THE BCS PROFESSIONAL EXAMINATION
Certificate

October 2004

EXAMINERS' REPORT

Information Systems

General

Marks for section A have improved slightly, compared with previous papers. Candidates must be reminded to read and understand the rubric; only two questions should be attempted from Section A. Similarly, they must read the questions; there have been some unfortunate misinterpretations of the requirements. The system development cycle has many phases and the questions have been devised to test the understanding of the stages, techniques and tools. A final point is that candidates should take care with their writing; some papers were very difficult to read.

Question 1

1. *a)* You have been appointed as a consultant for a large clothing company, which has merged with several smaller companies. Your brief is to investigate the current systems and produce a report advising which methodology you would use in this investigation. Include the phases, tasks, tools and techniques you would use to do this. **(15 marks)**

b) The design of the interface is extremely important to the company, which intends to do most of its trading over the internet. Describe the issues that need to be taken into consideration when designing this interface. **(15 marks)**

Examiners' Comments

This question gave the students the ability to show their knowledge in two important areas of information systems design and development.
Section a - several candidates concentrated on the initial investigation phase and described fact-finding techniques only instead of describing a methodology with all its attendant phases. Most did include the typical development cycle, although many still believe that the waterfall cycle is a methodology. Several types of methodology are acceptable including SSADM, RAD, UML, and Soft Systems etc.
Section b – this question was answered reasonably well. A few interpreted the question by describing the application, which was not the intention.

Answer Pointers

a) Typical system development life cycle, possibly SSADM is expected: preliminary review, feasibility, analysis, design, development, implementation, maintenance and review. Tools such as CASE tools e.g. Rational Rose, Together and techniques such as dataflow diagrams, entity relationship models, entity life history, use case diagrams, class diagrams, collaboration diagrams, activity diagrams etc would be acceptable.

b) Interface design aspects: consistency, relevance, supportiveness, user friendly screens, ease of use, user diversity, meaningful design, flexibility, use of colour and space, attractiveness, help, error correction, security etc

Question 2

2. *a)* A specialist holiday company takes bookings from various sources. Customers visit its office in person, telephone or book over the internet. The holiday includes the flight and hotel. Details of the customer are held on file and discounts given for regular customers. A ten percent deposit is taken at the booking in cash (only when the booking is made in person) or credit card. Invoices are sent out immediately on confirmation of the booking. Payment is expected four weeks before the departure date. Tickets are issued only when payment is made.

i) Using a diagramming convention with which you are familiar, draw the above, showing you understand the processes and dataflows, taking into account maintenance of the system. **(8 marks)**

ii) Design a set of normalised tables for the above system, containing appropriate attributes. Define the primary and foreign keys for each table. **(7 marks)**

b) Define what is meant by:

i) A database management system **(5 marks)**

ii) An expert system **(5 marks)**

iii) Network analysis **(5 marks)**

Examiners' Comments

Section a - it was pleasing to note that reasonable attempts were made drawing dataflow/process diagrams, however the table design was very poor showing the lack of understanding and practising of normalisation techniques. The concept of the booking was missing from many answers, even though it was mentioned in the process diagrams, it was often included in the customer details. Similarly, the flight and hotel details were often missing. Few candidates recognised the fact that the holiday could have its own table as would be found in a brochure or on the internet. The model answer given below is only an indication of possible tables and attributes.
Section b – most candidates could describe a database management system, (although some confused this with the database administrator), and expert systems, but many confused network analysis with the physical network administration and management.

Answer Pointers

(a) (i) Processes: Enter/amend customer details, take bookings, record deposit, add/amend holidays, hotels, flights, issue invoices, deal with payment, issue tickets.

