THE BCS PROFESSIONAL EXAMINATIONS
Certificate

April 2006

EXAMINERS' REPORT

Information Systems

General

There has been a marked improvement in the candidates' performance, although the overall average is still quite low. Candidates seem to have taken note of previous papers and examiner's comments, although many still do not seem to understand the rubric and attempt too few questions. There was a good spread of attempts across all questions. Question 1 was the least popular question, possibly because it contains application rather than theory. However, the attempts were better than usual. Question 2 was the most popular but candidates obtained the best marks from Question 4.

Question 1

1. A large local travel company has acquired several smaller companies within the area and plans to provide specialist overseas holidays such as visits to historical sites, cookery classes, art classes and walking tours. A new computer system is required to cope with the new business. The following functions would be required: advertising, booking holidays, dealing with suppliers such as airlines, hotels, tour guides and coach companies, deposits, invoicing and payments for all the suppliers as well as customers.

a) Imagine you are responsible for this development. Describe the stages you would follow to ensure a fully integrated and stable system using a methodology with which you are familiar. **(12 marks)**

b) Give examples of the following techniques using the above example:

i) Data flow diagramming including a context diagram and a high level data flow diagram **(8 marks)**

ii) Entity relationship modelling **(3 marks)**

iii) Rich picture **(4 marks)**

iv) Class diagram **(3 marks)**

Answer Pointers

Part a)

As this is only 12 marks, it is the stages that should be described. Typical answers would include the life cycle in the form of methodologies such as SSADM, Yourdon etc. Stages range from preliminary survey, feasibility (these are not always covered within a methodology), systems/ requirements analysis, systems design (logical/physical), development, testing, implementation, review and maintenance.

Part b)

The functions are provided and should be repeated. External entities would be advertising companies, airlines, hotels, coach companies, (all these could be encompassed as suppliers), and external personnel such as tour guides, customers. Data stores would be required for all the external entities separately and would include order, invoice, deposit, and payment for both suppliers and customers.

Entities: advertising company, airline, hotel, tour guide, coach company, customer, order, deposit, invoice, and payment.

The rich picture would depict the external elements as described above. Conflicts would arise between the various functions when booking for example.

Class diagram would reflect the entities combined with the functions.

Examiner's Comments
It is gratifying to see that candidates are able to apply the techniques in a more professional manner. They should be advised to look at other types of methodologies such as soft and object-oriented as not many attempts were made to draw a rich picture or describe and object class diagram. They should also be advised to note the number of marks allocated to a question and not spend too much time as happened in answering part a).

Question 2

2. *a)* Name and describe the advantages and disadvantages of THREE fact-finding techniques. **(10 marks)**

b) There are many storage and retrieval techniques for accessing data. Define the following, giving examples:
- *i)* Indexed-sequential **(3 marks)**
- *ii)* Relational **(3 marks)**
- *iii)* Sequential **(3 marks)**
- *iv)* Direct access **(3 marks)**

c) Outline the measures you would use to provide good screen design using current HCI (human computer interface) techniques. **(8 marks)**

Answer Pointers
Part a)
Typical fact finding techniques are: interviewing, questionnaires, observation, sampling, prototyping, JAD sessions. Advantages and disadvantages of each are expected. Interviewing – advantages are the ability to obtain views from differing levels ranging from clerical to management. Typical disadvantages are the time and cost required and the possible negative reaction of the interviewee. Questionnaires are useful in a diverse situation and to obtain actual facts. Problems occur in designing questionnaires and response. Observation is useful to identify procedures and possible bottlenecks but are time consuming and may seem to be intrusive. Sampling is a good way of obtaining facts from previous records, but anomalies and discrepancies may not be noticed. Prototyping and JAD sessions can be a quick way of obtaining an overview of a system, but too often prototypes are implemented too soon.

Part b)
Indexed sequential – a storage and access method based on a key stored in an index is sequential sequence, ensuring quick access, the disadvantage is that in a volatile file, re-organization is required frequently in order to prevent degradation.
Relational a storage and access method based on mathematical principles of relational calculus using primary and foreign keys. It is the most commonly used method.
Sequential or serial storage and access is based on data being stored as it arrives useful for audit trails and when data is processed in order rather than a volatile file.
Direct access and hence random storage is where data is stored randomly, but access is by address rather than key making it an extremely (if now dated) access method.

