

**THE BCS PROFESSIONAL EXAMINATION
Diploma**

April 2002

EXAMINERS' REPORT

Systems Analysis

QUESTION 1 is mandatory and receives 50% of the total marks available for this paper.

Question 1

New Straights Video and DVD Rentals

The following information was gained during an initial interview with Mr. Toukai, the owner of New Straights Video and DVD Rentals. What follows is a summary of the meeting:

“We are only concerned with the hiring and return of videos and DVD’s. We are not concerned with creating new stock, deleting old stock, etc. We are aiming at providing the best video and DVD rental service possible. Stock levels are currently just over 3000 VHS videos and 4000 DVD’s. We rent items for any period of up to one week with a nightly charge. If an item is rented for a week then a 10% discount is provided on the total hire charge. Videos cost \$5, \$8 or \$10 per night and DVD are charged at a standard rate of \$12 per night. Customers are not allowed to have on loan at any one time more than six items. We want the system to record a standard hire that occurs in the following way:

- a. check if the item is in stock,
- b. check that the customer is registered with us using their customer number on their card,
- c. check that they have not exceeded the maximum loan number,
- d. create a new hire for the items being hired,
- e. calculate and record the total charge,
- f. accept payment and finalise the rental.

The system must also be able to provide details of when an item that is currently out of stock is due to be returned and record an advanced booking for it. Once an item is returned the system should prompt the counter assistant that a reservation exists for the item so that we can find out which customer has made the reservation. The counter assistant will telephone customers informing them that the item is now available for loan.”

- a) Draw a Top Level Current Logical Data Flow Diagram to represent the ‘New Straights Video and DVD Rentals’ system described above.

(20 marks)

- b) Prepare an Entity Relationship Diagram (Logical Data Structure) and produce the resulting tables.

(20 marks)

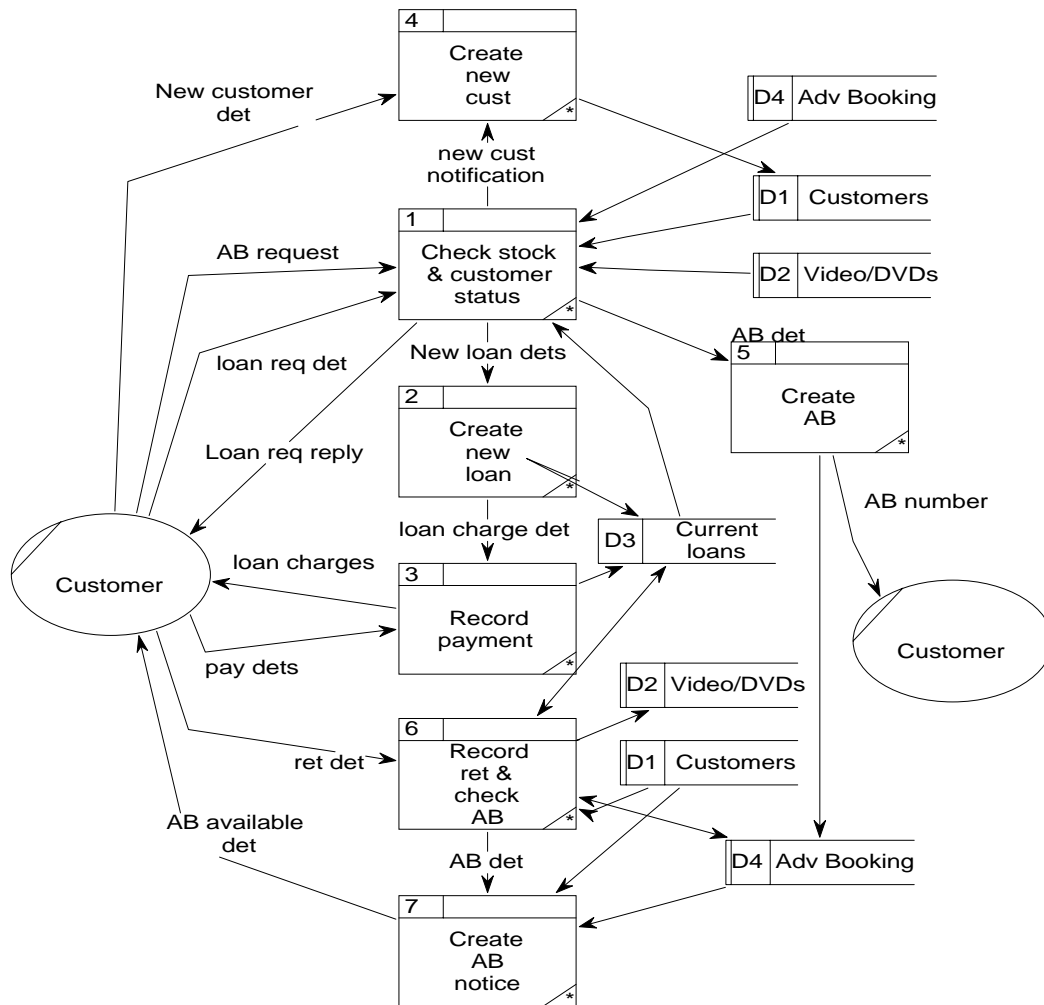
c) Explain how Data Flow Diagrams and Entity Relationship Diagram (Logical Data Structure) can be used in a Structured Walkthrough to assist a quality assurance process.