(ii) Table: Customer – customer no (primary key), customer name, address, telephone number, email address etc. This should contain only detail about the customer that would be accessible from the booking table using the customer number.
Booking – Booking reference (primary key), holiday number (foreign key), customer number (foreign key), outward date, inward date, number in party etc
Holiday – Holiday number (brochure number) primary key, hotel number (foreign key), flight number (foreign key) etc
Hotel – hotel number (primary key), hotel name etc
Flight – flight number (primary key), dates etc, Payment – payment id (primary key), booking reference (foreign key), deposit, amount due etc

(b) (i) A database is an integrated collection of data, which fulfils the data requirements of all applications that access it. Aspects such as data independence, shareability, reliability, integrity and flexibility, the support of various commands covering data definition, data control and data manipulation should be included.

(ii) An expert system is software that uses the knowledge and reasoning of human experts within a limited field of expertise. It comprises a knowledge base and an inference engine. Such systems are used in areas like medicine, education, forensic science and military.

(iii) Network analysis is part of the project control technique often referred to as PERT analysis. A network diagram consists of an activity diagram, which is a graphical way of describing the sequence and dependencies of tasks within a project. Start and finish times and floats are recorded and a critical path identified.

Question 3

3. *a)* You have just been appointed manager for a project that deals with the ordering and payment of raw materials on-line from suppliers and will take six man months to prepare. You are responsible for the testing of this system. Describe the testing methods you would use, and what plans you would make to ensure that this is a successful implementation and integration with the company's financial application. **(15 marks)**

b) The information for the project above will be held on a large database and various applications will supply details to staff throughout the organisation. Using the above, describe and give examples of strategic, tactical and operational information and suggest what type of application would be used at each level and typically who would require this information. **(15 marks)**

Examiner's Comments

This was the least popular question and was answered reasonably well, although again candidates should be reminded to read the question.

Section a – all aspects of testing were included. Some noted the inclusion of aspects such as basic requirements, which should be tested alongside the application. These included speed of response, accuracy, reliability, security, training, hardware/software resourcing etc.

Section b – most candidates were able to describe the three levels of management information and include the three level diagram, though few gave examples.

Answer Pointers

a) Testing is an important part of the development life cycle. Careful plans need to be made, from the lowest common denominator i.e. at program level up to system integration. Methods include: black box testing, white box testing, alpha/beta testing, modular testing, integration testing, acceptance testing, validation rules, data constraints, integrity constraints, business rules etc. See also above.

b) Strategic information is used by the top management to make executive decisions; the information obtained using executive information software. The information would be unstructured and random and would deal with long term planning e.g.
World market prices for raw materials, market trends etc. Tactical information is used by middle management and is more structured and is produced using management information systems. E.g. period purchases. Operational information is at the lowest level of management, supervisors and operational personnel and deals with day to day information used to progress transactions. E.g. purchase order detail, supplier detail etc. Transaction processing systems provide this information.

Question 4

4. *a)* The advent of networking, and the use of trading over the internet, have exposed corporate information systems to security issues. Describe the sort of problems which may occur with the hardware and software and what solutions you would propose to prevent these happening. **(14 marks)**

b) Implementation of the new system occurs towards the end of the system development life cycle. Give details of THREE METHODS, which can be used to implement the system identifying the advantages and disadvantages of each. Provide examples of where each method may typically be used. **(9 marks)**

c) Nowadays, developers of information systems must be aware of legal and ethical aspects. As a systems development manager, draft a memo to your team outlining the legal and ethical issues of which they ought to be aware. **(7 marks)**

Examiner's Comments

This was a popular question, though quite a few candidates ignored section c, also several looked at the word method and described methodologies – again they did not read the question. Section a was answered well. The importance of ethical and legal issues needs to be emphasised, as it is a very important aspect within information systems development.