Part c)
Good screen design should include the following: good use of colour, clarity, commonality, consistency in design from screen to another, good help facilities, no overcrowding, common use of language, consistent manoeuvrability etc

Examiner's Comments
Most candidates who attempted this question could describe the advantages and disadvantages of three fact-finding techniques. However, their attempt at part b) was disappointing. Storage and retrieval techniques are part of the syllabus and should be understood by IT professionals. The model answer for part c) expects differing aspects of screen design and was marked accordingly.

Question 3

3. *a)* Explain the following business functions:

i) Purchasing (Buying) **(3 marks)**

ii) Marketing **(3 marks)**

iii) Payroll and Human Resource Management (Personnel) **(3 marks)**

iv) Manufacturing **(3 marks)**

b) Three main areas of management information are stored in a typical organization. Identify the types of information and typical systems used in EACH area. **(9 marks)**

c) Over the last few years the importance of controlling the information stored with regard to legal and ethical issues has resulted in laws designed to protect the data. Give THREE examples of laws with which you are familiar, explaining their use. **(9 marks)**

Answer Pointers

Part a)

Purchasing is the process of buying goods, raw materials and services from suppliers. It includes invoicing, payment and debt collection.

Marketing is the mechanism used to promote the goods or services of an organization. It includes the production of advertising material in many forms e.g. printing and publishing in many forms, the media, the internet etc

Payroll is the process of paying the staff for the work they carry out in the course of their job. The company is also responsible for processing all appropriate taxes. HRM manages the human resources i.e. the staff. Dealing with problems and issues, unions, disputes, recruitment and dismissals related to the staff.

Manufacturing deals with the conversion of raw materials into a product as it flows through a factory or assembly plant. It is closely linked with purchasing and stock control ensuring the presence of the correct material being available at the right time.

Part b)

Operational information is the lowest level of data used within an organization. It is of timely often daily importance and is produced as a result of transaction process systems and is used by the lowest managers such as supervisors to ensure smooth processing.

Tactical information is the middle level. It consists of accrued information such as that produced weekly or monthly by management information systems and is used for such functions as financial reports indication the progress of the organization.

Strategic information is at the top level often unstructured and is used by the executives to control the organization. Information can be internal such as annual profit and loss or external such as the market forces and stocks and shares. It is produced by executive information systems and decision support systems.

Part c)

The examples will vary according to the candidates' experience. Typical examples would be the Data Protection Act enabling people to know what is being stored in their name. All companies holding information whether on paper or electronic media have to be registered and reveal the information stored if requested. The Computer Misuse Act covers the ethical use of computers enabling prosecutions for malicious damage, hacking, viruses, worms etc. The Freedom of Information Act is similar in a way to the DP Act, but is more relevant to information stored at institutional level such as government enabling access to the public. Intellectual Property Act deals with the 'ownership' of software amongst other aspects. The BCS code of conduct provides and ethical and professional approach to development. Other examples are the Health and Safety Act and Copyright.

Examiner's Comments
The answers to part a) were disappointing, candidates failed to distinguish between the various business functions and should be recommended to obtain an overview of how a typical business functions. Part b) was answered reasonably well. Legal and ethical issues have become more important in the IT industry over the past few years. This is another area candidates should consider researching.

Question 4

4. *a)* Recently there has been an explosion in the use of the web/internet. Draft a report indicating why this has happened, giving examples of how the following organizations could make use of the internet:
i) A music production company
ii) A travel company
iii) A sports shop **(12 marks)**

b) The use of the internet does have its problems, write BRIEF notes indicating typical security problems and solutions you would recommend. **(6 marks)**

c) There are several ways in which new systems can be implemented, depending on the type of system. Identify THREE different implementation methods indicating advantages and disadvantages and examples of when each would be used. **(12 marks)**

Answer Pointers
Part a)
Processing power, the introduction of bandwidths, speed of processing, the vast increase in the storage of data in many different forms including pictures, sound, video etc, the increase in ownership of computers have all contributed to the internet revolution. A music production company could produce a multi-media web site containing snippets of their music, pictures and details available to both public and retail companies. Travel companies could give details of holidays, special offers etc and enable on-line booking, payment and confirmation. Costs can be reduced, for example brochure costs, staffing, rental etc. Sports shops could introduce internet shopping, enabling customers to browse their products, question availability, build a shopping basket and process payment and arrange delivery.