(10 marks)

Answer Pointers

Please note that all solutions are indicative; reasonable alternatives will be accepted.

a) Sample solution to Q1a, plausible alternatives will be accepted.



Marking Scheme:

Processes: 1 mark each up to a max of 5

External Entity: 1

Stores: Customers, Stock, AB, Current loans = 1 each & 1 for others up to max of 6

Data Flows: Names are meaningful and logical up to maximum of 3

Conforms to rules: Process names active verb 1

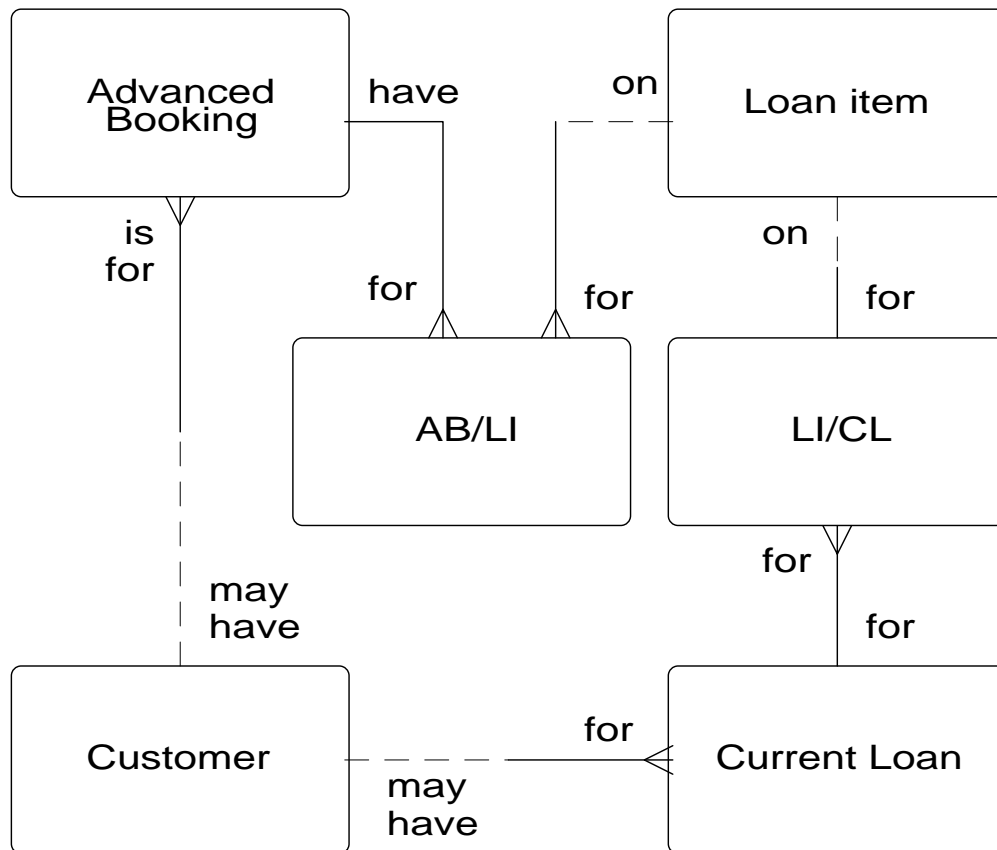
Process names meaningful 1

Flow names match processing 1

Flow names passive logical data names 2

Total: 20 marks

b) Sample LDS, plausible alternatives will be accepted.



Tables

Advanced Booking	(AB# , ABdatemade, <u>Cust#</u>)
AB/LI	(AB# , LI#)
Loan Item	(LI# , LItitle, LInightlyrate, LIpurchasedate, LICost) (Note that LI# is a faceted code to differentiate between media)
Customer	(Cust# , Cname, Caddress, Chometel, Cmobtel, Cemail, Cjoineddate, Cstatus)
Current loan	(CL# , CLs-date, CLe-date, CLtot-cost, <u>Cust#</u>)
LI/CL	(CL# , LI#)

Marking Scheme:

Entities:	1 mark each up to maximum of	5
Relationships:	Correctly expressed and logically consistent with case up to	4
Tables – consistency with LDS:	Same number of tables to entities	1
Primary Keys:	Appropriate PK identified for each table	2
Foreign Keys:	All FK identifies and posted	3
Other attributes:	Attributes sufficient to meet functional requirements	2
Normalisation:	All data is well normalized	3
Total:		20 marks

c) DFDs and LDS can be used to:

- Explain to other IS staff how system works and get them to check logic or model
- 'Walkthrough' main business functions to identify anomalies and or confusions
- Ensure adherence to rules of modeling, methodology and in-house QA standards
- Check understanding of relationships and data structures
- Ensure completeness of models and comprehension of requirements
- Assure that all tables are normalised
- Provides a fresh look at the problems and solutions – possibly give new insight
- Audit that models can support all functions by walking through data to check for long paths, etc.
- Etc.

At least 3 contributions for each of the two models required and two marks for each to maximum of 6 for each model but to maximum of 10 overall.

