

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

**OBJECT-ORIENTED PROGRAMMING**

Tuesday 18<sup>th</sup> April 2023 - 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) Describe a real-world practical scenario in which a variable in a class should be set to have public visibility.  

**(10 marks)**
  
- b) Write a code fragment that demonstrates an appropriate use of a nested class (i.e., a real-world practical scenario that is well-suited to the use of a nested class).  

**(15 marks)**

**A2.**

- a) Briefly describe what is meant by the term first class object?  

**(10 marks)**
  
- b) Discuss the issues that might occur in languages where multiple inheritance is permitted. Your answer should include examples which illustrate the points you make.  

**(15 marks)**

**A3.**

- a) Describe a real-world practical scenario in which a method in a class should be set to have private visibility.  

**(10 marks)**
  
- b) Write a code fragment that demonstrates the application of the Liskov Substitution Principle.  

**(15 marks)**

**Section B**  
**Answer Section B questions in Answer Book B**

**B4.**

- a) Describe the key components of a Use Case diagram and explain with examples, how they aid the development of an object-oriented program. **(15 marks)**
- b) Discuss how object-oriented code can be tested; within your answer explain how Use Case diagrams and descriptions can be used to aid testing. **(10 marks)**

**B5.**

Explain what is meant by the following terms:

- i) Abstract and concrete classes;
- ii) Specialisation and generalization;
- iii) Encapsulation and data hiding;
- iv) Coupling and cohesion;
- v) Classes and objects.

Within your discussion include examples of **each**, based on a real-world scenario where possible.

**(25 marks)**

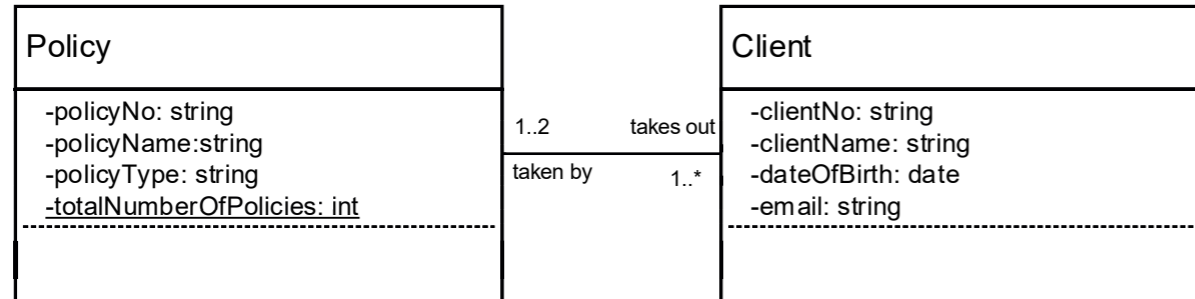
**[Turn Over]**

B6.

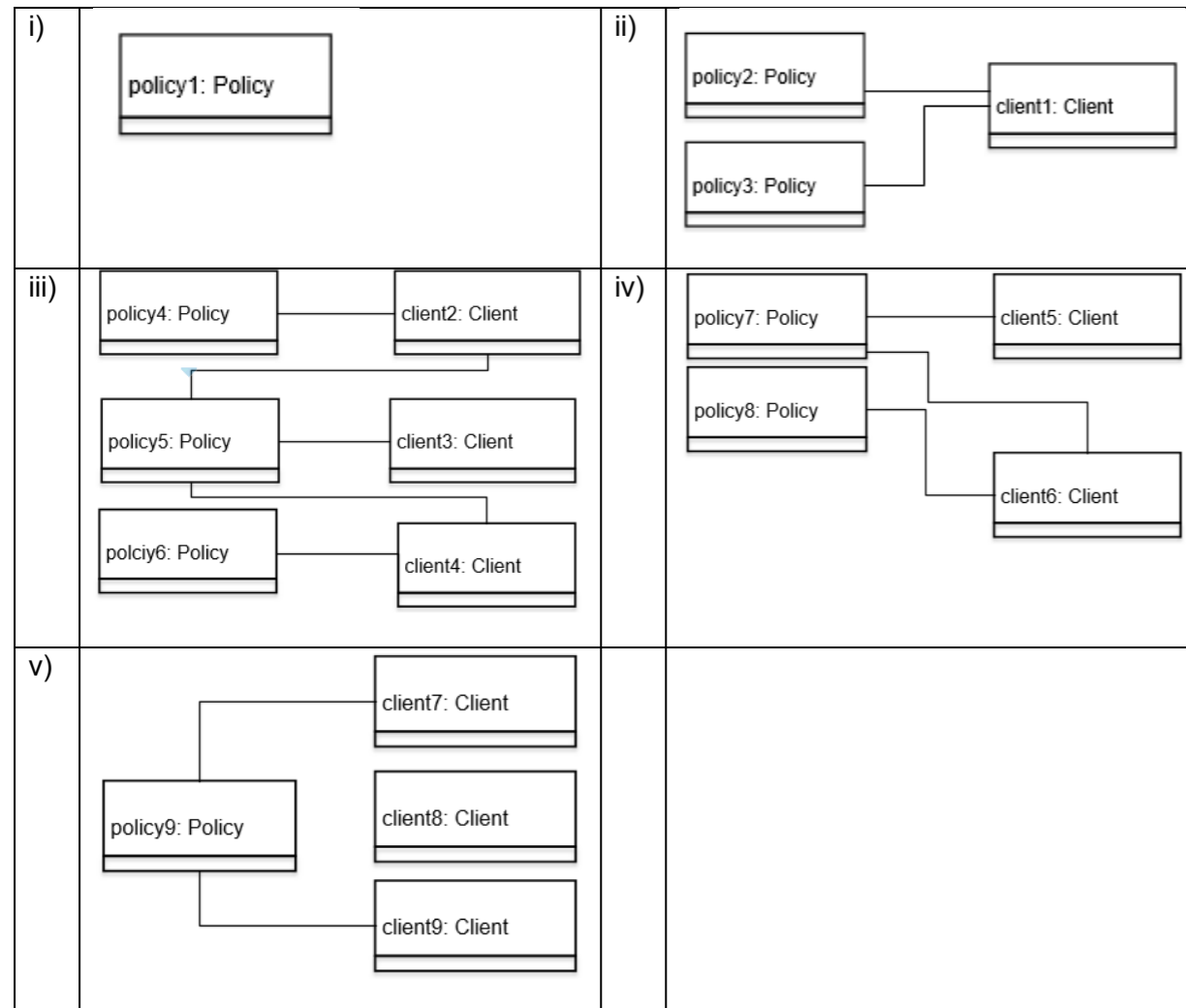
- a) Given the class diagram below and the following object diagrams (i - v), state whether each one represents legitimate instances or not. Assume that all links in the object diagrams are instances of the association shown in the class diagram.

Explain why each object diagram is legitimate or not.

(10 marks)



END OF EXAMINATION



- b) In a 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 strings to "Not known", numeric fields to 0 and the date to 1st January 2000. The class variable should be set and incremented appropriately. (15 marks)