

THE BCS PROFESSIONAL EXAMINATION

BCS Level 4 Certificate in IT

September 2017

EXAMINERS' REPORT

Information Systems

General comments on candidates' performance

The evidence shows that answers were almost equally split over all four questions.

Please note that the answer pointers contained in this report are examples only. Full marks were given for alternative valid answers.

SECTION A

(Candidates were required to answer **TWO** out of the four questions set)

A1

A team of doctors are opening a new clinic. They require a system to deal with registering patients, arranging and cancelling appointments for existing and new patients, and recording the discussions. Patient details will be recorded, and each patient is assigned a unique clinic number. Patients contact the receptionist to arrange or cancel an appointment. When the patient attends the appointment, they enter their name and date of birth on a check-in screen. Confirmation will be displayed and the time, room number and clinic number for the appointment displayed. After the appointment the doctor enters the details of the consultation and prescriptions provided.

a) Using the above description

- i) Draw a Context Diagram **(4 marks)**
- ii) Draw a High Level Dataflow Diagram **(10 marks)**

b) There are several methods for analysing systems. Describe the stages in the following including techniques:

- i) A typical waterfall method **(10 marks)**
- ii) A typical iterative method **(6 marks)**

Examiner's comment

This question was attempted by half of the candidates with a pass rate of 53%. The standard of the diagrams has improved, with many identifying the main components of a diagram, namely external entities, data stores and processes before attempting a diagram. The evidence shows that the stages of waterfall methods were identified by most; however, fewer could describe an iterative approach. An agile approach is increasing in understanding.

Indicative Answer Pointers

(ai) The diagram should include external entities doctor and patient and indicate the major flows.

(aii) The diagram should expand on the context diagram and identify the processes which are register new patient, book or cancel appointment, check in, record consultation. Data stores are patient, appointment, doctor, and consultation/prescription.

(bi) A typical waterfall method such as software life cycle development and partly SSADM involves the stages of feasibility, analysis, design, development, testing and implementation. Techniques should include dataflow diagrams, entity relationship models, entity life histories etc.

(bii) A typical iterative or incremental method would be prototyping or RAD involving analysis and production of a prototype which would be introduced to the users, using comments to re-design and re-introduced in a cyclic manner until the users are satisfied. Depending on the type of method used the system would then be developed to be more robust. An Agile approach is also acceptable.

A2

a) Describe what should be included in a feasibility report. **(10 marks)**

b) Discuss how you would manage a large information systems project which is estimated to take at least one year. **(12 marks)**

c) Briefly explain the following elements in object-oriented analysis and design:

i) Use Case and Sequence diagrams. **(4 marks)**

ii) Object Classes and Inheritance, including an example. **(4 marks)**

Examiner's comment

46% of candidates attempted this question with a 50% pass rate. There is evidence that there was little mention of problems, alternative solutions and benefits mentioned within the feasibility report. Candidates repeated the software life cycle, which although relevant did not include how the project could be managed. Few candidates could describe OO techniques.

Indicative Answer Pointers

(a) A feasibility report should contain an overview of the requirements and existing problems, cost and benefit analysis, time scale and budgets, technical hardware and software requirements, staffing resources, legal issues, alternative solutions, operational considerations and project management details. The use of planning tools and statistical charts, SWOT analysis could be mentioned.

(b) The management of a large project requires meticulous planning. The manager needs to be aware of many aspects such as time scales, preparing plans using sophisticated software, staffing resources, allocation of teams, identifying tasks and subtasks within the development, providing testing mechanisms, technical and budget considerations and ways of measuring these, feedback mechanisms, contingency plans, risk assessments, progress meetings and evaluation of the projects success. Modern methods include an Agile approach such as SCRUM enabling the use of sprint planning and an iterative development.

- (ci) Use case diagrams provide an overview of user requirements by showing the association or actions between the actors within a system. Sequence diagrams model the flow or sequence of these actions to complement the use case diagrams.
- (ii) A class describes the name, attributes and methods of objects within a system. Inheritance is the term for sharing common characteristics within an object such as sub classes or super classes. Examples are expected.

A3

a) The following is an example of a form used to manually record appointments.

| Appointment Date | Appointment Time | Doctor No | Doctor Name | Room No | Patient Clinic No | Patient Name |
|------------------|------------------|-----------|-------------|---------|-------------------|--------------|
| 01/08/16 | 10.00 | D1 | Dr Jones | 1 | 123 | Mrs Brown |
| | 10.00 | D2 | Dr Chin | 2 | 234 | Mr Smith |
| | 10.30 | D1 | Dr Jones | 1 | 345 | Miss Ball |
| 02/08/16 | 10.00 | D1 | Dr Jones | 1 | 234 | Mr Smith |
| | 10.00 | D3 | Dr Peters | 3 | 123 | Mrs Brown |
| | 10.30 | D2 | Dr Chin | 2 | 345 | Miss Ball |

- i) Describe the three stages of normalisation to provide 3NF (third normal form) **(6 marks)**
- ii) Identify the normalised relations in the form in part a) indicating primary and foreign keys **(6 marks)**
- iii) Draw an entity relationship diagram using these relations **(4 marks)**
- b) Briefly discuss the advantages of using a database management system instead of separate files. **(2 marks)**
- c) What are the main functions of a modern database management system? **(12 marks)**

Examiner's comment

This was the least popular question with the lowest pass rate of 46%. The evidence shows that most candidates could describe the three stages of normalisation. Identifying the relations was not so successful, many candidates did not include room number in the doctor relation, and the form implied that the doctor was always in the same room. Answers to part c, which was worth 12 marks, were quite brief. Candidates are reminded to look at the mark allocation for each question.

