BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

OBJECT ORIENTED PROGRAMMING

Monday 16th September 2019 - 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.

[Turn over]

Section A
Answer Section A questions in Answer Book A

A1. Describe the following object oriented concepts and discuss how they help a programmer design and implement an application. Illustrate your answer with appropriate examples.

    i) Objects and classes;
    ii) Encapsulation;
    iii) Inheritance;
    iv) Polymorphism;
    v) Aggregation**.**

(25 marks)

A2. The Unified Modelling Language (UML) comprises of a variety of different diagrams that can be broadly categorised as:

    i) Behaviour diagrams;
    ii) Structure diagrams;
    iii) Interaction diagrams.

(a) Give a description of one diagram that falls into each category; include a simple example of its use and explain when you would use it.
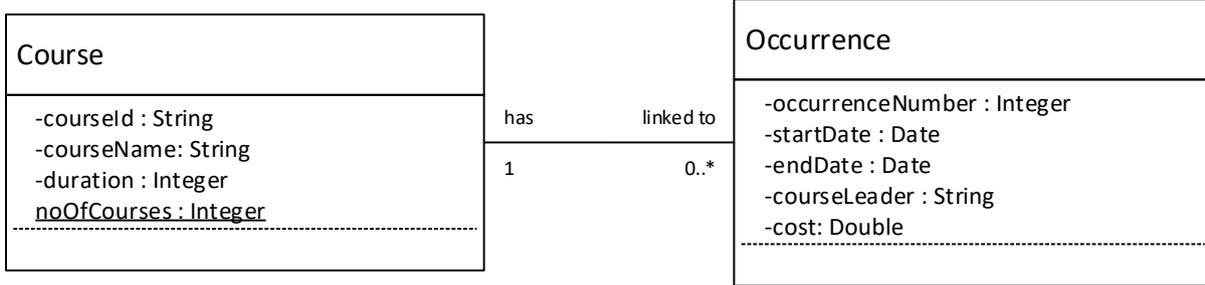
(15 marks)

