

BCS THE CHARTERED INSTITUTE FOR IT
BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

OBJECT ORIENTED PROGRAMMING

Tuesday 17th March 2020 - 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) Define the following terms:

- i) Encapsulation;
- ii) Typed language;
- iii) Untyped languages;
- iv) Coupling;
- v) Cohesion.

(15 marks)

b) Your local computing club wants to produce a website that documents the history of programming languages for its younger members. You have been asked to provide a page that discusses how structured programming and procedural programming contributed to the development of object oriented programming languages. Give an outline of what features would appear on this web page.

(10 marks)

A2.

a) Define what the following **Object Constraint Language** (OCL) concepts mean:

- i) Invariant;
- ii) Pre-condition;
- iii) Post-condition.

(9 marks)

b) Explain the role of the OCL in the development of an object oriented system.

(8 marks)

c) Explain what methods can be used to test an object oriented system.

(8 marks)

[Turn Over]

A3.

The Acorn Academy is a training provider that offers IT courses both in the classroom and online. The Academy wishes to keep information about the courses and the staff only. Several types of staff are employed: Managers, Administrators and Instructors. Attendee registrations are handled by an outside agency.

Every three months the Administrator generates a timetable for the dates when the courses will run. The Administrator is in charge of booking the rooms needed for each course. A week before the course is due to start, the Administrator will also arrange for refreshments to be provided.

Each course has a maximum number of attendees that can be accommodated. If the maximum is reached, an Administrator will remove the course from the online timetable.

Every year Instructors must provide a biography that will be used for publicity purposes. Before the course starts, the Instructor oversees installing the required software. Some courses will have attendees who are attending live, but are online, so a special webinar system will need to be setup. At the end of the course, the Instructor will give the attendees a questionnaire to gain feedback.

At the start of each year the Managers will review which courses will continue to be offered. Feedback from the questionnaires is used as part of the decision process. If they identify an area that is likely to be a future trend, they will commission an expert to develop the course material.

(a) Draw a Use Case diagram for this system.

(15 marks)

(b) Discuss the role of Use Cases (diagrams and descriptions) in the development of an object oriented system. Include examples where appropriate.

(10 marks)

[Turn Over]

Section B

Answer Section B questions in Answer Book B

B4.

- (a) Explain the difference between the concepts **Abstract Data Type** (ADT) and **class**.
(10 marks)
- (b) Using a common object oriented programming language, give an efficient class structure that uses both **is-a** and **has-a** relationships suitable for storing 2D points, lines, triangles, and filled triangles. Assume that points/lines and fills are defined in terms of a brightness level from 0 to 255.
(15 marks)

B5.

- (a) Explain the role of a garbage collector.
(10 marks)
- (b) Explain the approach to and benefits of code refactoring.
(15 marks)

B6.

- (a) What can we learn from examining a method signature?
(10 marks)
- (b) Using a common object oriented programming language give **THREE** code fragments that illustrate different ways that two different classes may be interconnected.
(15 marks)

END OF EXAMINATION