THE BCS PROFESSIONAL EXAMINATION
Certificate

April 2005

EXAMINERS' REPORT

Information Systems

General

There has been a slight improvement in the quality of candidates, but emphasis should be made advising candidates to read and understand the rubric.

Question 1

1. A database has to be constructed for a new in-patient system in a hospital. Each ward in the hospital has its own name. The number of beds in each ward is also recorded. Each ward has a fixed number of nurses. Each nurse only works in one ward. Patient details are recorded when they arrive and this includes name, address, telephone number, date of birth, doctor's name and marital status. When admitted to the ward, each patient is assigned a consultant who is responsible for the treatment of his/her patients. Consultants are specialists in one area. The patient's temperature, blood pressure and weight are recorded.

   a) Construct a logical data model (entity relationship model) for the above case study. Identify the relationships between each entity and show how you resolve any many to many relationships. **(10 marks)**

   b) Construct an object model for the above case study. Include appropriate methods for each object.
   (10 marks)

   c) Design a set of input screens which will:
   i) record the patient details
   ii) allocate a consultant
   iii) assign a nurse to a ward **(10 marks)**

Answer Pointers

Ward, bed, patient, nurse, consultant and the relationships between them should be identified. There are a couple of many to many relationships e.g. patient allocated to bed and consultant assigned to patient.

The objects will be similar to the entities. The object model should contain the attributes and methods applicable to each class. Methods should include allocation of nurse to a ward, allocation of a patient to a bed, assessment of patient's current details, assignment of a consultant.
Clarity of screens with effective functionality and consistency will gain the marks. Description of each field whether entered or displayed is useful. Each screen should include the actions, which can be taken on completion of the screen, e.g. accept, cancel, help, exit etc

Examiner's Comments

There is a noticeable improvement in the attempts on this question, although this was not the most popular question. Candidates seem to be able to recognise traditional modelling techniques such as entity relationship models, but are still unsure about object oriented modelling. They also managed to produce reasonable screen layouts, many of which were neat and workable.

Question 2

2. There are several analysis and design methods and techniques used in the development of information systems.

   a) Explain what is meant by prototyping giving examples of THREE different approaches. **(10 marks)**

   b) Define what is meant by a hard and a soft system methodology, giving examples of each. **(5 marks)**

   c) Briefly describe the phases and techniques used in a structured methodology with which you are familiar.
   (15 marks)

Answer Pointers

Prototyping is a method of producing application software with the involvement of the users throughout the project. There are several types e.g. dummy, spiral, evolutionary, partial, staged, phased etc. Commercial methods use a RAD/JAD approach such as DSDM. The addition of a diagram is useful, egg depicting the evolutionary and iterative process between defining the prototype, developing it, evaluating it

A hard methodology such as SSADM deals with the facts, the processes, and the detail whereas soft systems are not only concerned with these but concentrate on the human and sociological issues an example would be ETHICS, devised by Edith Mumford. Mixed methods such as Avison combine the best of both.

Typical example would be SSADM, ranging from feasibility (partially outside true SSADM), requirement analysis, logical and physical design before implementation, testing, review and maintenance. Techniques - data flow diagrams, data modelling, entity life histories, normalisation etc.

Examiner's Comments

This was a popular question and answered well, particularly part i) and iii). Very few candidates understood the terms hard and soft methodology, although it is part of the syllabus. They also seem to have to taken into consideration the number of marks allocated to each part of the question and reduced the amount of detail provided. Once again, the system development life and waterfall cycle were described as a structured method, which are not methods. Only one candidate described a different method to SSADM, this was YOURDON, which is perfectly acceptable.

Question 3

3. *a)* All types of organisations need to store their information for day to day and periodic processing, statistical analysis, historical analysis and in some case legal requirements.

   i) Describe the main features of a database management system. **(8 marks)**

   ii) Briefly discuss the main differences between the traditional database architectures - hierarchical, network, relational and object oriented database management systems. Give examples of each showing a typical physical implementation. **(12 marks)**

   b) The following is a set of data items describing projects and the employees linked to these projects:

   Project code
   Project type
   Project description
   Employee No
   Name
   Grade
   Salary scale
   Date employee joined project
   Time employee allocated to project

Each project may have one or more employees allocated to it. Each person is on a single job grade. One salary scale may apply to a number of grades but a given grade will only have one salary scale.

