

THE BRITISH COMPUTER SOCIETY

THE BCS PROFESSIONAL EXAMINATIONS BCS Level 5 Diploma in IT

OBJECT ORIENTED PROGRAMMING

18th October 2006, 2.30 p.m.-4.30 p.m.

Answer FOUR questions out of SIX. All questions carry equal marks.

Time: TWO hours.

*The marks given in brackets are **indicative** of the weight given to each part of the question.*

Calculators are NOT allowed in this examination.
--

1.
 - a) Describe the features that differentiate object-oriented programming languages from structured programming languages which do not support objects. **(10 marks)**
 - b) You have been asked to advise the manager of an IT department on the choice of programming language. The manager wishes to know whether the use of an object-oriented programming language would increase programmer productivity. Write a report that sets out the potential benefits and disadvantages of deploying an object-oriented language. **(15 marks)**

2.
 - a) What is the difference between an *object* in an object-oriented language and a *variable* in a structured programming language? **(4 marks)**
 - b) Using an example of code written in a language with which you are familiar, explain what is meant by *object creation* and *initialisation*. Your answer should explain the role of *constructors* in *object initialisation*. **(9 marks)**
 - c) Expand your answer to part *b*) to show the order in which constructors are invoked when the object to be initialised belongs to a class X which is the subclass of class Y where class Y also defines constructors. **(6 marks)**
 - d) Some object-oriented languages allow the programmer to write methods known as *destructors*. Explain the term *destructor*, the purpose of these methods, and at what point they are invoked. **(6 marks)**

3.
 - a) Explain the following terms:
 - i) Inheritance
 - ii) Abstract class
 - iii) DelegationYour answer should explain how a programmer might make use of each of these concepts and illustrate their use with an example of code. **(15 marks)**
 - b) Discuss the contribution of *inheritance*, *abstract classes* and *delegation* to promoting software reuse. Illustrate your answer by explaining how these features can be used to implement collection classes. **(10 marks)**

4. *StartRite Kiddies* is a nursery school for young children under 4 years of age. The company wishes to keep information on the children and the staff who work there. Two types of staff are employed: Administrators and Child Minders. Personal details, such as name and address, are recorded by the Administrator for all staff and if they are a Child Minder they must also pass a police check. The system must record when this has been passed and when it must be renewed, because a Child Minder cannot work with the children until this condition is met.

When a child starts at the nursery, an Administrator records the child's personal details such as name, address, date of birth and at least one emergency contact number, up to a maximum of three. As part of the registration process, the Administrator also records the details of who is allowed to collect the child, such as their name, address and photo. The Child Minder will print these details, so that they can check that the person collecting the child at the end of a session is authorised to do so.

Some children have special needs requiring medication, such as asthma, and the Administrator will record what the condition is, what medicine can be used and what to do in an emergency.

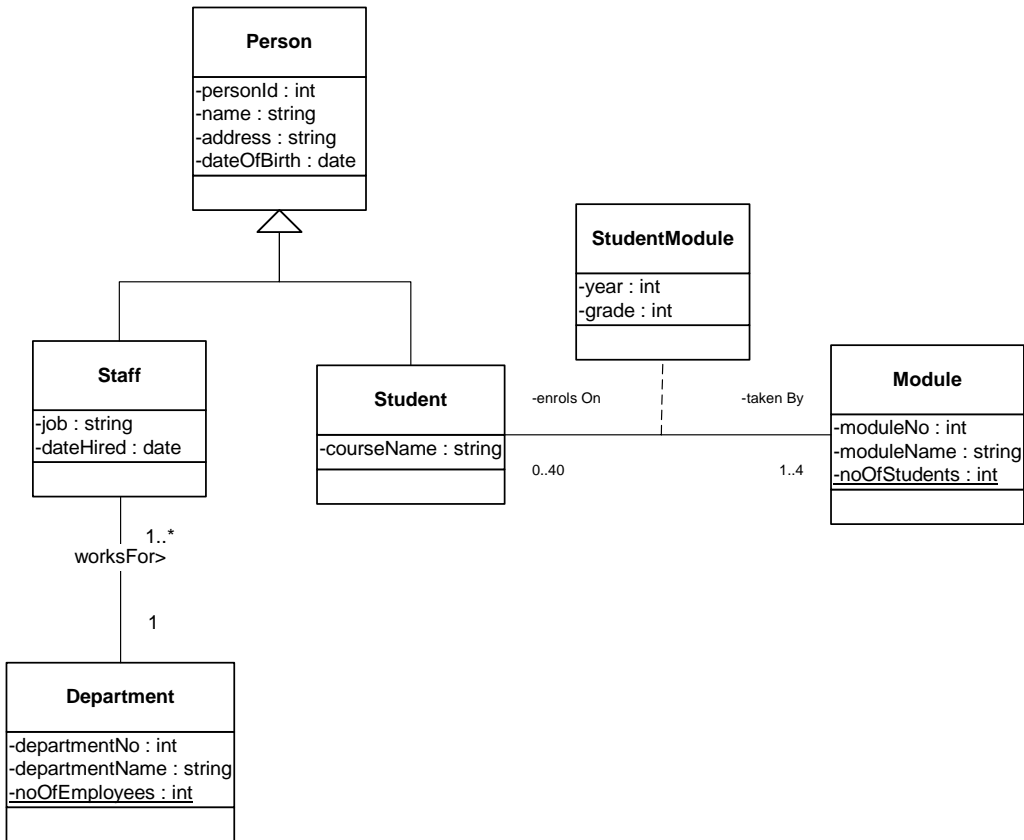
There are three different classes, after an initial assessment the Child Minder is responsible for allocating each child to a class appropriate to his/her age and ability.

