

**THE BCS PROFESSIONAL EXAMINATION
Certificate**

April 2007

EXAMINERS' REPORT

Information Systems

General comment

The pass rate has improved considerably from previous papers suggesting that candidates are taking note of model answers and previous advice. There are still a few candidates who do not read the rubric and still answer too many questions in Section A and not enough in Section B. Centres should give advice concerning exam technique in particular in time management.

SECTION A

Question 1

(a) Information systems development requires careful thought and planning. Several methods are available to support the development.

Give examples and a BRIEF overview of the main features in the following:

- (i) Object-oriented development using UML
- (ii) A soft system approach
- (iii) A prototyping method
- (iv) Structured systems analysis methodology **(20 marks)**

(b) Using any system as an example, describe the use of TWO of the following techniques:

- (i) Normalisation (1NF to 3NF)
- (ii) Entity life history
- (iii) Entity/relationship diagrams (logical data model) **(10 marks)**

Answer Points

a) This question is open ended and gives the candidates the opportunity to show what they know about different methods and techniques

(i) UML - Unified Modelling Language and Object-Oriented analysis technique such as use case, class, collaboration, sequence and activity diagrams. Data structures and methods are combined together within the object-oriented framework.

(ii) Soft system approach – e.g. ETHICS, which deals with analysis from the personal and ethical angle or SSM devised by Checkland with 7 stages to solve unstructured problem situations. Techniques such as CATWOE, rich picture diagrams, conceptual models, root definitions showing conflicts, behaviour and interactions between actors and stakeholders.

(iii) Prototyping – also known as RAD, e.g. DSDM or Agile - several methods of developing the system based on user interaction and user requirements e.g. throw-away, spiral, partial, evolutionary all based on differing areas of the system in various depths.

(iv) Structured systems analysis methodology – e.g. SSADM provides a strict structure and deliverables at each stage, ranging from requirements analysis to logical and physical modelling. Techniques include data modelling, data flow diagrams, normalisation, entity life histories etc.

b) A few candidates did not read the question and described three techniques.

(i) Normalisation is the production of simple stable relationships as a basis for relational analysis. The various stages reduce the duplication, redundancy of data and update anomalies. 1NF - removes repeating items, 2NF - removes partial dependencies and 3NF removes transitive dependencies.

(ii) An entity life history deals with the aspect of time and the life of an entity from its creation to its deletion. It contains the concepts of sequence, selection and iteration.

(iii) A logical data model consists of entities, attributes and relationships between entities. These relationships can be one to one, one to many or many to many (which needs resolving). They can be optional or mandatory depending on circumstances. Other more advanced techniques would be acceptable.

Question 2

A large hotel company is opening a new hotel at a new holiday destination resort. A new system will be required to deal with room reservations and bookings. It will need to provide an on-line (web-based) enquiry system as well as the reservations, bookings and payments.

(a) As the senior analyst, you are responsible for planning the investigation and implementation of the above system. Using a structured systems methodology, with which you are familiar, describe the stages and tasks you would use within the project
(15 marks)

(b) The first stage of the development life cycle is a feasibility study, which is not normally part of the methodology. What is a feasibility study and what areas would you expect to include in the feasibility report.
(9 marks)

(c) Briefly describe THREE fact-finding techniques you would use in the analysis phase.
(6 marks)

Answer Points

(a) The stages covered were mainly those as described in SSADM i.e. requirements analysis, current environment and business options, technical options, requirements specification. Further extension into the development, implementation and maintenance is also accepted. Other aspects such as the waterfall method, which is still very popular, with the more conventional life cycle is acceptable

(b) A feasibility report should contain economic, technical, social, legal and ethical aspects plus a brief overview of problems and possible alternative solutions enabling the management to confirm the development before too much time and money has been spent.

(c) Candidates tended to write too much for six marks, wasting time on this part of the question.

Fact finding techniques: interviews, questionnaires, observation, sampling, record searching – a brief example of three is expected.

Question 3

- (a) A hotel is upgrading its on-line booking system.
- (i) Design a typical input screen, which can be used by the receptionist to record booking details. **(8 marks)**
 - (ii) Comment on what design techniques you would use to ensure a user-friendly system. **(8 marks)**
 - (iii) Define the validation needed for typical fields **(4 marks)**
- (b) As the hotel has an existing system, describe a suitable method of implementation that could be used. Include in your answer other aspects that need to be considered when converting to the new system and justify your choice of implementation method. **(10 marks)**

Answer Points

a) (i) There were some good techniques such as combo boxes, drop down menus, text boxes and command buttons, but poor functionality e.g. many forgot dates and just put number of days, there was no calculation of total and no automatic generation of reference numbers.