(b) Discuss how object oriented code can be tested. Within your answer explain which UML diagrams can be used to aid testing.
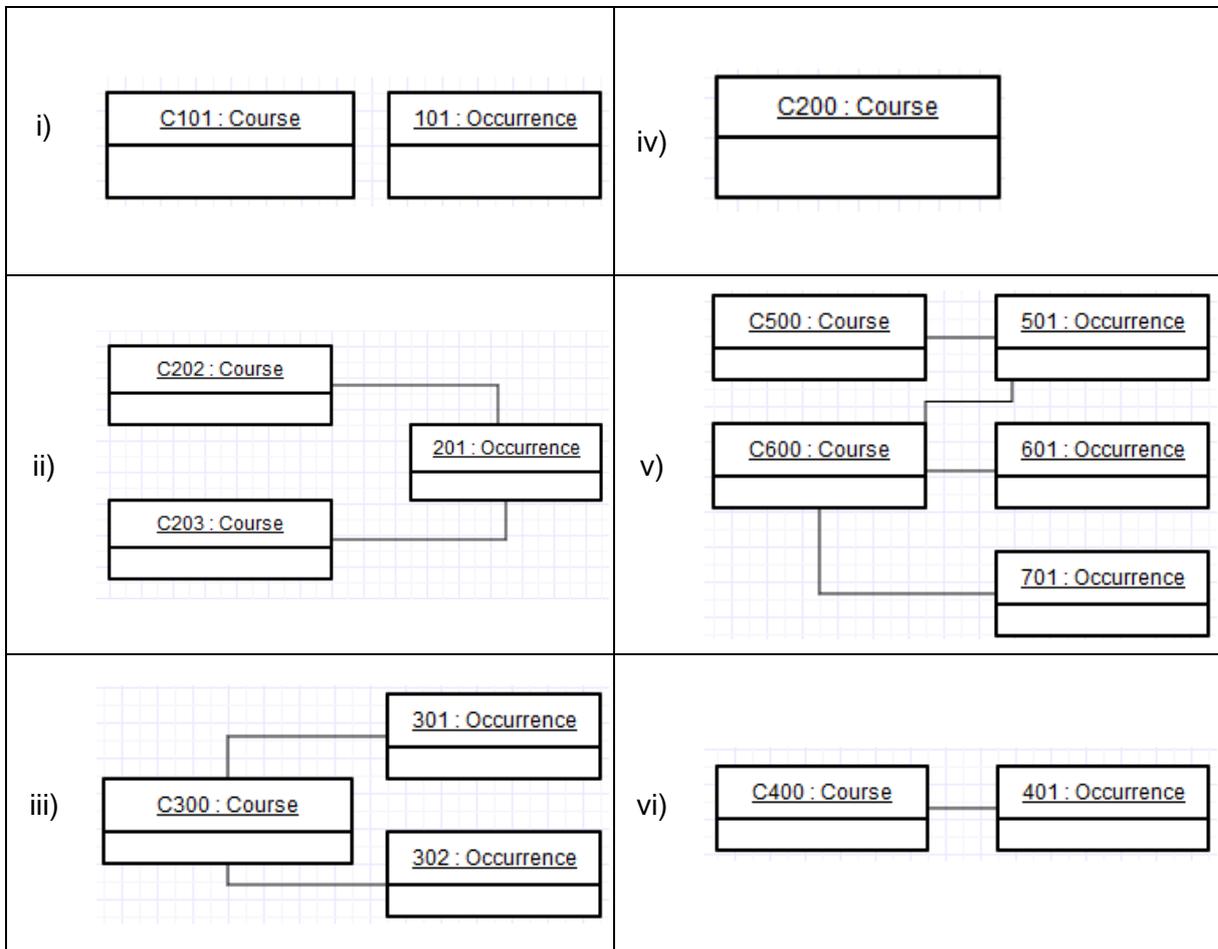
(10 marks)

[Turn over]

A3.

Course

-courseId : String
-courseName: String
-duration : Integer
noOfCourses : Integer

has   linked to

1   0..*

Occurrence

-occurrenceNumber : Integer
-startDate : Date
-endDate : Date
-courseLeader : String
-cost: Double

(a) Given the class diagram above, state which of the object diagrams (i-vi) are legitimate instances. Assume that all links in the object diagram are instances of the association shown in the class diagram. If an object diagram is not legitimate explain why not.

(10 marks)

i)
C101 : Course   101 : Occurrence

ii)
C202 : Course
201 : Occurrence
C203 : Course

iii)
301 : Occurrence
C300 : Course
302 : Occurrence

iv)
C200 : Course

v)
C500 : Course   501 : Occurrence
C600 : Course   601 : Occurrence
701 : Occurrence

vi)
C400 : Course   401 : Occurrence

(b) In an object oriented programming language with which you are familiar, write code to implement the class diagram above. Within your code provide a default constructor for each class that sets the variables to appropriate initial values. The class variable should be set and incremented appropriately.

(15 marks)

[Turn over]

Section B
Answer Section B questions in Answer Book B

B4.

(a) Explain the difference between the terms class variable, instance variable, and member variable.

(10 marks)

(b) Describe a situation in which we might use abstract and concrete classes, giving an example code fragment to illustrate your answer.

(15 marks)

B5.

(a) Explain the difference between abstraction and information hiding.

(10 marks)

(b) Describe situations in which it would be appropriate to define the following:

i)   Methods as private, public, or protected;
ii)   Variables (attributes) as private, public or protected.

(15 marks)

B6.

(a) Explain the different roles of constructors and destructors in object oriented programming.

(10 marks)

(b) Provide THREE code fragments that illustrate how we would implement the following in a common object oriented programming language, and describe practical situations in which each might be used.

i)   Single inheritance;
ii)   Multiple inheritance;
iii)   Hierarchical inheritance.

(15 marks)

End of Exam