BCS THE CHARTERED INSTITUTE FOR IT

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

PROGRAMMING PARADIGMS

Monday 16th November 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 **NOT** allowed in this examination.

Section A
Answer Section A questions in Answer Book A

A1.

a) Within the context of programming languages, what is the concept of abstraction?

(5 marks)

b) Using an object-oriented programming language of your choice, explain what an abstract class is and give an example of using an abstract class.

(5 marks)

c) Discuss what the following concepts are and why they are useful in object-oriented programming. State and use a programming language of your choice to illustrate your answer.

i) Inheritance;
ii) Overriding;
iii) Polymorphism.

(15 marks)

A2.

a) The major methods for converting source code into executable code are:

i) Compilation;
ii) Interpretation;
iii) A combination of compilation and interpretation.

Discuss the process of each of these methods. For **EACH** method, identify a programming language that uses that method.

(15 marks)

b) One way of maximising a programmer's productivity is to use Integrated Development Environments (IDE) tools. Discuss the role of IDE tools to improve productivity, using examples of tools you are familiar with.

(10 marks)

A3.

a) From a programmer's perspective, what are the benefits of procedural programming?

(6 marks)

b) Using examples of code illustrate how procedural programming differs from:

i) Declarative programming;
ii) Object oriented programming.

(10 marks)

c) Name **TWO** types of scripting languages and discuss their uses.

(9 marks)

Section B
Answer Section B questions in Answer Book B

B4.

a) A Prolog medical database contains the following facts:

```
drug(aspirin).
drug(paracetamol).
drug(statin).
condition(headache).
condition(high_cholesterol).
condition(back_pain).

treats(aspirin, headache).
treats(paracetamol, headache).
treats(statin, high_cholesterol).
treats(aspirin, back_pain).
treats(paracetamol, back_pain).
```

Provide an example of **EACH** of the following and describe how each would be used:

i) A ground query (no variables);
ii) An existential/nonground query (using variables);
iii) A conjunctive query (using a conjunction);
iv) A rule (with a head and a body).

(8 marks)

b) Given the following facts:

```
Sarah is taller than Kate.
Kate is taller than Mary.
Mary is taller than Amy.
```

Write a recursive Prolog program that will determine that Sarah's height is greater than Amy's.

(7 marks)

c) Using an example, explain what the cut operator (!) is in a Prolog program. If the cut operator is used, discuss whether the program is still declarative.

(10 marks)

[Turn Over]

B5.

a) Define the term concurrency with reference to software systems. Explain why it is desirable for a programming language to provide support for concurrency.

(5 marks)

b) Discuss the problems that can arise when sharing resources in a concurrent system and describe the solutions that are available. Illustrate your answer with at least **ONE** example.

(15 marks)

c) What is Deadlock and how could it happen even when the solutions described in part b) are used?

(5 marks)

End of Examination