

**THE BCS PROFESSIONAL EXAMINATION  
Certificate**

**October 2003**

**EXAMINERS' REPORT**

**Information Systems**

**General Comment**

Judging by the amount of pages Section A's answers covered and the number of candidates that failed to answer their full quota of questions in Section B, it appeared that more time was spent on Section A. Time management in examinations is important. Candidates need to have a broad understanding of information systems for this paper.

**Question 1**

You have been appointed to investigate the admissions processes of a private education institution and to design an on-line system.

Students apply to the institution to study for a particular course. They may make more than one application for different courses but can only be offered one full time course provided they have the appropriate qualifications and attend a satisfactory interview. They complete the application form and submit it to the Admissions Office who check the application to make sure it is completed correctly. If there are any errors then the forms are returned to the student for amendment. Once the forms are correct they are passed to the Admissions Counsellor who has the options to make an offer for one course, offer an alternative or will reject the application. The student is sent a letter indicating the details of the offer and is asked to accept or reject the offer. Once the offer has been accepted, the student details are entered onto the Admissions Database. At the start of the course, students are registered by the Admissions Office and are allocated to a particular class. Each class for the course has the same timetable for lectures and a different timetable for practical sessions. Only one lecturer teaches a lecture, whereas a different lecturer supervises each practical session.

- a) Draw a Context Diagram and a set of Data Flow Diagrams to depict the above system. **(10 marks)**
- b) Draw a Data Model identifying the main Entities and Relationships indicating the degree of relationship and optionality. **(10 marks)**
- c) Design a set of screens which would:
  - i) Be used by the student to apply for a course
  - ii) Be used by the Admissions Counsellor to make an offer
  - iii) Be used by the student to accept/reject the offer.**(10 marks)**

This question was the least popular of all in Section A and scored the lowest marks. Candidates do find this type of question very difficult and yet all the processes are detailed quite clearly. Course providers should allow more practice. A flowchart is not a dataflow diagram, however if understanding was shown then some marks were given. The data model was very poor; admission counsellors and the admissions office were repeatedly identified as entities, whereas they are more likely to appear as an attribute to the application entity. An entity is something of importance to the organisation/enterprise, about which information needs to be stored or held. The screen layouts were very weak, titles should be clear, navigation buttons identified and appropriate fields described.

The context and data flow diagrams should identify the external entities, data flows, processes and data stores. They should be understandable.

## Answer Pointers

External entity - student.

Processes - student application, verification of application form, making an offer, accepting an offer, allocating classes.

The entities will be student, application, offer, rejection, acceptance, class, and lecturer. Optionality would exist around the offer, possibly an arc could be used to indicate offer or rejection. Physically the offer, rejection and acceptance would become columns within the application entity.

Screens should be clear, contain appropriate headings, be common in look and feel etc.

## Question 2

- a) Define the main role and typical functions of a database management system (DBMS). **(10 marks)**
- b) Describe the main theories of a relational database approach to storing and accessing data. **(10 marks)**
- c) Object-oriented concepts are widely used within web application development. Explain, using examples, the following:
- i) Class
  - ii) Type
  - iii) Method
  - iv) Inheritance
  - v) Persistence **(10 marks)**

This question was also a bit disappointing - students were unsure about the difference between a database management system which is the software providing facilities to support a database and a database administrator who manages the database. The theory of the relational database architecture was discussed reasonably well, as were the object-oriented techniques. The latter could be learned and was an easy question to answer.

## Answer Pointers

- a) DBMS - this is complex software that describes, stores and manipulates data within a defined structure. It provides control, effective automatic recovery, integrity and security. There are several architectures supporting the ANSI standard of external, conceptual and internal data models. Examples are hierarchic, network and relational.
- b) Data is stored in as values as rows or tuples of columns within tables. Each row is accessed via a primary key and can be related to another table using a foreign key. Duplication of data is reduced using normalisation techniques. Integrity constraints are supported. It is process independent; changes can be made to the table without affecting the process. The theory is based on relational calculus, providing project, select, joins etc
- c) (i) Class - this is a set of objects which have the same internal structure, attributes and methods e.g. Vehicle
- (ii) Type - models the common features of a set of objects, which have the same feature compared to abstract types e.g. integer, character etc
- (iii) Method - manipulates objects e.g. drive (as in vehicle)

(iv) Inheritance - classes can be sub-divided into subclass, which can inherit the characteristics of the class to which it is related.