Total: 10 marks

Examiner's Comments

1a) This part of question 1 was generally well answered and the marks gained were usually quite high. Pleasing features of answers included the consistent use of notation and that most processes and stores were identified and represented. On the negative side common errors included:

- a. Failing to include a process to manage the return of hired goods and to check for an advanced booking.
- b. Processes with either no input or output, or input and output from and to a store only. A flow from a store cannot serve as a trigger for a process, yet many candidates modelled their data flow/processing in this way.
- c. Frequently flows from process to process and from process to sources/sinks were not named.
- d. Sometimes data flow names were conditional statement such as, 'if not in stock'. Data flow names should be 'passive' data flow names and not conditionals or active verbs. This error was very common.
- e. Some candidates named processes a little too briefly; names such as 'hire' or 'booking' could have easily been made more meaningful, for example, 'Create new hire' or Record advanced booking'.

1b) This part of question 1 was also successfully attempted by most candidates. Most candidates identified the main entities, relationships and multiplicity. Problems identified include:

- a. The inclusion of skeleton tables only, ie. primary and foreign keys. This was problematic as I was looking to see if the data structures presented could support all the functionality required and this could not be evidenced by viewing the keys alone. Presenting skeleton tables alone meant that it was not possible to review the tables for normalisation.
- b. Some candidates from one particular centre failed to include tables at all and this had a serious impact on their overall mark for questions 1.
- c. The implications of non-obligatory relationships when posting keys was almost always ignored.
- d. Some candidates spent a considerable amount of time documenting the process of normalisation. This was not required and must have taken a considerable amount of time that candidates could have usefully used elsewhere.

