

**THE BCS PROFESSIONAL EXAMINATION
Diploma**

April 2004

EXAMINERS' REPORT

Systems Analysis

General

Candidates must remember to circle the questions attempted on the front of the examination paper. Overall, where candidates have not done well, it is because they have not answered the question; specific incidence of this is noted with individual questions.

Candidates should not assume that data flow modelling, entity relationship modelling or ELHs will always continue to appear in the compulsory section of this paper. Given the global move towards the use of object technologies it is reasonable to expect this paper to reflect this in the tools and techniques it assesses.

Question 1 (Mandatory question worth 50% of total marks for this paper)

National Surfing Association - Competitions Information System

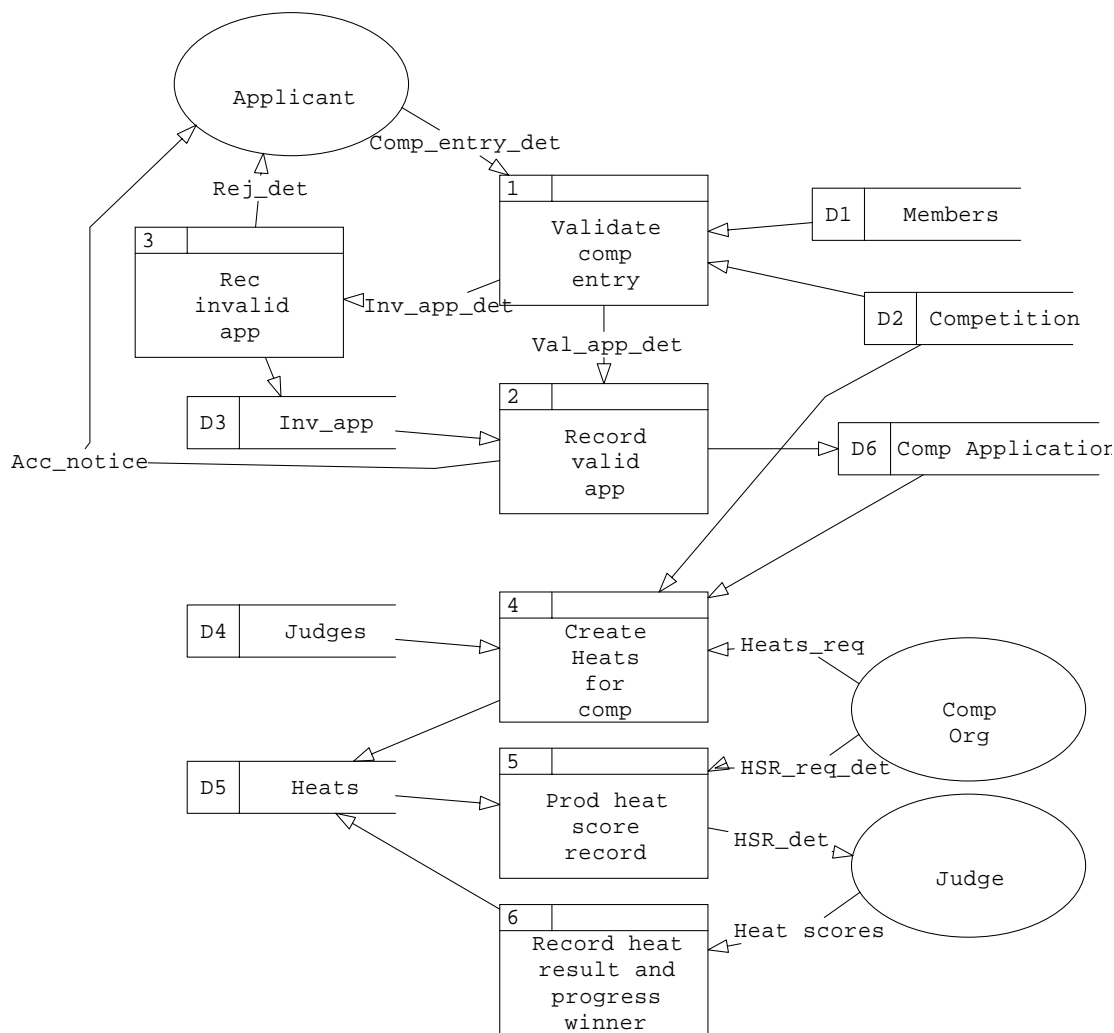
The Surfing Association (SA) is responsible for running 10 competitions each year. A competition is made up of 'rounds' and 'heats'. A 'heat' is a competition between 2, 3 or 4 competitors of which only the winner will progress to the next round. A 'round' is a set of heats at a given level of the competition. So, for example, if there are 64 competitors in a competition we have a first round with 16 heats. The 16 heat winners progress to the semi-final round which has 4 heats and the winners of the semi-final heats progress to the final which is made up of a single heat of up to 4 competitors.