Part b)
Security plays a vital role when processing on the internet. Examples of breaches include hackers, viruses, worms, spyware, phishing etc. Many products exist to prevent these such as virus checkers, anti spyware programs, secure sites for processing payments by credit cards.

Part c)
Three typical implementation examples would direct changeover, parallel running and staged changeover. Direct changeover can be used when for example a computerised system has not existed previously. It is cheap in terms of staffing and time but costly if not fully tested and a potential for failure. Parallel running a system entails the running of both old and new systems side by side until the user is satisfied. It is costly in terms of time and effort but safer. Staged changeover as its name suggest involves a series of small parts of the system being introduced a little at a time. This is also costly but not as much as parallel running and is often used when several locations or systems are being implemented.

Examiner's Comments
Candidates obtained the highest marks from this question. Parts a) and b) were answered well and candidates were able to discuss the internet explosion and its problems intelligently. Once again there were a few candidates who misinterpreted part c). There is a difference between an implementation method and a development method. Implementation is the final stage of development and deals with the way a system is being used in practice after development.

Section B

5. A Data Flow Model (DFM) consists of the Data Flow Diagram (DFD) and associated documentation.

a) What information should be included in the additional documentation? **(5 marks)**
b) Outline what you consider to be good practice for drawing a DFD. **(4 marks)**
c) List THREE other techniques that could be used to support a DFD. **(3 marks)**

Answer Pointers

a) A range of documentation – one mark for each validate document, will reduce marks for duplication
Examples, definitions for flows, processes, data stores
A content diagram
Level 2 DFDs
Etc.

b) Open ended, open for the students
e.g. Draw the diagram from left to right, or top to bottom of the page
Use of millers magic number (7 +- 2), limit the number of processes etc.
Use of naming conventions (D for data store, F for flow etc.)
Data stores do not have flows connecting them to other data sources, external entities etc.

c) One mark for each relevant example
From SSADM, we could use ERD/M, ELH, requirements analysis etc.

Examiner's Comments

Where it was clear that the student understood SSADM or DFDs the answer were good.

Part b) was the weakest of the three parts, the vast majority of students seemed to be unaware of good practice.

Question 6

6. Outline the procedures for testing the quality and function of the user interface for a website. **(12 marks)**

Answer Pointers

Open ended BUT the answer must include

Function testing
Usability testing
Consistency testing – against expected internet norms etc

For example, an answer that included black and white box testing with usability (as long as it was explained) would achieve a reasonable mark.

Examiner's Comments
Poorly answered, focusing on black and white box, or a note dump on testing styles.

The "user" in the testing process was generally omitted.

Question 7
7. What is a requirements catalogue and what should it contain? **(12 marks)**

Answer Pointers
Key elements would be:

project
version
non-functional / functional requirement
Priority
benefits

Diagram courtesy of http://users.wmin.ac.uk/~lambrox/Short%20RDEF.doc

<table>
<tr><th colspan="4">Requirements Catalogue Entry</th></tr>
<tr><td colspan="4">Project Author Date Version Page of</td></tr>
<tr><td colspan="4">Source Priority Owner Requirement ID</td></tr>
<tr><td colspan="4">Functional Requirement

Business Event:</td></tr>
<tr><td colspan="4">Non-functional requirements</td></tr>
<tr><td>Description</td><td>Target value</td><td>Acceptable range</td><td>Comments</td></tr>
<tr><td colspan="4">Benefits</td></tr>
<tr><td colspan="4">Comments/suggested solutions</td></tr>
<tr><td colspan="4">Related Documents</td></tr>
<tr><td colspan="4">Related requirements</td></tr>
<tr><td colspan="4">Resolution</td></tr>
</table>

Open ended but the form should reflect a number of the above key points, or elements that could have been included from the above form.

Examiner's Comments
Poorly answered. Most methodologies or project would have a set of goals that would need to be met for the project/method to be a success. A lot of the answers were in the style of a "shop/company catalogue".