Each week the children take part in a number of activities and for these they may need to bring in additional items from home, for example, boots if they are going to the park. The Child Minder will generate a weekly letter for the parents to advise them of what they need to bring in.

At the end of each month an Administrator will generate an invoice for the parents to pay.

- 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. **(10 marks)**
5. a) Describe what is meant by the process of *iterative and incremental development*. **(7 marks)**
- b) Using examples from an object-oriented programming language with which you are familiar, discuss the suitability of object technology for iterative programming development. **(10 marks)**
- c) When developing any system it needs to be tested. Describe TWO different approaches that could be used when using object-oriented technology. **(8 marks)**

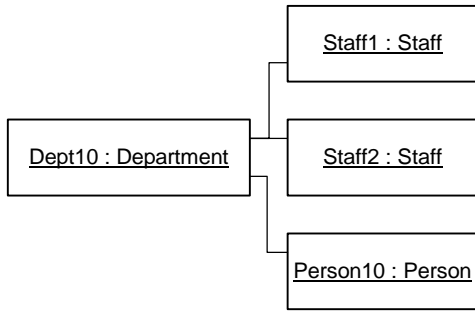
6. The class diagram below represents a student system that records what course they are doing and the modules they take.



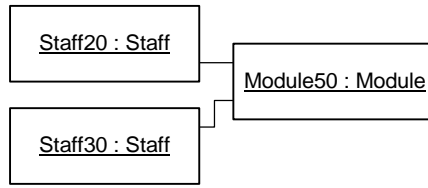
- a) Describe what the diagram above represents. Include all structural constraints. (15 marks)
- b) Given the object diagrams below (i-vi), state which are legitimate instances. If an object diagram is not legitimate explain why not. (10 marks)

Turn over]

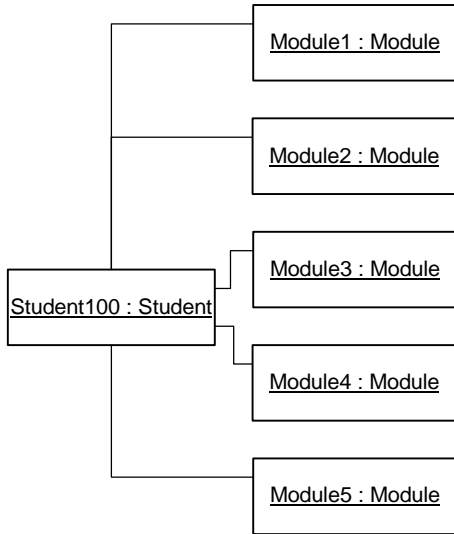
i)



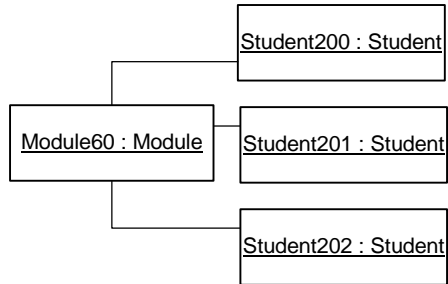
ii)



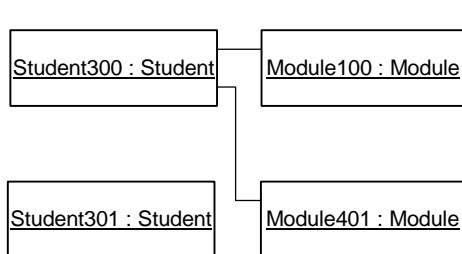
iii)



iv)



v)



vi)