1c) Candidates found this very difficult to answer. Often, candidates did not attempt this part of question 1. Most answers stated what insights the two models give the developer and stated in detail what a structured walkthrough actually is and how it works. However, it was quite rare for candidates to relate the models to Structured Walkthroughs and QA enhancements. This part of the question was always intended to be challenging and was designed to allow the very best candidates to gain due credit and in this respect it was successful.

Many candidates wrote at great length about balancing the logical models and the use of ELH's. This may be a consequence of candidates presenting prepared answers to anticipated questions but failing to contextualise them to meet the requirements of the particular question being answered.

Section B answer 2 from 4 questions

Question 2

a) Define what is meant by the 'traditional waterfall systems development lifecycle (SDLC)' and explain the disadvantages associated with its use.

(10 marks)

b) Discuss the alternatives to the traditional waterfall SDLC that have been proposed and explain how they overcome the disadvantages that you have identified in your answer to part a).

(15 marks)

Answer Pointers

- a) Comprises the following stages: Feasibility Study, System Investigation, Systems Analysis, Systems Design, Implementation, Review and Maintenance (Avison & Fitzgerald, p20).
Stages are undertaken in a linear fashion.
Disadvantages include:
Failure to meet business needs
Requirements frozen early; difficulty of adapting to changes in environment
User dissatisfaction/rejection
Poor project estimation/control
Can help generate application backlog/maintenance workload.

2 marks for correctly identifying stages

2 marks for referring to linear fashion in which stages are intended to be carried out
0.5 for identifying a disadvantage, 1 for brief explanation, to a maximum of 6

Total: 10 marks

- b) Alternatives include:
Incorporate prototyping: feedback from user can address their dissatisfaction & extent to which requirements are being met.
Adopt a RAD lifecycle: prioritise & address business needs; iteration allows changes to be taken on board during the project.
Incremental development: address priorities first; systems evolve & thus respond to dynamic business environment.
Time-boxing as a means to control project timescales.
These and other reasonable suggestions will be given credit.

Either up to 15 marks for a detailed & accurate discussion of one alternative (e.g. DSDM as a RAD framework) OR up to 5 marks each for a less detailed discussion of a number of different alternatives.

No more than 7 marks in total if candidate does not mention how the alternatives address the disadvantages they have identified in a).

Total: 15 marks

Examiner's Comments

This was the most popular of the 4 choices.

Many candidates referred to the traditional 'waterfall' lifecycle as a 'methodology' (which, according to Avison and Fitzgerald's definition, it is not) and identified as alternatives methodologies such as SSADM and Soft Systems; or approaches such as the Object Oriented approach; or even the use of CASE tools, whereas the question was seeking a discussion of RAD, prototyping, incremental development, etc. Better solutions discussed these and other alternatives to the 'waterfall' approach to development and/or discussed DSDM as an example of a methodology that embodies them.

Some candidates wasted time and effort in describing each phase in detail instead of answering the question, displaying poor examination technique in providing pages of work for (a) for 10 marks and only a paragraph for (b) for 15 marks.

- Q3**
- a) **Identify the key document that you would expect to be the output of the systems analysis phase of a systems development project, and describe what you would expect it to contain.** (11 marks)
- b) **Explain the role that a Computer Assisted Software Engineering (CASE) tool can play in the preparation of systems analysis documentation.** (14 marks)

Answer Pointers

- a) Functional Specification, or Requirements Specification, or Definition of Requirements, or equivalent.

2 marks for correct identification.

Contents should include:

- Functional requirements: depending on the methodology used, these could be documented in a number of ways, including:
Requirements catalogue, data model; process model (structured method such as SSADM)
Use cases, analysis class diagram (OO method such as Unified Process).
- Non-functional requirements: system performance, reliability, security issues etc.
- Constraints: hardware, software, environmental, operational.

Up to 9 marks for accurate description of contents.