Question 8

8. *a)* Define what is meant by the following database terms:
i) Primary Key
ii) Foreign Key
iii) Null **(3 x 2 marks)**

b) Business rules are required for validating the data input for credit card details onto a system (i.e. card holder's name, credit card number, start date, expiry date). Outline SIX rules that you would expect to be implemented. **(6 marks)**

Answer Pointers
i) The primary key of a relational table uniquely identifies each record in the table. It can either be a normal attribute that is guaranteed to be unique (such as Social Security Number in a table with no more than one record per person) or it can be generated by the DBMS (such as a globally unique identifier, or GUID, in Microsoft SQL Server).

http://databases.about.com/cs/administration/g/primarykey.htm
Up to 2 marks for any reasonable definition

ii) In relational database, it is a field in one table that is indexed in another
Up to 2 marks for any reasonable definition

iii)

One school of thought – Codd's – holds that nulls are not values, but something else: "marks" that are applied to cells (row/column intersections) that do not contain values.

http://www.btinternet.com/~adrian.larner/database/snulls.htm
Up to 2 marks for any reasonable definition

Examiner's Comments
Lots of answers confused database and table.

Still getting "a null is a space" answers.

b)
One mark for each reasonable rule.

Examples:
i) name must be greater than one character in length
ii) credit card number must be equal to 16 digits
iii) the first four digits of the credit card number but define the credit card company
iv) expiry date must be greater than or equal to today's date
v) the start date must be before the expiry date
vi) the start date must be less than today's date.

Some answers spoke of range checks, format checks etc. but did not actually state any business rules. This style of answer attracted 2 marks.

Question 9

9. Discuss what is meant by the following terms with respect to systems analysis:

a) Hard methodology
b) Soft methodology
c) Agile methodology **(12 marks)**

Answer Pointers

a)
A hard method is often defined as being one that sticks rigidly to the prescribed programme of tools and techniques that form the philosophy of the methodologies. Often the method dictates there is a solution that that solution can be engineered.

b)
A soft method may be considered to be useful when the solution may not be clear and human factors / politics may need to be included in any design.

c)
Most agile methods attempt to minimize risk by developing software in short time boxes, called iterations, which typically last one to four weeks. Each iteration is like a miniature software project of its own, and includes all the tasks necessary to release the mini-increment of new functionality.

http://en.wikipedia.org/wiki/Agile_software_development

For each section:
1 mark for a relevant methodology.
Up to 3 marks for a discussion, note that question asked what made the methodology different to the other ones.

Examiner's Comments

Hard and soft were generally answered well. Hard methods are just for situations where the customer is IT literate and soft for situations where the customer is IT illiterate. A number of answers suggested this.

Part c) was the weakest part of the question.

Question 10

10. Prototyping is often seen as an effective fact-finding technique.

a) Outline TWO different prototyping techniques. **(8 marks)**
b) State FOUR disadvantages for use of prototyping as a fact-finding technique. **(4 marks)**

Answer Pointers

a)
Two marks for naming recognised prototyping styles.
Up to 3 marks (times 2) for describing two prototyping styles

Often the students states one style of prototyping technique and describes another; no marks will be awarded for the name if this occurs but credit will be given for the description of an unnamed technique.

Polarised answers in terms of throwaway and incremental, but generally good.

b)
Up to 4 marks for negative aspects

i) building unrealistic user expectation
ii) requires a trained prototype developer
iii) requires full user co-operation
iv) can lead the user rather than develop material

Examiner's Comments
Lots of answers stated "cost" and "time", but did not explain why it may increase cost or time.

Question 11

11. *a)* How do development environments help to reduce programme errors? **(6 marks)**

b) Outline the facilities of a CASE tool. **(6 marks)**

Answer Pointers

a) For example, syntax verify, re-use of code, debugging features.
One mark for each relevant comment

b) generation of code from a diagram, re-use of existing.
One mark for each relevant comment

Examiner's Comments
Part b) was better answered than part a). Reasonable answers to this question in general.

Question 12

12. Describe THREE project management techniques. For each technique described, specify the type of project the technique is best suited to and why. **(12 marks)**

Answer Pointers
Any PERT or CPN style technique (or similar technique) described.

If the student answers with Microsoft project they might get some credit for the answer; the question asks for technique not application.

Open ended question, dependent on the student to answer.

Examiner's Comments
Where the student understood the question it was well answered.