(ii) Clarity of screen, good use of colours, simplicity, flow from left to right, consistency, good help facilities etc. Simple, well designed screens are expected, with appropriate field headings, help facilities, navigation aids etc

(iii) Validation would be very simple e.g. checking existing customer number is valid and exists and details displayed, range checks, type checks and presence, marks would be obtained for inclusion of categories or severity of problem

b) Either parallel running or pilot changeover would be most suitable. The appropriate choice should be described and justified. It is unlikely that direct changeover would be appropriate. Other aspects would include transferring data to the new database, thorough system testing, user training, allocation of user names, passwords and roles, production of appropriate user guides (manual and technical), installation of any new equipment etc.

Question 4

A hotel company has been advised that it is losing its business as it is failing to keep up to date with new technology.

- (a) Draft a report discussing and providing examples of how new technology could be used to give competitive advantage to the hotel company. **(15 marks)**
- (b) Define what is meant by each of the following:
- (i) An expert system
 - (ii) A decision support system **(6 marks)**
- (c) Define the roles and responsibilities of the following systems personnel:
- (i) Systems analyst
 - (ii) Network administrator
 - (iii) Web designer **(9 marks)**

Answer Points

(a)

Examples would be use of database management systems, web technology, object oriented technology, multimedia etc. Database management technology ensures that data is kept in one place, it is secure and multimedia is the combination of media other than text which is the normal medium for processing information and includes speech, sound, pictures, video clips. Object oriented technology enables the use of objects that can be defined by encapsulating data definitions as well as processing methods and which promote reusability. Trading, advertising and communicating over the Internet would obtain competitive advantage. Other aspects may be described such as use of technology within the hotel security systems and business, e.g. electronic key cards, surveillance cameras, availability of on-line facilities in each room etc.

(b)

(i) 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

(ii) 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.

(c)

(i) A systems analyst is responsible for the analysis, design, development, implementation and maintenance of an automated system. He/she will use methods, tools and techniques enabling the production of a professional computerised system.

(ii) A network administrator is responsible for the technical aspects of the network, troubleshooting, adding/maintaining users, security, issuing of usernames and passwords etc.

(iii) A web designer will use object oriented technology to design and implement web-based systems enabling on-line use by users/customers etc. Security issues will also need to be taken into consideration.

SECTION B

General Comment:

A number of questions in this section asked for examples, and a number of candidates seemed unable or unwilling to do so.

For example, those candidates that answered question 7 and 8 who did not provide examples missed out on 7 marks out of the 60 that is available for this section (i.e. immediately reduce the potential marks available by 10%)

Question 5

Testing is often seen as the last stage of any project. Discuss where else within a typical project lifecycle, testing could occur. **(12 marks)**

Answer Points

Poorly answered question, which mainly was a note dump on black box, white box, unit testing etc.

Where an answer was confined to a note dump the mark awarded was in the 4 to 6 range.

Testing is not just about the code, but other aspects of the project can be tested.

For example,

- the user interface can be tested via prototyping or storyboarding
- DFDs and ERDs can be validated and tested by the support documentation
- The system needs to be performance tested, stressed test once the application goes live
- Etc.

It was expected that a discussion about testing various aspects of the documentation and stages of the project could and should occur.

Question 6

a) Within a multi-national company, identify four key departments which need to exist. **(4 marks)**

b) Give examples of the type of information that would flow between these departments. **(8 marks)**

Answer Points

The answers to part a) were generally very good, showing typical functions / departments of an organisation like sales, HR, marketing, production etc.

Part b) tending to be internal processes of those departments rather than the flows of information.

For examples, pre-sales, sales, production, marketing.

Pre-Sales will provide sales with names of potential customers / contacts (leads)

Sales will provide production with a report of products to be build

Etc.

Question 7

a) Define what is meant by the following terms, and then using examples for a published book table provide an example for each.

- i) Primary Key
- ii) Foreign Key
- iii) Composite Key
- iv) Candidate Key

4 times 2 marks (1 for definition, 1 for example)

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

Answer Points

a)

A number of candidates failed to provide examples, or stated single columns without a responsible explanation.