The SA has approved the development of a Competitions Information System to support the processing of competitions data. Following an initial interview, the project manager described the manual system as follows:

- When an application arrives we check that the applicant is a member of the SA, that they are insured and that the correct fee is enclosed.
 - If an application is valid we record the application and send the competitor notification that their application has been recorded.
 - If an application is not valid we record only the name and address in the system and send a letter to applicants explaining why their applications cannot be processed or why it was rejected.
 - Once the closing date for applications arrives the competitions organiser:
 - a) Creates a heat structure for the competition according to the number of competitors entered.
 - b) Allocates up to 4 competitors to each heat.
 - c) Allocates judges to heats. There are between 2 and 4 judges per heat.
 - Judges require a printed form for each heat on which they record the scores they award each competitor.
 - We keep a record of who judged each heat.
 - At the end of each heat, scores are recorded and the competitor with the highest score progress to the next round. This continues until the last heat is run with up to 4 competitors and the eventual winner is identified.
- a) Draw a Top Level (i.e. the level below a Context Diagram) Current Logical Data Flow Diagram for the above scenario. (15 marks)
- b) Produce an Entity Relationship Diagram (Logical Data Structure) and a set of normalised tables for the above scenario. You DO NOT have to show evidence of the normalisation process. (20 marks)
- c) i) Create a Use Case diagram for the above scenario. (7 marks)
ii) Define with an example from your Use Case Diagram <<extends>> and <<includes>> use case associations. (8 marks)

Answer Pointers

a) Data Flow Diagram (other suitable notation will be accepted).



Marking Scheme:

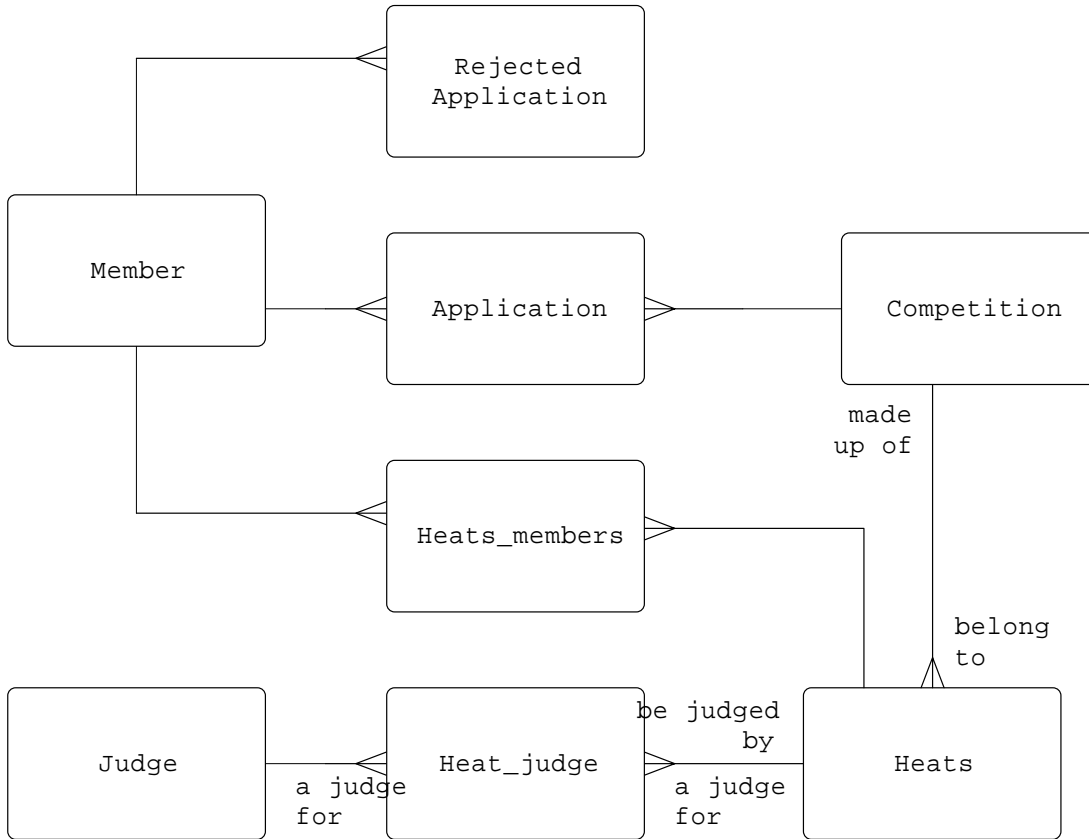
- Processes: 1 each up to 5
- Data Stores: 1 each up to 4
- Data Flows: 0.5 each up to 3
- External Entities: 1 each up to 3

