

THE BCS PROFESSIONAL EXAMINATION  
Diploma

April 2001

EXAMINERS' REPORT

Systems Analysis

QUESTION ONE

a) Draw a Top Level Current Logical Data Flow Diagram to represent the Mansfield Court conference booking system described above. (20 marks)

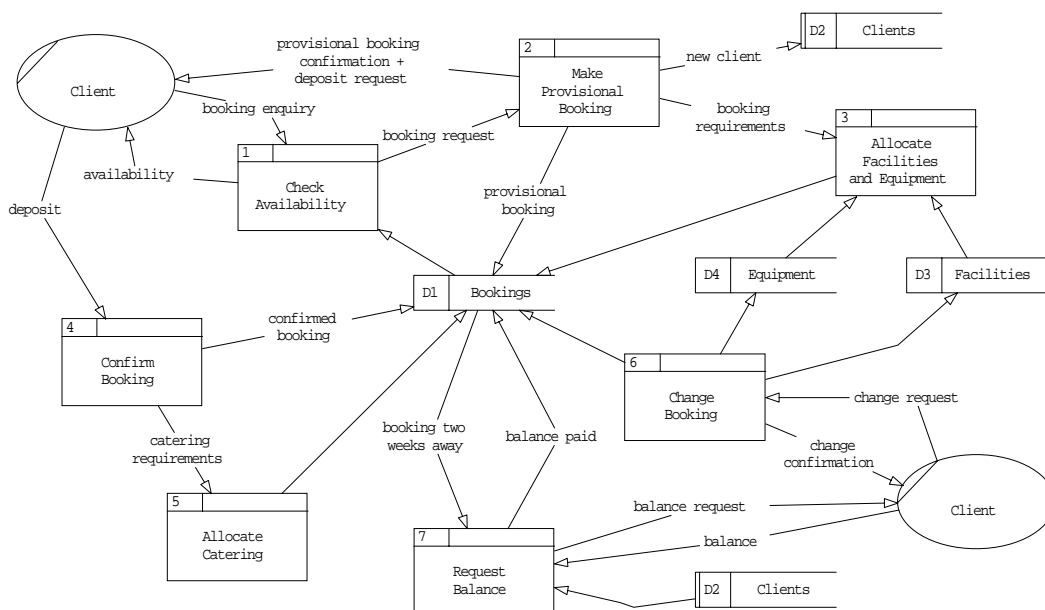
A "Top Level Current Logical" DFD was asked for. While process modelling was, on the whole, the strongest skill demonstrated by candidates, the following issues arose from this part of the question:

1. Some candidates included physical features, such as manual ('M') labels for data stores and in particular from some centres, labelling the process with the person who carries it out or location where it takes place.
2. A large proportion of solutions included inappropriate naming conventions (e.g. process names that do not start with an imperative verb), this was not penalised.

Some candidates included a context diagram as well as a top level DFD, which was not asked for and which was not marked. A few produced only a context diagram, in which cases it was of course marked.

Answer Pointers

The answers above represent the likely responses from candidates. However there will be answers that do not conform to the suggested answers but are nevertheless worthy of credit. Answers of this type will be awarded marks as determined by the examiner. See sample DFD below. Plausible alternatives will be accepted.