Produce a set of 3NF (third normal form) relations from these data items. You should show each stage i.e. 1NF, 2NF and 3NF and explain the rules for each stage. **(10 marks)**

Answer Pointers

Database management systems allow the description, storage, access, retrieval, control, security, and integrity of an organisation's data.

Hierarchical - parent/child tree structure limited in that a child record may only have one parent. Indexes can overcome this problem. Various storage and access methods can assist with the design. Although it is outdated it is till in use in old legacy systems. e.g. IMS
Network - parent/child structure more complex than above allowing a child record to have more than one parent. This is done using a set mechanism including indexes for easy access. Difficult to design but very efficient. e.g. IDMS

Relational - based on Codd's rules and relational calculus. Simple table, column, row structure at use of primary and foreign keys within relationships. Indexing improved access in later versions. e.g. Oracle, Access Most common currently.

Object oriented - based on object-oriented technology combining attributes and methods using the techniques of polymorphism, re-usability, inheritance etc. Not used much in commercial environment as an actual OO designed, it is more often an adaptation of a relation database e.g. Oracle.

1NF Remove repeating items
Project code, project type, project description
Project code, employee no, name, grade, salary scale, date joined project, time allocated to project

2NF Remove partial key dependencies
Project code etc as 1NF
Project code, employee no, date joined project, time allocated to project
Employee no, name, grade, salary scale

3NF Remove transitive dependencies
Relation Project - Project code as 1NF
Relation Allocation - Project code, employee as 2 NF
Relation Employee - Employee no, name, grade
Relation Grade - Grade, salary scale

Examiner's Comments

Many candidates attempted this question, but the results were a bit disappointing, particularly as candidates could not explain the differing architectures. However, the attempts at normalisation and the description of the process were better than previous, there seems to be a bit more understanding of the technique.

Question 4

4. *a)* You have been asked to supervise the installation of a new financial package, which has been developed by your staff. Draft a memo to your Financial Director explaining to him:
   i) How you have ensured a good quality system,
   ii) Measures you have taken to deal with security, legal and ethical issues. **(14 marks)**

   b) There are several methods you could use to implement/install this system depending on the current situation. Describe THREE methods you could use, giving examples of which you would use in a given situation:
   i) The current system is manual.
   ii) The current system is a very large complex system.
   iii) The system will be implemented in many different locations. **(6 marks)**

   c) As well as taking on existing data, write a report containing details of other issues, which you must consider to ensure a satisfactory implementation. **(10 marks)**

Answer Pointers

Quality assurance would be obtained by using a good project management system, feedback, walkthroughs, test plans, use of company standards in terms of methodologies, naming conventions etc

Security issues would include usernames, passwords, roles, access to data using these, control of the functions, virus checking etc. Legal issues would include privacy of information, data protection, computer misuse etc. Ethical issues would include professionalism, membership of BCS, non-disclosure of sensitive information etc.

Three typical methods that could be used for each scenario are i) direct, ii) parallel and iii) pilot or staged or phased implementation.
Satisfactory implementation needs to include training, installation of hardware, software, new networks, manual procedures, input/output procedures etc

Examiner's Comments

This was the least popular question. The inclusion of the words quality and security enabled candidates to describe the ways in which developed software can be protected. There was considerable overlap in the answers to part a) and c). There is a difference in measures taken during development and the actual implementation of a system. Most candidates were able to identify three implementation methods and gave good reasons for the choice of method to be used in each of the given situations.

Question 5

5. Microsoft Access and Oracle are considered to be Relational Database Management Systems. Discuss how these, or similar RDBMSs, help to enforce good database design.

(6 marks for areas, 6 marks for discussion)

Answer Pointers

Answer could have included mention of Primary Key, Foreign Key, Triggers / DB code, domain constraints, the use of nulls, combo / check boxes etc.

A short explanation of why they these features help design was required.

Examiner's Comments

Reasonably well-answered question, lots focused on primary and foreign key but still addressed a number of key issues.

A number of answers focused on what Oracle and Access are, and discussed tables, GUIs etc.

Question 6

6. Testing is often seen as the least important aspect of any project.

a) Comment on whether you agree or disagree with this statement (and why).   **(2 marks)**

b) Discuss what testing strategies you would implement to ensure the quality of an application developed as an Internet Shopping Site (similar in style to the Amazon group of on-line shops).   **(10 marks)**

Answer Pointers

This was an open ended and candidates were expected to argue their views.