Total 1a: 15 marks

Examiner's Comments

The question was answered quite well by most candidates with high marks being frequently awarded. Processes were clearly identified and modelled as were the stores needed to support the processing. Data flows were modelled less well with many candidates failing to name their data flows at all. All candidates need to be aware of the precise meaning of the word 'logical' as used in data flow modelling – all too often the physical systems and its artefacts were modelled. However, this question was generally well answered. Candidates should not assume that data flow modelling will continue to appear in the compulsory section of this paper. Given the global move towards the use of object technologies it is reasonable to expect this paper to reflect this in the tools and techniques it assesses.

b) ERD (LDS) (other suitable notation will be accepted).



Normalised Tables:

- Member (mem#, m_name, m_add, m_tel, m_email, m_insurance, m_points_score)
- Rejected Application (RA#, r_reason, date reject_note-sent, mem#)
- Application (app#, comp#, app_date, pay_amount)
- Competition (comp#, comp_date, comp_venue, comp_local contact)
- Heats (heat#, heat desc, comp#)
- Heat_members (heat#, mem#, h_score)
- Heat_judge (heat#, jud#)
- Judge (jud#, j_name, j_add, j_tel, j_email)

Marking Scheme:

- Entity types: 1 mark each to max of 6
- Relationships with appropriate degrees & membership classes: 1 mark each to max of 5
- Table types, consistency with LDS + appropriate PK: 0.5 each to max of 3
- FK postings: 0.5 each to max of 3
- Other attributes (i.e. insurance status) placed to result in normalised tables and support processing: to max of 3

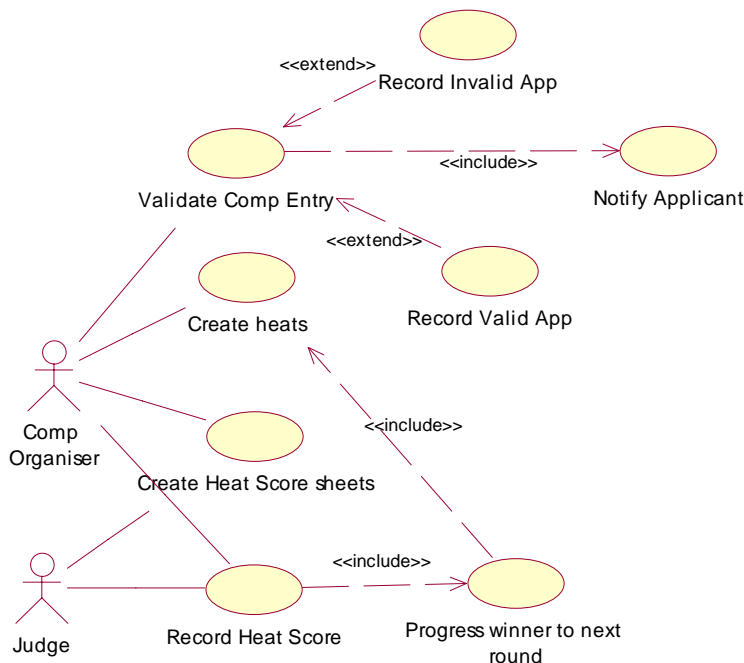
Total 1b: 20 marks

Examiner's Comments

Again a good level of ability was displayed in response to this question. Good answers correctly identified the required entities and modelled them according to ERM rules. These answers usually added sufficient attributes to demonstrate an understanding of the basic data required for this system (in particular an 'insured or not' attribute) and normalisation principles. Many solutions presented were either identical or almost identical to the examiner's suggested answer. Some of the less good answers were characterised by the following errors or misunderstandings:

- Over complicated and too many relationships between entities.
- Including too many entities when they add little or nothing to the overall model. Many candidates included entities such as 'Surfing Association', 'Competition Organiser', 'Round' and 'Winner'. None of these entities are needed. The first two are outside this systems responsibility and the second two can be derived from exist data or identified by the use of faceted codes or decriptions within other entities.
- Too many candidates still fail to fully understand the Primary/Foreign key relationship.

c)i Expected to see UC's for same/similar processes to Q1a. Actors are Competition Organiser, Judge.