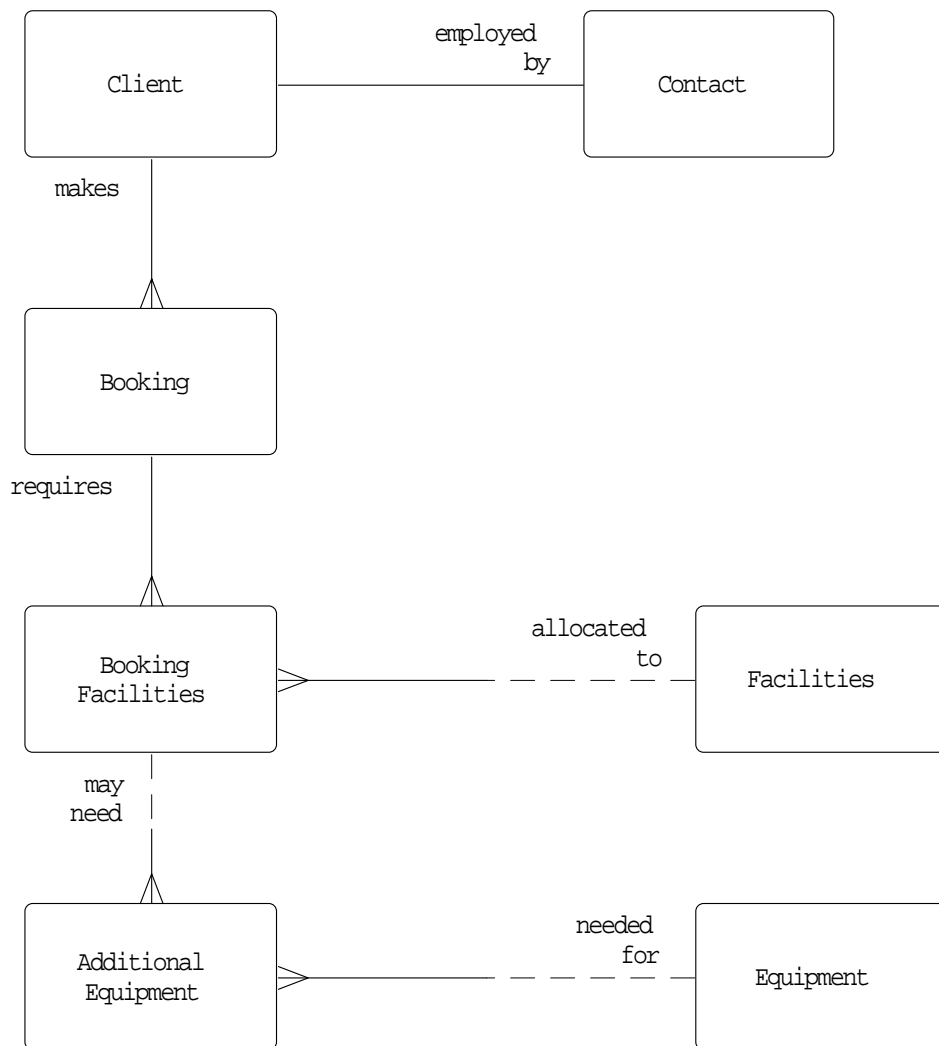


**b) Prepare an Entity Relationship Diagram (Logical Data Structure) and produce the resulting tables. (20 marks)**

While candidates from some centres produced good solutions, others produced only a diagram and no tables. Some candidates misunderstood 'tables' and drew a table structure. A number of candidates had 'Administrator' as an entity and some looked more like a process than a data model.

**Answer Pointers**

See sample LDS and tables below. Plausible alternatives will be accepted.



**Tables**

CLIENT	( <u>client_no</u> , client_name, client_address)
CONTACT	( <u>contact_no</u> , client_no, contact_name, tel_no, email_address)
BOOKING	( <u>booking_no</u> , client_no, start_date, end_date, status, deposit_paid, balance_due, balance_paid)
FACILITIES	( <u>facility_no</u> , description, capacity)
BOOKING FACILITIES	( <u>booking_no</u> , <u>facility_no</u> )
EQUIPMENT	( <u>equipment_no</u> , description)
ADDITIONAL EQUIPMENT	( <u>booking_no</u> , <u>facility_no</u> , <u>equipment_no</u> )

**c) In your answers to a) and b) you have used two structured analysis techniques to model the process and the data views of the system. Explain what difference it would have made had you instead prepared an Object Oriented model of the system. (10 marks)**

Only a small proportion of candidates answered this question well. There was a tendency to write everything known about Object Technology rather than to address the question. It was clear that candidates from some centres knew little if anything about the OO approach, despite the fact that this is included in the syllabus. It was a little worrying to find statements to the effect that there are “no standards” for OO; to counter balance this, candidates from some centres were aware of UML and correctly identified (and even provided sketched examples of) the models that would be used at the systems analysis stage. In addition to the elements in the marking scheme, credit was given for:

1. Noting that Use Case Diagrams are used to model requirements.
2. Mentioning sequence and/or state diagrams and correctly identifying their function, although these are used more in design than analysis.
3. Providing examples, 1 or up to 2 marks if they correctly drew upon the Mansfield Park scenario.

Credit has not been given for writing about the features or benefits of Object Technology in general.

#### **Answer Pointers**

1. A single analysis Class Diagram would have been produced.
2. The Class Diagram would have contained business domain objects encapsulating both data and behaviour.
3. The data would not have been normalised (e.g. a single ‘Client’ class could be used to hold both client and the contact person’s details).
4. Requirements may have been documented using Use Cases.

