BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

OBJECT ORIENTED PROGRAMMING

Thursday 27th March 2014 - 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) Briefly describe the following in the context of object oriented programming:
   i) Class;
   ii) Object.

(4 marks)

b) Describe two types of class members used in object oriented programming languages.
(6 marks)

c) Explain how three types of class member visibility are used in object oriented programming.
(6 marks)

d) Using an object oriented language with which you are familiar, give an example of a class definition which illustrates the use of the concepts you described in your answer to parts b) and c).

(9 marks)

A2.

a) Compare and contrast:
   i) Object oriented programming;
   ii) Procedural programming;
   iii) Structured programming.

(15 marks)

b) You have been invited to give a talk to trainee programmers outlining the reasons for the widespread use of object oriented programming within the software development industry. Summarise the points you would present in your talk.

(10 marks)

Turn Over]

A3.

a) Give the meaning of the following terms:
   i) Subclass;
   ii) Superclass;
   iii) Inheritance;
   iv) Dynamic binding;
   v) Delegation.

(10 marks)

b) Use an object oriented language with which you are familiar to give an example of delegation.

(10 marks)

c) Compare and contrast delegation with inheritance.

(5 marks)

Section B

Answer Section B questions in Answer Book B

B4.

Consider the following class definition that represents a thermostatically controlled home heating system.

```
class thermostaticHeaterSystem
{
  public:
    int  temperatureLimit;         // from 0 to 30 (celsius)
    bool heaterState;              // true or false (for on/off)
    void evaluateState();          // switch heater on/off as needed
    int  getCurrentTemp();         // obtain temperature from sensor
    bool getCurrentHeaterState(); // report whether on or off
};
```

a) Provide a redesigned **thermostaticHeaterSystem** class that uses more appropriate access modifiers.

(5 marks)

b) Provide a getter and a setter method that will enable the **temperatureLimit** instance variable to be retrieved and modified.

(5 marks)

c) Provide a constructor for the **thermostaticHeaterSystem** class that will initialise the instance variables to suitable (valid) start values.

(5 marks)

d) Write a body for the **evaluateState()** method that enables it to switch the heater on and off (by updating the **heaterState** instance variable, where appropriate) by comparing the current value of **temperatureLimit** with the current temperature, as returned by **getCurrentTemp()** method.

(5 marks)

e) Write a short test harness that instantiates the **thermostaticHeaterSystem** class and demonstrates that the setter and getter methods you designed in part (b) behave correctly.

(5 marks)

B5.

The follow questions relate to class diagrams represented in the Unified Modeling Language (UML).

a) State the UML symbol used to represent the following class member visibility levels:

(i) protected
(ii) derived
(iii) private
(iv) static
(v) public

(5 marks)

b) State what the following inter-class relationships elements represent in UML:

(i) filled diamond
(ii) empty triangle
(iii) empty diamond
(iv) solid line
(v) dotted line

(5 marks)

c) State how the following inter-class relationships would be represented in a UML class diagram:

(i) one or more
(ii) one
(iii) zero or one
(iv) zero or more
(v) exactly two

(5 marks)

d) Distinguish between abstract and concrete methods, provide an example of a situation in which each would be used, and show how each would be represented in UML class diagram.

(10 marks)

B6.

a) Distinguish between class and instance variables.

(5 marks)

b) Distinguish between aggregation and composition.

(5 marks)

c) Distinguish between interpreted and compiled languages.

(5 marks)

d) Distinguish between ad-hoc and parametric polymorphism.

(5 marks)

e) Distinguish between virtual methods and pure virtual methods.

(5 marks)