BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

OBJECT ORIENTED PROGRAMMING

Tuesday 16th April 2024 – 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 A
Answer Section A questions in Answer Book A

A1.

    a) Describe a real-world practical scenario in which object-oriented programming might **not** be the most appropriate paradigm.

    (10 marks)

    b) Describe **THREE** features of the object-oriented paradigm that promote code reuse.

    (15 marks)

A2.

    a) Describe what is meant by the term abstract class and describe, with justification, a real-world practical scenario in which it might be used.

    (10 marks)

    b) Contrast the concept of hierarchical inheritance with that of hybrid inheritance, using code fragments to illustrate your answer.

    (15 marks)

A3.

    a) What does the SOLID acronym stand for in object-oriented programming?

    (10 marks)

    b) Select **ONE** principle in SOLID.

    Explain how the principle is interpreted in object-oriented programming and why it is important, and provide code examples showing it being:

        i.   Violated
        ii.   Adhered to.

    (15 marks)

Section B
Answer Section B questions in Answer Book B

B4.

a) Describe what features of the Object Constraint Language (OCL) can be used to improve software quality. Include an example of OCL to illustrate your answer.

(15 marks)

b) Explain what features of coupling and cohesion can be used in object-oriented programming to improve software quality. Include examples to support your answer.

(10 marks)

B5.

a) A van hire company wants to computerise their record-based system using object-oriented technology. A designer viewing their records can see that the following details are important to the company:

- Van: registration number, manufacturer, model, colour, mileage, tonnes, and class.
- Each van has an annual service: service date, work needed, current mileage and cost of service.
- Manager: staff number, name, address, salary, date started.
- Car: registration number, manufacturer, model, colour, mileage, number of doors.
- Each Manager is allocated one car, a car belongs to only one Manager.
- They wish to store how many vehicles they have.
- Customer: customer ID, name, address, date of birth, contact telephone number.
- A Customer can hire a van, for each Hiring, there must be one nominated Customer, but can have at most one additional Customer associated with the Hiring who can drive the van. The hire date and cost of hiring is stored.

Draw a Class Diagram to represent the above information, showing all structural constraints. Determine appropriate data types for the attributes. Include any assumptions made.

(20 marks)

b) Explain what the **THREE** compartments of a UML class contain and how private, protected and public members are identified.

(5 marks)

[Turn Over]

B6.

a) Discuss how the following have contributed to the development of object-oriented languages:

    i.   Procedural programming

    ii.   Structured programming.

(12 marks)

b) Describe **FOUR** key items of information found in the documentation for a design pattern and for **each**, explain why it is important. Include an example of a design pattern to illustrate your answer.

(13 marks)

END OF EXAMINATION