#### **Marks Breakdown**

<b>a) Each Process</b>	(1 mark up to 7)
External Entity	(2 marks)
Stores - each client/booking	(2 marks)
Others	(1 mark up to 6)
Data flows	(Up to 5 marks)
<b>b) Entities</b>	(1 mark each up to 7)
Relationships	(0.5 each up to 3)
Tables – consistency with LDS	(2 marks)
Primary Keys	(2 marks)
Foreign Keys	(2 marks)
Other attributes	(2 marks)
Normalisation	(2 marks)

- c) The second point is the core difference:
- |                               |                                   |
|-------------------------------|-----------------------------------|
| Accurate statement of that    | (Up to 4 marks)                   |
| Other appropriate differences | (Up to 2 marks)                   |
| Any examples                  | (2 marks to make a maximum of 10) |

## QUESTION TWO

- a) **Identify and briefly describe the main fact finding techniques used in systems analysis** **(10 marks)**

This question was attempted by most candidates and some very good answers were presented. Most candidates included the obvious techniques but it was pleasing to see a broader definition of fact finding being presented. Suggestions that prototyping, RAD and JAD can all be used as a form of fact finding were welcomed and awarded credit accordingly.

Unfortunately in part a) some candidates stated the techniques but failed to describe them in any way. This meant that they were awarded marks for naming the technique but did not get any credit for the 'briefly describe' element. For future candidates the message from this is simple. Always provide exactly what the question asks for, e.g. "state and describe" requires both elements to be attempted for full marks. Many candidates did actually receive full marks for part a).

### Answer Pointers

Fact finding techniques – suggested solution more detailed than expected from candidates.

- |                      |   |
|----------------------|---|
| <u>Sampling</u>      | Can be used to obtain a representative sample from a large mass of data that is too large for it all to be analysed. We may take samples of document to confirm that our understanding of data requirements and processes are accurate. We may also use sampling as a statistical analysis tool when dealing with large data sets. May be good for confirming other SA findings and may be used to provide empirical support for systems proposals. Problems may include sample bias, misinterpretation, unrepresentative sample if inappropriate selection criteria applied. |
| <u>Questionnaire</u> | When interviewing is not possible or when a very large number of responses are required, questionnaires can be used. Good when large number, geographically dispersed and when the range of responses is low and can be predetermined. Drawbacks include low response rate and therefore unrepresentative, lack of contact and guidance may lead to interpretation errors, no opportunity to address ambiguities, etc. Questionnaires need considerable skill and focus to compile properly.  |
| <u>Interview</u>     | Formal or informal meeting during which analyst can seek general or specific information from key respondents. Most widely used FF technique and possibly the one requiring the greatest skill. Can be used at a range of times in life cycle and for a range of purposes.  |

Very flexible and powerful technique. Must be planned, implemented and followed up carefully to gain maximum benefit. Responses may be difficult to obtain and quantify, but this may not be a problem. Most widely used and perhaps the most important technique of all. Used not only to find out about current operations but also may be used to develop relationships and trust with client group. Output from interviews can be used as inputs to other techniques, i.e. activities explained at interview can be followed up by observation and or further research/reading. Interviews are limited to those that are physically close. Can be costly in terms of time and money. A further strength is the opportunity to be formal or informal and to explore issues that emerge during the interview that may not have been considered before.

Research Company documents, minutes, marketing leaflets, strategic plan, mission, etc to gain insight into company, its operations and strategy. Good for gaining overview of company as starting point of SA. May spend too long looking at current operations. Text may not be as reality. Superficial overview provided.

Observations Chance to see actual operations and may give rise to new insights and or the discovery of work practices not previously noted. Analysis will note work flow, pace of work, problems in work flow, peaks and troughs, informal and undocumented practices that may or may not comply with the published way of doing things. The main criticism of observation is that it may distort the reality one is trying to discover. Can be used as an effective addition to other techniques.

**b) Evaluate the extent to which each technique could contribute or not to the fact finding process of the Mansfield Court system as described in Question 1a) (15 marks)**

This part of the question was mostly well answered but two mistakes noted included:

1. Restating the techniques from part a) of the question with a list of advantages and disadvantages and not relating it to MC.
2. Some students (from one centre) misunderstood the question and took it to mean that they had to explain how each technique could assist MC staff fact find about their clients booking needs. This led some candidates to include statements such as "interviews could be used by the MC administrator to find out the dates of the booking, number of delegates, check how many rooms the client wants, if they want a video player etc". Credit was given for naming the techniques and drawing out the benefits even though the consideration was being applied to the wrong processes

Only a small number of candidates actually evaluated the appropriateness of the techniques for the fact finding at MC, many candidates simply stated the techniques and their advantages.

