BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

OBJECT-ORIENTED PROGRAMMING

Thursday 9th October 2025 – 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.

In object-oriented programming, objects consist of various components that define their behaviour and state.

Using an appropriate example, explain the following key concepts in relation to objects:

a)
- i. Fields (also known as data members, variables, attributes)
- ii. Methods (also known as member functions, procedures)

(8 marks)

b)
- i. Object state
- ii. Object scope

(8 marks)

c)
- i. Accessors
- ii. Mutators
- iii. Constructors

(9 marks)

A2.

a) Explain the purpose of code refactoring in object-oriented programming.

(5 marks)

b) Discuss **two** common approaches to refactoring and give **one** specific programming scenario in which each might be used.

(10 marks)

c) Identify **two** potential risks of code refactoring, including what strategies we might use to minimise these risks.

(10 marks)

A3.

a) Describe the following inter-class relationships in object-oriented programming and then explain how they are related to one another:

i. Is-a
ii. Has-a
iii. Part-of
iv. Association
v. Aggregation
vi. Composition

(15 marks)

b) Give example code in an object-oriented programming language showing:

i. An is-a relationship
ii. A has-a relationship

(10 marks)

[Turn Over]

Section B
Answer Section B questions in Answer Book B

B4.

a) Explain the following concepts:

i. Abstract data type
ii. Structured programming
iii. Encapsulation
iv. Untyped languages
v. Typed languages

(15 marks)

b) Describe **three** advantages and **two** disadvantages of the object-oriented programming paradigm.

(10 marks)

B5.

a) In the context of object-oriented development:

i. Explain what is meant by the term design pattern.
ii. Explain the motivation for using them from a programmer's point of view.

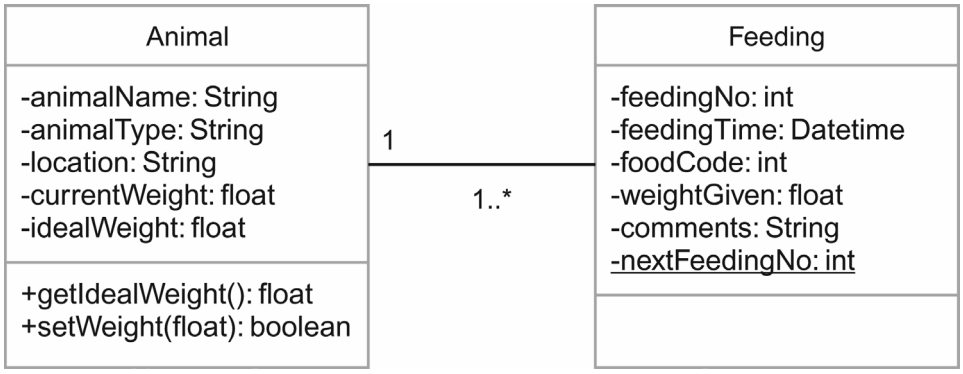
(10 marks)

b) Choose **three** of the following design patterns and give a detailed description of **each**, stating the problem they address and the basis of the solution they offer:

i. Adapter
ii. Decorator
iii. Iterator
iv. Observer
v. Singleton

(15 marks)

B6.



a) In an object-oriented programming language with which you are familiar, write code to partially implement the class diagram above, which represents animals being fed in a Zoo.

You should write code to implement the following:

i. A constructor for each of the two classes that sets the variables to the values passed in the parameter list.
ii. *feedingTime* contains the date and time the animal was fed.
iii. On the first day of each month, each animal is weighed and the current weight stored. Provide code for *getIdealWeight()* and *setWeight(float)*, where:
    - *getIdealWeight()* returns the ideal weight of the animal.
    - *setWeight(float)* stores the current weight of the animal and calls *getIdealWeight()* which compares it to the current weight. If the current weight is within 10% of the ideal weight, true is returned, otherwise false is returned.
iv. You **do not** need to provide setter and getter methods for any other attributes.
v. The class variable should be set and incremented appropriately.

(15 marks)

b) Discuss what methods can be used to test object-oriented code during the development of a system.

In your discussion, highlight which stage of the development process the method helps.

(10 marks)

END OF EXAMINATION