For example, answer i) isbn
ii) isbn

Some marks were awarded for i) because ISBN is a unique reference for a book, but it would have been better to show the entire / part table and the table name. No marks were awarded for ii) as it was not clear as to why this was a foreign key.

- 1) a column / attribute or a combination of which uniquely identifies each row / record in a table
- 2) a column / attribute in another table which is used to enforce integrity of data
- 3) a combination of columns / attributes which provide a key to each row in a table
- 4) an alternative key, which could be used as a primary or foreign key

b)

A poorly answered section.

A null is an attribute which has no value, or where a value is not appropriate.

For example, using the test data provided by Oracle (emp, dept), a null is used in the commission column for all employees who are not salesman.

This has the advantages of showing that clerks do not get any commission; a zero would indicate that the clerk has the potential of commission but has reached the level of no commission. A null in that column helps to reflect the situation.

One major disadvantage of nulls is that you cannot do any calculation with them, and therefore have to pre-process columns to replace nulls with a substitute value (the nvl function in Oracle for example).

Another advantage of using the "not null" feature, enforcing that a value is inserted.

Question 8

Discuss what is meant by the following methodology related terms. For each methodology state a type of project that is suitable for that methodology, and outline the methodology.

- a) SSADM
- b) Waterfall
- c) UML

(3 times 4 marks)

Answer Points

Part a) and b) was reasonable well answered but a number of candidates failed to suggest a suitable type of project, which reduced the potential marks available by 25%.

UML was the weakest answered of the three and perhaps needs a greater emphasis in the course.

Question 9

Prototyping is often seen as an effective fact finding technique.

- a) Name and describe one prototyping technique. **(4 marks)**
- b) State 4 negative aspects of using prototyping as a fact finding technique. **(4 marks)**
- c) State 4 positive aspects of using prototyping as a fact finding technique. **(4 marks)**

Answer Points

Some marks were deducted were the answers of to b) stated "increased costs" and for c) stated "decreased costs". Both cannot be correct.

Mark were not awarded or half marks given when similar answers to given within a section. For example, reduce in development times and development costs are similar.

In general a well answered question, with the weakest section being the negative aspects of fact finding (function creep, requires skills develops, requires user involvement, maybe a reduction in paperwork)

Question 10

During every phase of a project, metrics should be gathered to assist in the planning of a new or the next project.

Comment on what data you would gather to assist with the following areas:

- a) Error rate
- b) Productivity
- c) Quality

(3 times 4 marks)

Answer Points

Expected style of answer for section a) was

Number of errors found i) before given to the customer
ii) after given to the customer
iii) total number of errors found

Type of errors found
Stage at which the errors were found
Number of lines of code or functions

These stats will provide metrics in terms of

Errors per xxx lines of code / per function
Testing error rate = number of errors found in live system / total errors found

b)

Productivity

Number of developers etc
Total person days spent on project
Number of lines of code etc
Cost of the project

This leads to the ability to state

Lines of code per day
Lines of code per developer
Cost per day etc.

c)

Quality

Linked to error rate, so some overlap.

But also could include customer satisfaction ratings

Perhaps would focus more on post implementation metrics.

Question 11

a) Black hat and white hat hackers are a potential risk to any company. Outline the differences between white hat and black hat hackers. **(3 marks)**

b) The use of SQL Injection is becoming an increasing threat to web sites, state what SQL Injection is. **(3 marks)**

c) When developing a web site, what design features would you implement to improve the security of that web site? **(6 marks)**

Answer Points

a)

This section was poorly answered, it might be worth a review of the following lecture:

[www.rit.edu/~msc6318/White Hat vs Black Hat.ppt](http://www.rit.edu/~msc6318/White%20Hat%20vs%20Black%20Hat.ppt)

b)

An attack technique where an attacker tries to make an application execute unauthorised (or unintended) SQL code, by using weak SQL statement. For example,

Select * from users where password = "password" or 1=1

The second part of the or will always be true, so even if the password is incorrect the statement will still return results.

c)

Reasonably attempted answer,

Use of userids and passwords

Use of audit logs

Use of IP filters

Good design principles

Firewalls

etc

Question 12

Discuss the types of media that could be used to present information on a web site.

Your discussion should include comments on the advantages and disadvantages of each type of media. **(12 marks)**

Answer Points

Some candidates seemed to confuse media with news, paper, TV and radio.

The answer was expected to mention text, video, graphics, sound, animation and the positives and negatives of using them