(v) Persistence - an object is persistent i.e. exists with all its properties and methods until it is physically deleted as an object.

### Question 3

Information is said to be the most powerful resource within a business organisation.

- a) Discuss how information flows in a typical organisation hierarchy giving examples of the type of information at each level and typically what system type is used at each level. **(9 marks)**
- b) Define what is meant by each of the following:
- i) An expert system
  - ii) A decision support system **(6 marks)**
- c) Security of information within an organisation is extremely important. Describe what measures you would take to ensure complete security of all the information held on the computers within an organisation. **(15 marks)**

Operational, tactical, strategic levels are the three levels of decision making within an organisation. Information flows both ways between each level from top management (strategic) to the operational level. Executive decisions would be made on aggregated information; these would be random and unstructured and deal with long range planning. Typical sources would be government policies, the market, competitors etc. Tactical decisions are more structured and timely i.e. periodic or monthly and tend to include administration at management level, forecasting, budgeting etc. Operational information is the day to day processing and relates to the processes within the organisation.

### Answer Pointers

EIS - integrates data both external and internal, are interactive, may also be classed as artificial intelligent systems, are simple using graphics and simulation techniques and used by senior management.

MIS - summarises transaction data, high volume, simple models, routine reports, low level analysis producing summary and exception reports and used by middle managers.

TPS - transactions, events, deals with sorting, listing, merging, updating, provides detail reports and lists and used by operational personnel and supervisors.

Expert systems are knowledge-based or artificial intelligence-based systems built on expert knowledge. They imitate the reasoning of an expert in their respective field e.g. a medical diagnostic system, credit card screening etc

A decision support system (DSS) is an information system application that provides the user with decision-oriented information. It does not make the decisions; it provides the useful information. Decisions can be either structured or un-structured. Typical examples would be 'what-if' type questions that enable the user to see the effect of raising prices or promoting new products.

Security issues - all aspects need to be included for both hardware and software, the environment etc.

Typical areas - usernames, passwords, roles, use of views, database management system features, encryption techniques, pin numbers, firewalls, locks, computer room systems (bearing in mind overseas students tend to think mainframe), back-up, fireproof safes, contingency plans,

disaster plans, insurance, use of intranets, more modern approaches such as retina scans, palm/finger prints, voice recognition etc.

**Question 4**

Activity Code	Description	Duration (weeks)
1-2	Feasibility Study	2
2-4	Systems Analysis	3
4-7	Analysis Report	1
7-8	Systems Design	6
8-9	Design Report	1
9-10	Testing	2
10-11	Implementation	2
11-12	Review	2
2-3	Evaluate Hardware	8
3-6	Order Equipment	2
6-9	Delivery & Installation	2
2-5	Design Office Layout	1
5-9	Office Alteration	8

**Figure 1**

The above table (**Figure 1**) shows the activities that need to take place in the design of an information system development project. The activity m-n refers to the activity that takes place between nodes m and n.

- a) From the information above draw the network diagram (PERT chart) and indicate the critical path(s) of the project. **(10 marks)**
  
- b) As manager of this project, describe the steps you would take to ensure a quality project was produced on time **(8 marks)**
  
- c) There are several ways that can be used to transfer the data to this new system and for users to start using it. Describe the following and give an example of when each would be suitable:
  - i) Parallel method
  - ii) Direct changeover
  - iii) Pilot systems**(12 marks)**

**Answer Pointers**

- a) A normal Pert Chart will indicate the critical path: 1-2, 2-3, 3-6, 6-9, 9-10. The maximum number of days is 20 taking into account this path.
  
- b) Allocation of tasks, resources, implementation of a good project management system, use of structured methods, techniques, regular progress meetings, structured walkthroughs etc
  
- c) Parallel method is the safest method of running the two systems side by side for a period of time and comparing the results. It is a costly method, but is of less risk. It is the most common method and would be used in updating outdated business applications. Direct changeovers are dangerous in that there is no backup, but are less costly and risky. It depends on thorough testing. The old system is abandoned and the new system used immediately. It may be the only method available, as the existing system is no longer relevant e.g. web based systems. Pilot systems are used by large companies particularly when the system is being used in many places e.g. branches. It can also be a part of the system that is implemented first e.g. a small section of the stock within a stock control

system. Basically a small part of the system is implemented and tested before the whole system goes live.