Answer Pointers

a) Security issues: - all aspects need to be included for both hardware and software, the environment in terms of organisational, logical and physical security. Problems should include computer viruses, hackers, spammers, loss of information accidental or deliberate etc

Typical areas - usernames, passwords, roles, use of views, database management system features such as referential integrity, constraints, triggers, encryption techniques, pin numbers, virus scanners, 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.

b) Parallel, pilot, direct methods of implementation. Parallel running is the most common and consists of running the current and new systems together for a period of time. It is costly but a safe method. It is mainly used when there is an existing system. Pilot implementation is, as its name suggests a way of trying the system in a small area and is often used in systems which are being implemented in many areas e.g. supermarket provision. It allows the system to be tested thoroughly but any problems mean that recovery must be controlled. The direct method occurs when there is not a comparable existing system and the new system is implemented immediately. It is cheap but risky. E.g. a web-based system. In all cases the data must be prepared and loaded onto the database, the training and all other aspects carried out before implementation can commence.

c) Examples of legal issues include Data Protection Act, Computer Misuses Act, Intellectual Property Act etc. Ethical aspects include freedom of information, privacy, respect for the profession, competence, honesty, and integrity within development. Security of information is also important in terms of hacking, viruses, illegal exposure etc

SECTION B

Answer FIVE questions out of EIGHT. All questions carry equal marks.

*The marks given in brackets are **indicative** of the weight given to each part of the question.*

Question 5

5. *a)* Define what is meant by the term *Computer Aided Software Engineering (CASE).* **(2 marks)**

b) State FIVE reasons why companies may not be using CASE tools. **(5 marks)**

c) In your opinion is Microsoft Access a CASE tool? You will need to justify your answer. (This needs to match your answer to *a)*. **(5 marks)**

Answer Pointers

a) 2 marks for any reasonable definition.

b) Cost, expertise, training issues, not mapping to current methods or applications.

c) From an IS view point "no", from a SE view point yes.

Yes, can draw ERD, prototyping tool, generation of application, code, sql etc.
No, does not support Methods etc.

Examiner's Comments

Reasonably well answered question for part a.

Part B was reasonable

Part C, most thought Access is a CASE tool, and got lower marks according. Some answered no, but without discussing the methodology support, and a limited number actually got the point of question.

Question 6

6. *a)* What is meant by prototyping with respect to systems analysis? **(2 marks)**

b) Describe what you would expect to be the deliverables from a prototyping stage of a project. Include all aspects (such as the documents etc.) you would expect to be produced from the stage. **(10 marks)**

Answer Pointers

a) A simple reasonable discussion on prototyping was expected.

b) Prototyping is not just about creating a software artefact; it is also about obtaining what the user wants.

So typical products would be a
- Requirements catalogue
- CD / DFD or equivalent
- ERM / ERD or equivalent
- Screen designs
- Process definitions
- Etc.

Examiner's Comments
Part A - well discussed.

Part B - Poorly done, very few realised that any method approach should generate the same sort of documentation.

Question 7

7. Discuss what is meant by THREE of the following four terms. State a methodology based on the approach and then define an advantage.

a) Soft Methodology
b) Hard Methodology
c) Agile Methodology
d) Hybrid Methodology **(3 x 4 marks)**

Answer Pointers
Three times:
1 mark for correct method
2 marks for highlighting rational behind method
1 mark for advantage

An open ended question in which a range of answers were acceptable.

Examiner's Comments
Reasonably well answered.

Some thought that RAD was a soft methodology, but generally OK.

Question 8

8. Company X is considering using text-only dumb terminals for all data entry and using high specification Windows PCs for all management functions (reports, queries, market trends etc.).

Define, and then discuss, the advantages and disadvantages of using these two types of interfaces. **(12 marks)**

Answer Pointers
Expected definition of WIMP (Windows, Icons, Mouse, Pointers) or similar for PCs
Expected definition of Forms or similar for Dumb terminal

Advantages

Form	Restricts faults, Fill-in blanks, lower learning curve etc.
Wimp	Improve performance, flexibility, graphs for report etc.