## Answer Pointers

- Sampling May be used to review MC documents (orders, past events) to confirm other SA findings and may be used to provide empirical support for systems proposals. May also be used to identify new empirical relationships that were not forthcoming.
- Questionnaire Not likely to be used as a primary technique, but could be used to survey past customers with regard to processes. MC is regarded as a fairly confined system with an accessible set of users.
- Interview Most important technique for MC investigation. Its advantages match the requirements of this relatively confined system. The major contributor and likely to be used throughout the SA at MC.
- Research The investigation would be likely to make use of this technique by examining company documents, minutes, marketing leaflets, strategic plan, mission etc, to gain insight into the company, its operations and strategy. Good for gaining overview of company as starting point of SA and as such quite likely to contribute to the investigation of MC system,
- Observations May be used but most likely not a prime technique, though a case could be made for including elements of observation in the strategy. May be used to see actual operations and may give rise to insights into work practices not previously noted, and which may or not may not comply with the published way of doing things.

## Marks Breakdown

- a) Identification of each main technique (1 mark up to 5)  
Brief description of each technique (1 mark up to 5)
- b) Clear evaluative statement and use for MC (1 mark each up to 5)  
Explanation of technique's contribution (2 marks each up to 10)

## QUESTION THREE

**'Modern information systems need to be developed using modern methodologies'.**

**Evaluate the validity of this statement. Your answer should include references to specific information systems methodologies and types of systems whose development they best support. (25 marks)**

This question was not popular but when it was answered it was done to varying degrees of success. Most candidates did identify the changing systems environment and pointed to the need for rapid systems development, flexibility, global platforms, unknown user groups and so on. They then went on to identify, RAD/Prototyping, DSDM, JAD, OO and end-user computing as features of new systems. Many candidates went on to include a consideration of the types of systems that may be

enabled by such strategies such as, DSS, Web DDS, EIS, ES, KBS and E-everything.

Some problematic answers included:

1. Presenting all systems development as being either hard or soft and insisting on applying that classification to this question. Answers of this kind often incorrectly stated that “there are only two ways of developing systems, hard and soft” and then going on to outline each with little or no attempt to relate the material to the title.
2. Some candidates regarded modern systems as including payroll, inventory, transaction processing systems, management reporting systems, etc. These are regarded (by someone who can remember them when they were actually new) as not necessarily modern. Candidates presenting answers such as this often included SSADM as the modern method to solve the problems.
3. Some answers started by identifying some problems such as lack of user involvement, large systems, failure to meet requirements, etc, and then presented an outline of a mix from SSADM, OO Hard, Soft, Multiview, concluding that more human factors would lead to better system.

Marks were awarded whenever possible to reflect the quality of the individual answers presented even when these differed from the anticipated solution.

### **Answer Pointers**

No answer is supplied due to the varied nature of possible responses, however, certain issues will need to be drawn out in any answer, and these include; What are modern systems? What methodologies are available to develop systems and in particular which are appropriate for modern systems and why?

A well structured answer may take the following format:

1. Introduction, clarify the issue.
2. What methodologies exist and what are their main uses, ie what kinds of systems developments they support best and why?
3. What are modern systems and how does the development of them differ from older more traditional batch or process focused systems?
4. Illustration of the views expressed by reference to particular types of developments, i.e. Expert systems, End User Computing etc. This should show that many new systems (i.e. DSS, ES, etc) need to be developed with RAD type approaches and that long life cycle approaches may be less appropriate.
5. Conclusion.

## Marks Breakdown

Clear introduction	(2 marks)
Clear expression of view, yes/no to question	(2 marks)
Outlining characteristics of modern systems with examples	(8 marks)
Considering the application of methodologies [this should include a consideration of appropriate and non-appropriate ones]	(8 marks)
Effective conclusion	(2 marks)
Overall structure and quality of the answer	(3 marks)

## QUESTION FOUR

**Explain how each of the following are used in Object Oriented Systems Analysis. Illustrate your answers with diagrams as appropriate:**

- a) Class, Collaboration and Responsibility Cards (CRC Cards) (8 marks)**
- b) Essential Use Cases (8 marks)**
- c) Sequence Diagrams (using the business classes only) (9 marks)**

Very few candidates attempted this question.

CRC – Only one or two candidates actually knew what CRC are and what their purpose is. All other candidates provided a definition of a class and class diagram. This was incorrect and not given credit.

EUC – Most candidates provided good answers to this and good marks were awarded. Few candidates actually drew out the meaning of the word “essential” and full marks for this question were reserved for them.

ISD – Again mostly well explained with many answers being technically quite comprehensive. Issues of sequence and control were frequently explained. Good marks were usually achieved for this part of the question.

