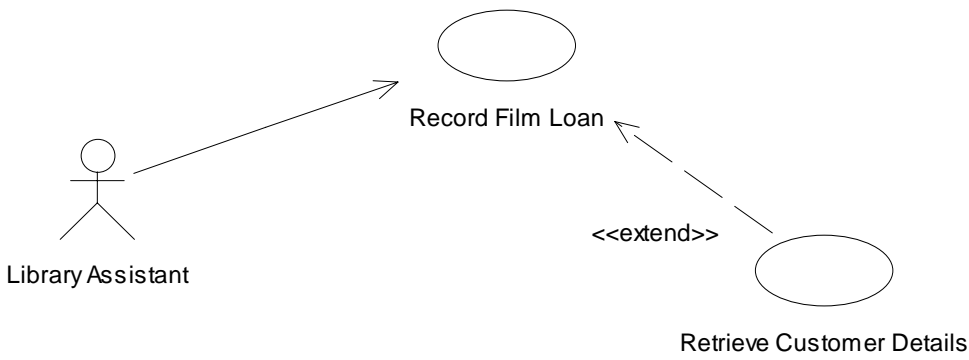**THE BRITISH COMPUTER SOCIETY**

THE BCS PROFESSIONAL EXAMINATION
Diploma

SYSTEMS DESIGN

26th April 2005, 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.*

1. *a)* Write a *brief* explanation of the purpose of TWO of the following UML diagrams as used in Object Oriented systems design. You should illustrate your answer with a labelled diagram:
  i) deployment diagram
  ii) package diagram
  iii) statechart (state diagram)

  (2 x 5 marks)

b) The following fragment of a Use Case diagram and entry from the Use Case Catalogue (**Figure 1** below) are taken from a film library system. Draw a labelled Sequence Diagram for the Use Case *Record Film Loan* to illustrate how objects will interact during the execution of the Use Case. **(15 marks)**

|	
Use Case:	*Record Film Loan*
Primary Actor:	*Library Assistant*
Goal:	*To facilitate the film rental library hiring out films to registered customers*
Preconditions:	*Film title is available for loan*
Success Condition:	*A specific copy of a specific film title is recorded as loaned to a specific registered customer*

Main Sequence:
  1. The library assistant swipes the customer's membership card
  2. The screen displays the membership number and confirms the customer's status as being in good standing
  3. The library assistant scans the film copy's bar code
  4. The system displays the film title, loan type and price and confirms availability for loan
  5. The library assistant confirms payment received
  6. The system displays the due return date and prints a receipt

(**Figure 1**)

2. The following class diagram fragment (**Figure 2**) is part of a design for a film library system. The library not only stocks popular feature films, it also stocks a wide range of training films which are loaned out to companies for their staff development programmes.

The objects represented by the classes in this class diagram are to be stored using a relational database management system (RDBMS).
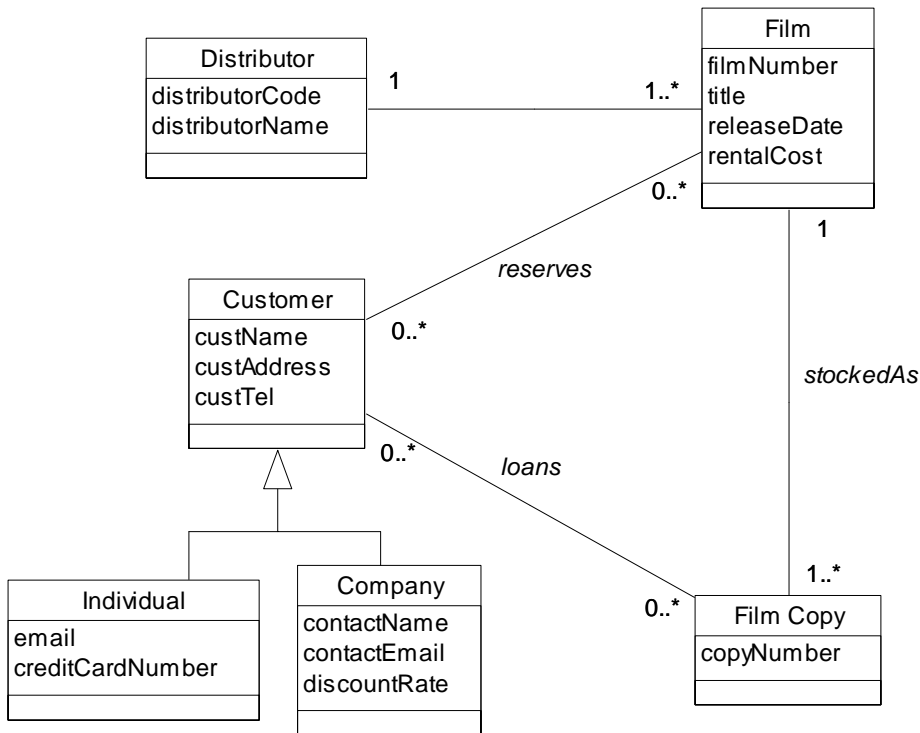
(**Figure 2**)

a) Briefly explain how each of the following elements of the class diagram may be mapped to a RDBMS Schema:
   i)   a class   (**2 marks**)
   ii) a one-to-many association   (**3 marks**)
   iii) a many-to-many association   (**4 marks**)
   iv) the 'Customer' inheritance hierarchy   (**6 marks**)

b) Produce a suitable relational schema (set of normalized tables) from the above class diagram. You *do not* need to show evidence of the normalization process.   (**10 marks**)

3. *a)* With the aid of a labelled diagram, explain how a Structure Chart is used to describe module architectures in a structured programming environment. **(12 marks)**

   b) With reference to transform analysis and transaction analysis, discuss the main principles of how a structure chart may be constructed from the information contained in a data flow diagram. **(13 marks)**

4. Write notes on all of the following, indicating the contribution of each to designing and developing a web-based system.
   i) XML **(5 marks)**
   ii) CSS (Cascading Style Sheets) **(5 marks)**
   iii) Cookies **(5 marks)**
   iv) SQL **(5 marks)**
   v) Web page frames **(5 marks)**

5. Users may make a variety of mistakes when entering data into an information system.

   a) Discuss ways in which the following aspects of User Interface Design can help prevent such errors occurring.
   i) Form Design
   ii) On-line feedback
   iii) Help facilities **(15 marks)**

   b) Explain with examples FIVE specific ways fields can be validated in order to prevent or detect errors. **(10 marks)**

6. An application needs to show a map of a selected geographical area.

   a) Design a screen that displays a map and a variety of controls to show different areas by the following means:
   i) Entering latitude and longitude
   ii) Panning and zooming
   iii) Finding by place name
   iv) Going back to a previous view **(16 marks)**

   b) Justify the design of each control. **(9 marks)**