Marking Scheme:

Use cases well named with correct notation 5 marks
 Actors identified and correct notation 2 marks

c) ii)

Definition of <<extends>> and <<includes>> required with example of each.

<<include>> - A relationship between UC's where one UC includes the behaviour or actions of another. For reuse - if behaviour can be reused by other U/Cs copy shared behaviour out of base UC and allow it to be reused by all UC's sharing that behaviour.

<<extends>> - A relationships between UC's where one UC extends or adds to the behaviour of another. Allows for optionality and providing additional functionality to the base UC.

Examples in the model above.

Validate comp entry U/C = <<extends>> to [Record valid] or [Record invalid]

Record heat score U/C = <<include >> to [Notify Applicant]
<<include >> to [Progress competitor]

Marking Scheme:

Extends defined with an example 4 marks
Includes defined with an example 4 marks

Total 1c: 15 marks

Total Q1: 50 marks

Examiner's Comments

Of the three parts in question 1 this was the most disappointing. Only a small number of candidates were able to produce a Use Case model and even fewer were able to satisfactorily explain the concepts of <<extends>> and <<includes>>. A number of candidates simply failed to even attempt this question. Common errors included:

- a. Including the applicant as an actor.
- b. Explaining <<extends>> as a selection between two options.

Candidates should be aware that with the increasing use of object technologies in the real-world OO systems analysis modelling techniques are likely to be assessed in this examination in the future.

Question 2

Dynamic Systems Development Methodology (DSDM) provides a framework to enable the rapid delivery of information systems that address business requirements.

Explain how each of the following concepts helps a DSDM project to deliver a successful business information system:

- a) timeboxing; (8 marks)
 - b) prototyping; (8 marks)
 - c) user participation. (9 marks)
- (Total 25 marks)

Answer Pointers

a) Timeboxing

Definition of 'timeboxing': 2 marks

Helps by ensuring:

- a working system is delivered on time
- no overruns allowed
- prioritization of requirements so essential functionality is delivered first.

2 marks for each of these or other relevant points = 6 marks.

(8 marks)

b) Prototyping

- produces an early working version of a system
- can be used to help elicit requirements
- enables alternative solutions to be evaluated
- enables feedback from user to be acquired.

2 marks for each of these or other relevant points =

(8 marks)

c) User participation

Explanation that this means users participating in development, as part of development team (JAD sessions in DSDM):
2 marks + 1 for mentioning JAD

Helps because:

- better requirements elicitation if users are actively involved
- any changes in requirements can be reflected early on in the project
- will help improve developers' understanding of the business domain, and users' understanding of the systems development process.

2 marks for each of these or other relevant points = 6.

(9 marks)

Examiner's Comments

This was the least popular question.

Some candidates for b) and c) described prototyping and user participation in general, not in the context of DSDM, and so were not addressing the question. Generally a lack of discussion of JAD in c).

Question 3

Soft Systems Methodology (SSM) takes into account the fact that the people in an organisation for whom an information system is to be developed, 'may have different and conflicting objectives, perceptions, and attitudes' (Avison and Fitzgerald, 2003).

Identify TWO techniques that are used in SSM to help highlight the conflicting ideas of the people involved in a problem situation and explain how each of them achieves this purpose.

(Total 25 marks)

Answer Pointers

Rich Pictures:

- draws the 'richest possible picture' of the problem situation
- involves talking to all the groups of people involved, thus finding out their points of view
- should show all the different groups of people involved
- allows conflicts to be highlighted (crossed swords)
- allows concerns to be shown ('think' bubbles).

2 marks for identifying this technique,

2 marks for each of these or other relevant points to a maximum of **12**.

Up to **5** marks for any use of diagrams to illustrate these points (but the production of a Rich Picture without some explanation does not address the question).

Root Definitions:

- uses 'CATWOE' to arrive at a 'root definition' of the system
- drawn up for each key person/set of people involved
- enables different points of view of the problem situation to be expressed.

2 marks for identifying this technique,

2 marks for each of these or other relevant points to a maximum of **8**.

(25 marks)

Examiner's Comments

There was a tendency for some candidates to write all they know about SSM, which did not address the question. On the whole, however, good knowledge of SSM was displayed.

