(5 x 3 marks)

- b) Using an object oriented language with which you are familiar, give an example of delegation.

(10 marks)

A3.

- a) Explain what is meant by the term abstract data type and how abstract data types are implemented using an object oriented programming language?
(5 marks)
- b) Explain why it is possible that the same abstract data type can have a variety of implementations.
(5 marks)
- c) What use might you make of an abstract class in implementing an abstract data type?
(5 marks)
- d) Explain the way in which the concept of type can be used in a programming language.
(5 marks)
- e) What is the relationship between the concept of type in a typed programming language and the concept of class in an object oriented programming language?
(5 marks)

Section B
Answer Section B questions in Answer Book B

B4.

Consider the following class definition:

```
public class date
{
    private int day;           // from 1 to 31
    private int month;        // from 1 to 12
    private int year;         // from 2000 upwards
    public void advance();    // move to next day
};
```

- a) Implement a constructor that initialises new objects of `date` class to be set to the 1st of January 2000.
(5 marks)
- b) Implement setters for `day`, `month` and `year`.
(5 marks)
- c) Implement the `advance` method, which moves to the next day, ensuring that all data members are updated appropriately.
(15 marks)

B5.

- a) Describe the meaning of <<extend>> and <<include>> in an UML use-case diagram.
(5 marks)
- b) How do we represent the visibility of class members as private, public and protected in an UML class diagram?
(5 marks)
- c) How are aggregation and composition relationships represented in an UML class diagram?
(5 marks)
- d) How are specialisation and generalisation relationships defined, and how they are represented in an UML class diagram?
(10 marks)

B6.

- a) Four basic features of object oriented programming languages are said to be abstraction, polymorphism, encapsulation and inheritance. Define each of these terms.
(20 marks)
- b) How does method overloading differ from method overriding?
(5 marks)