## Answer Pointers

- a) CRC Cards** – Used to assist in allocating operations (responsibility) to classes when they have to collaborate in order to fulfil systems responsibility. May be accompanied by Role Play to act out the ‘life of a transaction’ or use case. Cards are used to record the class name, its attributes and its operations. The use of CRC cards highlights the collaboration and encapsulated nature of classes and their dynamic associations with other classes. Used to assist in identifying the best place to locate operations within the system.
- b) Essential Use Cases** – These describe the ‘essence’ of a use case. It is the ‘core’ the essential thing that the UC is responsible for doing. It is implementation free and logical rather than physical. Most SA UCs are essential UCs. Compared to real UCs which are likely to be developed at design and include physical implementation details.
- c) Sequence Diagrams** – SD show how a UC is performed with regard to collaborating classes. There is normally one SD for each UC. SD can be linked together to show how a UC can use/extend to include the functionality of another UC. The UC description is provided within the ISD and provides



the starting point for the SD model. SD shows sequence of accesses and what messages are passed to objects to fulfil the systems responsibility. Control, selection, sequence and iteration can all be shown on the SD. SDs may also start to provide an insight into the development of design classes for subsequent 'stages' in the OO cycle.

### **Marks Breakdown**

For each technique marks will be allocated as follows:

Definition or explanation of technique	(3 marks)
Main uses of the technique	(2 marks)
Illustration / Diagrams	(2 marks)
Relating the explanation to the OO SA task	(1 mark)

For SD, 1 extra mark for explaining the use of control, selection, sequence and iteration.

### **QUESTION FIVE**

**a) What are Computer Assisted Software Engineering tools and how do they differ from Fourth Generation Languages (4GLs)? (10 marks)**

**b) Evaluate the potential of CASE tools in supporting the systems analysis process (15 marks)**

This question was very popular with many candidates answering this question and question 2.

The first part was generally well answered with many instances of maximum marks being awarded. Many candidates lost marks for not attempting to explain what 4GLs are and how they differ from CASE. Awareness of CASE was far greater than for 4GLs. An awareness of the support CASE offers was well presented as was the different types of CASE that exist and the levels of support offered. An understanding of 4GLs was less forthcoming.

Part b) was again well presented but many candidates presented the accepted advantages of CASE but failed to really attempt any real evaluation. Given the level of this paper, this was not wholly surprising, but some candidates did attempt to do this and were rewarded accordingly. Marks were awarded for all attempts at 'evaluation' even if it was quite brief. Those that repeated the accepted advantages of CASE were awarded marks accordingly.

The highest marks were reserved for those few candidates that addressed the future potential of CASE. Some candidates informed their answers to this part of the question by including references to their own professional experience. This was pleasing to see.

## Answer Pointers

a) CASE tools are a productivity software tool to provide support to systems developers at many stages of the systems life cycle. Upper, lower and integrated CASE tools exist. Upper CASE support the business analysis and modelling stages of the life cycle, whereas lower CASE supports the work of programmers by allowing for the automatic production of code from a high level expression of requirements. Integrated specific advantages of CASE include; increased productivity, improved analyst/user communication, integrating life cycle activities, more effective maintenance planning etc.

4GLs – Consensus does not exist as to a definition. Usually presented with a range of features that a 4GL should have, these include:

1. Report writer
2. Automatic code production
3. 3GL programming facility or link to one
4. Query language
5. Screen painter
6. RDBMS

Sometimes any one of these may be presented as a 4GL, but this is to misrepresent the fullness of 4GLs. The whole applications development process should be possible within the 4GL environment and as such a Query Language alone is not a 4GL.

Differences include:

1. CASE is usually a single software tool whereas 4GLs are often multiple software tools.
2. CASE is more clearly defined than 4GLs.
3. CASE is usually used by IS professionals whereas 4GLs are often sold as end-user products.
4. CASE supports the SAD and development life cycle whereas 4GLs do not explicitly support the SAD phase.
5. CASE provides project management facilities, 4GLs do not.

**b) CASE potential**

ACHIEVEMENTS SO FAR INCLUDE

Support systems A & D  
Whole development team support  
Encourage team approach  
Better discipline  
Saves time  
Greater accuracy  
Improved quality  
Speed up SD

FUTURE POTENTIAL

Adopting 4GL functionality  
Integrate whole life cycle  
Meta CASE  
Automatic code generation  
Better project management  
Estimating improved due to accuracy  
Lower cost of SD  
Better systems  
Better support maintenance

**Marks Breakdown**

- a)** Explanation of CASE (Up to 5 marks)  
Explanation of 4GLs (Up to 2 marks)  
Explanation of differences (Up to 3 marks)
- b)** Effective introduction (2 marks)  
CASE potential (8 marks)  
[1 for potential aspect presented and 1 for evaluation of its potential]
- Conclusion related to discussion (2 marks)  
Strong focus on SA task, not code production (3 marks)