Question 4

Explain, with the aid of a diagram where appropriate, FIVE of the following terms in the context of the Unified Modelling Language (UML):

- a) Use Case (5 marks)
 - b) Actor (5 marks)
 - c) Object (5 marks)
 - d) Association (5 marks)
 - e) Inheritance (5 marks)
 - f) Aggregation (5 marks)
 - g) Operation. (5 marks)
- (5 x 5 marks)

Answer Pointers

a) Use Case

A description of functionality of the system from the users' perspective.

Use Case Diagram shows the functionality the system is to provide and which users will communicate with the system to use that functionality.

Up to 4 marks for this or equivalent;

1 for a diagram that correctly illustrates a Use Case ellipse.

b) Actor

The role that people, other systems or devices take on when communicating with particular use cases.

Up to 4 marks (1 each for mentioning representation of people,

other system, device, 1 for communication/interaction with use case);

1 for correct illustration of an actor on a Use Case Diagram.

Note that candidates may draw one Use Case Diagram for a) and b).

c) Object

A concept, abstraction, thing in the problem domain

(2 marks for this or equivalent); an object has identity, data and behaviour

(3 marks for this or equivalent).

d) Association

A link between 2 classes that represents the potential for message-passing between them.

The multiplicity of an association may be specified.

3 marks for this or equivalent;

2 marks for an appropriate diagram to illustrate.

e) Inheritance

A 'type of' association whereby a class may inherit data or behaviour from a superclass.

2 marks for this or equivalent;

up to 3 marks for a diagram illustrating an inheritance hierarchy with a suitable explanation.

f) Aggregation

A 'whole-part' association whereby a class consists of an assembly of other classes.

2 marks for this or equivalent;

up to 3 marks for a diagram illustrating aggregation with a suitable explanation.

g) Operation

An element of common behaviour shared by all instances of a class.
They are actions that are carried out by, or on, an object.

3 marks for this or equivalent and

2 for any examples and/or how shown on a class diagram.

Examiner's Comments

Candidates' knowledge of UML is increasing.

b) Only a few candidates noted that an Actor is not necessarily a user but can be other systems or devices that communicate with the system being developed.

d) Associations were often confused with relationships in relational modelling (even ERD notation was provided in some example diagrams); very few candidates correctly identified them as the potential for message passing between objects.

e) & f) Note that providing just a diagram with no explanation achieved half of the 3 marks available; a suitable explanation was required to achieve all 3 marks for that part of the question.

A few candidates wasted time by answering more than 5 parts of the question; credit can only be given for 5 of them.

Question 5

a) Briefly define what is meant by a Computer Aided Systems (or Software) Engineering (CASE) tool. (2 marks)

b) Identify FIVE ways in which a CASE tool may aid the Systems Analysis phase of an information systems development project. (10 marks)

c) Discuss the extent to which a CASE tool aids quality during the Systems Analysis phase of a project. (13 marks)

(Total 25 marks)

Answer Pointers

a) Software support environment for the systems developer.

2 marks for this or equivalent.

b)

- automatic checking of syntax/completeness of models
- consistency checks across models
- automatic production of documentation (e.g. to aid with production of Requirements Specification)
- ease of making changes as requirements are added/modified
- ability to keep track of different versions & audit of change made
- improved accessibility of documentation to the development team.

2 marks for any of these or equivalent to a maximum of 10.

c) Aids quality by, for example:

- improving integrity of the documentation
- enabling changing requirements to be incorporated as they are discovered
- improving communication between the development team, and therefore increasing their understanding of the application domain
- providing support for production of prototypes, thus enabling requirements elicitation to be more thorough.

2 marks for each of these or equivalent to a maximum of 8.

At the same time, syntactically correct and consistent models do not guarantee that the systems analysts have correctly interpreted user requirements – i.e. there is a limit to what CASE tools can contribute to quality.

Up to 5 marks for a recognition of these limits.

Examiner's Comments

- a) Some candidates *described* CASE tools instead of *briefly defining* them. Note that there were only 2 marks, this should provide guidance on the amount of effort that is required for this part, as compared to the other parts, of the question.
- b) Note that the question specifically refers to the **systems analysis phase** of a project; this is a Systems Analysis exam; some candidates answered the question in a much wider context.
- c) Some candidates repeated their answer to b). A few discussed QA in general rather than answer the question. Note that the question was to 'discuss the extent to which'; many answers mentioned only the contribution of CASE tools to quality and did not point out the limitations to what they offer.