Disadvantages

Form	Flexibility, meets user levels,
Wimp	Flexibility, cost, training, learning curve

10 marks for discussion, would expect at least one advantage and disadvantage for both interfaces

Examiner's Comments
Variable answers ranging from good to poor.

Some focused on just one part of the question, just the terminal, or just the PC. It does seem to be an issue with this part that candidates don't seem to read the question.

Question 9

9. *a)* Explain the difference between a software fault and a software failure. **(2 marks)**

b) Company X is recording 'defects' information about all its current products, including those under development and those in operation. Defects can be reported by: system designers (during formal inspections); testers (during systems and integration testing) or users. The figure below shows the basic format of the current 'Defect Report' form.

Describe the weaknesses of the current form. **(10 marks)**

Defect Report

Date

Description of defect

Location

Cause

Change

Answer Pointers
a) A failure is something which is observed while the software is in operation - it is a deviation from expected or specified behaviour.

A fault is the part of a software document (code or other form of documentation). That is, the encoding of a human error. Failures are caused by triggering one or more faults with specific inputs.

b) The major problem is the lumping together of faults and failure into defects. Clearly system designers are reporting faults while users are reporting failures. Testers finding defects during system and integration testing may be finding faults or failures. The distinct groups cannot be expected to produce the same kind of information (e.g. 'cause' cannot be given by users). Users cannot be expected to provide information about faults. They can only report on incidents that they believe are failures. It is up to the software developers to determine if these really are (new) failures and if so it is up to them to find the fault that has caused it and then fix the fault.

Other weaknesses to note:

a. No name field
b. Date ambiguous; Is date the date of incident or the date reported?
c. Description could mean anything: ideally need to separate out symptom, end result and mechanism.
d. Too much reliance on free-form entry (simple scale choices are much better).
e. Does not provide a simple scale of severity
f. Does not identify location/version number

Examiner's Comments
Part A – poorly answered.

Part B – poorly answered.

A lot thought that the question was a HCI re-design of the report rather than what information was missing and needed to be acquired to resolve the issue of defects in SW.

Question 10

10. *a)* Define what is meant by the following terms, then by reference to a standard employee table, give an example of each.

i) Primary Key
ii) Foreign Key
iii) Composite Key
iv) Candidate Key **(4 x 2 marks)**

b) Nulls are a common feature in data design. Discuss the advantages and disadvantages of using Nulls in data design. **(4 marks)**

Answer Pointers

a) One mark for a good definition and one mark an example mapped to a standard employee table.

b) A discussion was required covering both parts of the question.

Advantages - Use of nulls for missing data or where there is no data, can loading of data.
Disadvantages – Missing data, incomplete data, maths etc.

Examiner's Comments
Part a) III and IV were very poorly answered.

Part b) was generally average, most thought that saving nothing into the DB took large amount of additional space.

Some very interesting (and wrong) definition of Primary Key (i.e. first column in a table)

One overriding comment is that candidates did not supply examples in some answers which were asked for.

Question 11

11. The data held in corporate databases is a valuable resource and may contain sensitive information which needs protecting. Describe the techniques that are used to protect corporate databases from the following threats:

i) Theft by employees
ii) Accidental loss
iii) Corruption of operational data arising from a hardware failure **(12 marks)**

Answer Pointers

One point for any viable point.
Marks were not repeated if the student repeated answers across the three sections.

Examiner's Comments

Well answered question on the whole, lots of variety but mostly to the point.

Some focused on just the hardware (RAID), some focused on just backing up. Generally most covered areas like user roles, recovery planning, decent hardware, maintenance etc.

Question 12

12. A standard development environment, such as Microsoft Windows, has a number of features that assist development of data entry applications.

Discuss THREE features and give examples of where they would be used to assist data entry (for example, radio buttons for selection of sex (male or female)). **(3 x 4 marks)**

Answer Pointers

Features could include, drop down lists, query based options, check boxes,
1 mark for a relevant Example

Examiner's Comments

Averagely answered.