### Question 5

The following can be used in the development of a distributed information system. Write a brief note describing on each of them.

- a) FTP service
- b) Active Server Page
- c) HTML form

Indicate whether the technology runs on the client, on the server, or on both.

**(3 x 4 marks)**

A reasonably well answered question. Most students had a clear understanding of what these technologies are used for, but a lot could not take it one stage further to obtain high marks.

Candidates with practical experience tended to score higher marks. A good portion of the answers had FTP as being part of the browser technology and not as one in its own right.

### Answer Pointers

- a) ftp server

- 1 mark for stating what FTP stands for
- 1 mark for client / server style answer
- 1 mark for pull / push style description

1 mark can be awarded for each novel but relevant fact

- b) ASP

- 1 mark for dynamic creation of web page
- 1 mark for stating it is actually HTML code generated
- 1 mark for presentation layer description
- 1 mark for stating Microsoft proprietary / use of VBscript

1 mark can be awarded for each novel but relevant fact

- c) HTML

- 1 mark for definition of Hypertext Mark-up Language
- 1 mark for client side exec, server side stored.
- 1 mark interpreted code
- 1 mark for tag description

1 mark can be awarded for each novel but relevant fact

### Question 6

Describe the main stages within a structured methodology with which you are familiar. Identify the main techniques used at each stage.

**(12 marks)**

The first part, outlining the stages, was well done by most of the students. The second part of outlining the techniques was poorly attempted. For example, a number of students outlined

SSADM but failed to mention CD or DFD or ERMs (which have been for a number of years core techniques), but explained about fact finding techniques in some detail (strangely not a core technique with SSADM 4+).

A number of students assumed that the sub stages were the techniques but it was difficult to give marks for simply listing stages.

Few students attempted to explain methods outside the traditional SSADM / waterfall / RAD domain.

### **Answer Pointers**

For SSADM the following would be expected

- Feasibility
- Requirements
- Investigation
- Analysis
- Design
- Construction

Or similar. But must outline techniques (CD / DFD / ERM, interviewing, observations etc.)

Other methods are acceptable but need to be outlined and techniques included.

Max 5 marks for stages

Max 7 marks for techniques

### **Question 7**

Explain, with examples, the meaning of the following relational database terms:

- a) Join condition
- b) Schema
- c) Null value

**(3 x 4 marks)**

The major comment for this question was the lack of examples even through the question asked for it. Lots of students dropped marks (clearly understanding the topic) due to missing examples. If a question asks for examples then marks will be awarded for examples - if examples are not given then marks will be lost!

### **Answer Pointers**

Join (a few common mistakes)

Students stated this was the condition in the where clause.

Some stated it was how you would join Databases (and not tables) together.

Some emphasised the join in queries (and where credited if appropriate).

Schema (a few comments)

Where the candidate discussed the three schema architecture (as in later SSADMs and traditional DB theory) the candidate achieved maximum marks. Lots of candidates did answer in this style.

This part of the question was poorly answered.

Null (a few comments)

Some very narrow answers were found where the candidate understood partly what nulls are used for and what they represented.

Some examples of misuse

Null is only a missing value

Null is the same as zero

Nulls cannot be used in keys (rather than should not)

Etc.

Examples.

There were some very weak examples. More practice may be the answer.

a)

1 mark for discussing joining two tables

1 mark for pk of one table to fk of another

2 marks for reasonable example

b)

1 mark for defining to do with db def

1 mark for more precise answer with dd ref

2 marks for reasonable example

c)

1 mark for stating no value

1 mark for stating why we might have no value (not just zero)

2 marks for reasonable example

### Question 8

How might a web site present 'dynamic' information content on its web pages? Describe the technology required and how it is used. Include an example of where dynamic information would be beneficial. **(12 marks)**

One of the two weakest answered questions in this section.