The answer should be structured and with some reference to front end testing.

Items mentioned could include

Black box
White box
Functional / Module / Unit
Integration
Etc.

Examiner's Comments

Again another well-answered question.

Both positive and negative answers to part a), were accepted as long as the candidate provided a reasonable answer.

Lots of students missed the need to focus on a multi-national internet company and the need to use testing of the interface (cultural, use of words, context etc). Functional testing was reasonably well addressed.

Question 7

7. CASE tools are often seen as a means of automating functions within projects. Discuss the areas in which CASE tools can assist in producing documentation. **(12 marks)**

Answer Pointers

A range of topics were expected and not just concerned with coding.

Documentation produced would relate to:

Code (schemas, variable list etc.)
Data (schema, scripts etc.)
Quality related
Default templates
Etc.

Examiner's Comments
CASE tools seem to cause lots of problems within this paper.

There appears to be a range of definition available to the students, but this is an information systems paper and therefore the definition of CASE should focus on this domain.

Lots of students deem that VB or similar development environments are case tools. They are, but this needs to be used in conjunction with work benches, code generators, analytic tools etc.

Answers vary, depending on the students' definition of CASE.

Question 8
8. It is 3:30 p.m. on a Friday afternoon and the database server has just crashed. Outline the backup strategy that needs to be in place to ensure the recovery of all data that would have been processed (including all transaction that would have successfully completed by 3:29 p.m.). **(12 marks)**

Answer Pointers
Open ended answer but must include:

   a) full backups
   b) incremental backups
   c) transaction logging
   d) system files backup
   e) db files backup (not data)
   f) db bins etc.

Examiner's Comments
Still getting grandfather, father, son style answers, which only address day-to-day backups.

Marks were awarded for defining what hardware strategies could be used but the focus should have been on transaction logging.

Question 9

9. Define what is meant by the following terms and how they are used.
  a) ODBC
  b) ASP
  c) HTML
  d) XML   **(4 x 3 marks)**

Answer Pointers

For each,

One mark was awarded for the correct expansion of each term and two marks were awarded for the relevant use of the technology.

Examiner's Comments

Well answered question from the defining what the terms meant.

XML was poorly addressed from the perspective of use of the technology.

Question 10

10. Outline the typical stages of a project and what documentation and deliverables you would expect to be produced at each stage.   **(1/2 mark for each stage, to a maximum of 3 marks)**
                                                 (9 marks for discussion of documentation and deliverables)

Answer Pointers

Stages of a project would include
  Feasibility
  Requirements
  Investigation
  Analysis
  Design
  Construction

  or similar.

Defining the stages alone was not sufficient. The question asked for the documentation and deliverables and this element gained the majority of marks.

Examiner's Comments
A well answered question, but it is clear that a number of PRINCE 2 trained students answered this question and focused on the stages of a PRINCE project.

A number of candidates repeated statements within their answer which does not gain any extra marks and just wastes candidate's time.

Question 11

11. The requirements of Special Needs users (blind, partially-sighted, deaf etc.) may not be always included in the design of a multimedia web site. Comment on what features can be incorporated into the web site to assist this group of users. **(12 marks)**

Answer Pointers

An open ended question which allowed the candidate to express their own views. It was anticipated that the student would answer with respect to complementary style of design.

- Where multimedia is used alternatives are also available
    - Text for deaf
    - Speech for blind
    - etc
- Style and range of language needs to map to all users
- Navigation style
- Help
- Contact forms
- Conformance to "bobbie" and w3c standards for example

Looking for a discussion on what features can be changed / added / taken into account

Examiner's Comments

For the most part a poorly-answered question, students tended to deal with each of the three disabilities listed rather than the features that need to be included.

Answered tended to be:

Blind – use sound (both as input and output)
Partial sighted – Same as blind
Deaf – Text only.

A lot of the answers were very narrow in focus and could have covered more areas.

Question 12

12. You have just implemented a new database management system to replace a text based application. Discuss the area of security with respect to the application and database, and what areas of concern there may be.

(It is expected that you will discuss a range of areas not simply focusing on users). **(12 marks)**

Answer Pointers

An open ended question.

Expected candidates to mention user id and password but needed to consider other ideas such as
Audit trails
Users Roles
Read only data
Backups
UPS
Etc.

Examiner's Comments

A poorly answered question, missing the security angle. Candidates appeared to ignore the statement in brackets.