BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

OBJECT ORIENTED PROGRAMMING

Thursday 21st April 2022 - Afternoon

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

Time: TWO 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.

Section B
Answer Section B questions in Answer Book B

B4.

a) Describe a realistic scenario in which overriding may be appropriate or necessary in the development of an object oriented program.

(10 marks)

b) Write a code fragment that demonstrates how the Liskov substitution principle of object oriented programming may be implemented in practice.

(15 marks)

B5.

a) Describe **TWO** features of the object oriented programming paradigm that lend themselves to the division of labour between multiple programmers working concurrently.

(10 marks)

b) Write a code fragment that demonstrates an appropriate use of a composition relationship between classes (i.e. a realistic scenario that would be well-suited to the use of composition).

(15 marks)

B6.

a) Describe **TWO** class access specifiers and the circumstances in which it would be appropriate to use **each** of them.

(10 marks)

b) Write a code fragment that demonstrates an appropriate use of **both** class and instance variables (i.e. a realistic scenario that would be well-suited to the use of both variable types).

(15 marks)

End of Examination

Section A
Answer Section A questions in Answer Book A

A1.

a) Explain what is meant by a 'design pattern' in the context of object oriented programming.

(5 marks)

b) Describe **FIVE** characteristics you could use to document a design pattern.

(10 marks)

c) Choose **ONE** of the following design patterns and give an example of object oriented code which uses this pattern:

    i) Iterator
    ii) Observer
    iii) Singleton.

(10 marks)

A2.

You are taking part in a debate on the features of the object oriented paradigm.

Choose **FIVE** features of the object oriented paradigm that you think are the most important, describe what they are and state why you think they are important. Give examples of them either with code or a diagram.

(5 marks per feature)
(25 marks)

A3.

A group of Open Water Swimmers have found their sport has become popular and now wish to set up a Swimming Club. The Club will be made up of Members, who can register online and have to provide their name, address, contact telephone number and emergency contact name and telephone number.

Each September there is an Annual General Meeting (AGM), where Members can join a Committee to help run the Club.

The Club meets every week at a local lake, where Members can train, or take part in lessons. The lessons are provided by Officials, who have to be qualified. New Officials need to register online and provide evidence of what qualifications they hold.

In addition to the weekly meetings, the Club runs a series of swims to be held on the first Saturday of each month at a different location. A Member can nominate a potential outdoor place, which can be a river, lake or sea and provide a classification of whether it is easy, moderate or strenuous. These will be assessed by the Committee to decide if they are suitable and whether a quota is needed to limit numbers. Suitable locations will be included in an online Diary produced by the Committee.

The Club charges an annual fee, which is due on the 1st January of each year. A month after this, the Committee will generate an email to remind any Members who have forgotten to pay.

a) Draw a Use Case diagram for the Swimming Club.

(15 marks)

b) Discuss how Use Case diagrams and scenarios contribute to the development of a system. Within your answer include an example scenario from the Swimming Club.

(10 marks)

[Turn Over]