Lots of students believed dynamic to simply be

- updateable
- graphical
- used for adverts
- etc.

and then proceeded to write a lot that was off topic and a basic discussion on what web sites were rather than the underpinning technologies (i.e. starting from obtaining live data from a data source, perhaps with some customisation occurring) and the potential benefits to the user of current, live data.

Those students who understood the area did reasonably well, those who didn't scored badly and there was very little in the middle ground.

### Answer Pointers

up to 3 marks for stating what dynamic is rather than updateable

examples such as timely, personalised, self updating etc  
[only 1 mark for defining process of manually updating web pages]

up to 5 marks for discussion on technology (cookies, ASP, vbscript, java applet etc),  
personalisation

up to 4 marks for discussion on example

### **Question 9**

Explain what is meant by prototyping and describe TWO different approaches to prototyping. What are the main problems with prototyping? **(12 marks)**

Another reasonable well answered question in parts.

The definition of prototyping was explained in the most part.

The definition / naming of two different ways of prototyping was well explained.

The explanation of the two different ways of prototyping was generally poor. (Some explanations of throwaway prototyping ended up using the prototype).

RAD was seen as prototyping, some answers stated that both RAD and JRP / JAD were methods of prototyping. There clearly needs to be a better explanation of RAD to some of the students

The disadvantages concentrated on management, time and financial issues and were fairly limited in scope.

Extreme programming was an area that was discussed as prototyping (by a small number of students), which might need a few words added into a methodology discussion.

### **Answer Pointers**

up to 2 marks for definition of prototypes

2 marks for defining two different ways of prototyping

two times 2 marks for discussion of different types of prototypes (max 4)

4 marks for a discussion on disadvantages of prototyping

### **Question 10**

A large organisation has operated a batch stock control system for a number of years. It is developing a new web based stock control system. Special attention needs to be paid to the design of the user interface. What issues need to be taken into consideration when designing the user interface for the new web based system? Illustrate your answer with sketches of two possible screen interactions between the user and the system. **(12 marks)**

A repeat of an earlier comment about lack of examples (screens) is probably the single most common mistake for this question.

Generally the HCI issues were dealt with at a reasonable level for this type (and content of course) but the lack of screens (examples) and a mapping back to the discussion was the biggest fault.



Some students decided to discuss the answer with respect to the type of controls available for the developer (radio groups, list boxes etc.) and some credit was given to this style of answer.

### **Answer Pointers**

up to 6 marks for discussion on relevant HCI issues, such as  
layout,  
empower users,  
prior knowledge,  
types of users  
etc.

marks can be awarded for relevant issues (not simply colour, text etc.)

Two times up to 3 marks for sketches of two possible screen interactions (max 6) using elements discussed

### **Question 11**

An insurance company has traditionally sold its policies (e.g. car insurance, house insurance, sickness insurance, etc) via mail shots or brokers. It now wishes to move to on-line selling. As a consultant, you have been asked to draft a report on the impact this is likely to have on its information systems. Identify the major features, with reasons, that you would include in such a report. **(12 marks)**

This was the weakest of all answered questions and represented a very poor understanding of the question.

The question asks for an explanation of how the IS function would be effected by a move to a web front end. The students (bar a handful) answered with respect to how much benefit a web presence would aid the company.

One student answered by stating how to write a report.

Needs to map to information systems rather than general issues on deploying an application on the web.

### **Answer Pointers**

2 marks for issues relevant point / reasons (as long as it is backed by a reason)

### **Question 12**

Describe the "ideal" functionality you would expect from a CASE tool. Compare this "ideal" functionality with the functionality of a CASE tool with which you are familiar. **(12 marks)**

There was a clear understanding of what a CASE tool was but few students showed that they had real interaction with CASE tools.

A number produced an IS definition of CASE (analytical and automatic building of part of a system) and then proceeded to discussed a CASE tool from a very software engineering view of a CASE tool (i.e. VB as a CASE tool (syntax checking, compiling of an exe etc.))

Perhaps demonstration of CASE tools would benefit, only a few responded with a real CASE tool like Rational Rose.

**Answer Pointers**

CASE – definition should be included.

Up to 2 marks for an ideal function with discussion of why.

Examples such as

Generation of application, code, reports, etc.

Verification of inputted diagrams against a dd

Verification of use of inputted diagrams

etc

Up to 4 marks for a comparison against a known (named) CASE tools