Total: 11 marks

- b) A CASE tool can help with:
- Producing diagrams, models, as required by the methodology in use
 - Error checking; syntactic correctness of models
 - Consistency, completeness checking between models
 - Communication between developers, and between developers and users
 - Version control, particularly with iterative development
 - Provide a central repository of project information
 - Generation of documentation for the Requirements Specification.

2 marks for each of these or other relevant points made to a maximum of 14.

Total: 14 marks

Examiner's comments

Some candidates did not answer the question; for (a) listing all kinds of documentation such as process models and data models rather than identifying the 'key document' (i.e. Requirements Specification, Functional Specification or

equivalent) and for (b) describing CASE tools in general instead of discussing the contribution they can make to the systems analysis phase. Some candidates had a very broad interpretation of 'CASE tool' – even including word processing, for example.

Q4 'The claims for the soft systems approach are that a true understanding of complex problem situations is more likely using this approach.' (Avison and Fitzgerald, 1995).

Describe the techniques used by Soft Systems Methodology and explain how they can help systems analysts acquire a 'true understanding' of the problem domain.

(25 marks)

Answer Pointers

Rich Picture

Provides the 'richest possible picture' of the problem domain; in pictorial form shows the people, processes, environment of the problem situation. Includes 'soft' as well as 'hard' features, incorporates concerns, conflicts, etc.

Can help the systems analyst understand a complex, messy situation. A technique that can be used with users to check out the analyst's understanding. Allows 'soft' issues to be brought into the open.

Root Definition

Uses the elements of CATWOE (Client, Actor, Transformation, World view, Owner, Environment) to capture what the purpose of the human activity system is. A number of root definitions can be prepared, from the point of view of the various stakeholders. Will help to expose different, perhaps conflicting, points of view about the situation, the problems faced and possible solutions.

Conceptual Model

A model that shows how the various activities identified by the Rich Picture and Root Definition are related to each other, and how they might be structured. The model is at a fairly high level and the notation is fairly informal. It illustrates what ought to be happening to achieve the objectives specified in the Root Definition.

Up to 10 marks for a detailed description of each technique and an accurate explanation of how they aid understanding, to a maximum of 25.

i.e. a candidate who provides complete and thorough discussion of only 2 techniques can obtain no more than 20 marks; a candidate who provides a very good, though not complete, discussion of all 3 could with 7 or 8 out of 10 each obtain all 25 marks. It is anticipated that candidates will be able to discuss Rich Pictures but will have a less good understanding of the other 2 models.

Total: 25 marks

Examiner's comments

There were some very good answers to this question, from one centre in particular. However, some candidates discussed SSM as if its intention is to produce a working information system rather than to clarify a problem situation and propose possible actions.

Q5 Class Diagrams and Use Cases are both Unified Modelling Language (UML) models that may be prepared during the analysis phase of a project using an object-oriented methodology.

- a) Describe, using diagrams, the components of each of these models. (12 marks)
- b) Explain the purpose of each model and the role that each plays during the systems analysis phase and during later phases of a development project. (13 marks)

Answer Pointers

- a) Use Case: use case description (text description of a piece of user functionality); actor, use case, with diagram to illustrate an example of how they are linked; potentially 'extend' and 'include' notation.
Class Diagram: shows classes with name, attributes, operations, with associations between them. Diagram to illustrate these components including multiplicity of associations.

3 marks each for accurate identification of components, 3 for each appropriate diagram.

Total: 12 marks

- b) A Use Case describes a piece of functionality and a set of them are used to document user requirements. They help to identify users of the system and the way(s) in which they interact with it. For each Use Case, an Interaction Diagram will later be developed. Use Cases can be used to drive the iterations in an iterative/incremental lifecycle and to derive tests.

6 marks

A Class Diagram provides an essentially static view of the system to be developed. It is used during the systems analysis phase to identify domain classes and the associations between them (i.e. the potential for message passing). It is elaborated throughout the life of a project, evolving from an analysis class diagram to a design class diagram as more detail is added.

7 marks

Total: 13 marks

Examiner's comments

There were some very good answers to this question.