Indicative Answer Pointers

(ai) the first stage (1NF) necessitates the removal of repeating items into separate relations using primary and foreign keys. 2NF removes partial dependencies, relations which only depend on part of a key. These are removed into new relations. 3NF involves ensuring that all attributes rely on the key and only that key, if not then they are transitive and removed into new relations

(aii) Relations are doctor (doctor no (PK), doctor name, room no), patient (patient no (PK), patient name), appointment ((appointment date+appointment time, doctor no(FK), patient no(FK))PK).

(aiii) The diagram should identify the three relations doctor, patient and appointment and their relationships.

(b) The same data can be included in different files causing problems with duplication of effort, possibility of inconsistencies when updating and more storage and access problems.

(c) A database management system is sophisticated software provided by commercial companies. It is used to define, store, present, manipulate, query and maintain a company's data. It also provides reporting and development functions and efficiency. Security issues such as user control with usernames, passwords, user views, user roles etc are provided. Concurrency control prevents anomalies. Backup and recovery mechanisms ensure integrity in event of an error.

A4

a) When planning the final installation of a system, discuss how you would organise training, system testing and conversion of existing data. **(10 marks)**

b) Briefly discuss the advantages and disadvantages of choosing packaged software rather than developing customised software. **(8 marks)**

c) Discuss measures taken to ensure as high a level of security as possible for the following:

i) Providing on-line ordering and payment systems over the internet. **(6 marks)**

ii) Protecting computers, terminals and networks in a company. **(6 marks)**

Examiner's comment

This was the most popular question with a good pass rate of 74%. Part a) was well answered, although the evidence shows that there was little mention of data conversion. Customised systems are designed and developed by professionals (either internal or external) exclusively and would be tested and delivered according to a company's stringent requirements – this appeared to be misunderstood.

Indicative Answer Pointers

(a) All staff from management to operational users need to be trained and user manuals provided. Sessions should be set up so that the minimum of interruption is made to the normal duties. Timing is essential. Differing methods can be used from formal presentations and practical demonstrations to on hand practice for the users. Staff need to know how to recover from errors, when to back-up etc. Testing should have taken place throughout the development. System testing should include the production of test plans, metrics, performance, quality, integrity, control and security. Once the system is ready for conversion existing required data needs to be transferred from the old system to the new. This could be manual entry but that would be time consuming and prone to error. More likely special programs could be developed to transfer the data automatically. It would also depend on the implementation method chosen. Documentation should be provided to support the installation process.

(b) Packaged software has the advantage of being developed by professional developers. It would be well tested and used by a large variety of users thus reducing errors. The disadvantage would be that it is costly; companies have to pay maintenance costs which could spiral out of control. It may not provide all the required facilities which can be provided when developed specifically. It may not be easy to adapt current business practices. Security, control and performance issues may not be as controllable. Customised software is developed exclusively for a company, it can be costly but the system is designed according to the exact requirements and would follow development methods, management and control techniques.

(ci) Simple measures such as password protection can be enhanced by ensuring passwords contain a variety of letters, use of uppercase and lowercase, numbers and symbols. Frequent change of passwords can be enforced despite this causing frustration to customers. Feedback mechanisms sent to customers such as generating a code which can be sent to mobile phones for confirmation can be introduced. Payment protection software and gateways can be provided together with security protocols e.g. HTTPS.

(cii) Network protectors and protocols, virus and anti-hacking software, firewalls, locks, fire alarms, smoke detectors, reducing access to computer/network rooms, physical recognition etc.

SECTION B

B5

Define what is meant by the following cloud computing terms and what the potential benefits for a small computing company are:

- a) Infrastructure as a service
- b) Platform as a service
- c) Software as a service

(3 * 4 marks)

Indicative Answer Pointers

One mark for each relevant point

- a) Provides virtualisation for a business.
A third party provider host virtually all the resources required by a company – that is software, hardware, server's storage and other elements of infrastructure.
The third party will handle all maintenance, back up recovery etc.
Effectively a small company can outsource its entire computing provision to a cloud provider.
Some discussion on advantages about not needing expensive people, machines etc or discussion about over reliance on third party etc.
- b) Provides an environment that allows developers to build applications and services.
Might be a point and click development environment where key components have already been built (almost off the shelf).
These services are managed by the cloud provider.
Usually a subscription service.
Advantage – company does not have to purchase an infrastructure, using existing pre-build apps should increase security.
Disadvantages – reliance on third party code, reliance on cloud provider etc.
- c) Removes the need for an internal data centre.
A third party hosts the data and performs all the associated backup and recovery.
May be a pay as you go style contract.

Allows the ability to upscale or downscale depending on requirements.
Does not required expensive on expensive highly trained individuals.
But does rely on the third party provider.

Examiner's comment

The evidence shows that some candidates knew these terms and applied their knowledge. However, some candidates demonstrated little knowledge about cloud but tried to apply their knowledge and this results in some marks being awarded.

Candidates would benefit from revising this area as SMEs will potentially use cloud services to reduce the costs of their infrastructure IS so an understanding of this area would be helpful.

B6

Discuss software solutions that can be implemented to ensure that a blind person can successfully use a web page.

[Focus only on software – there are no marks for discussing hardware related solutions]
(12 marks)

Indicative Answer Pointers

1 or 2 marks were awarded for each relevant point.

This question is about providing alternative means of providing information.

The top left should be a textual description of site with contact details. All images should have alt tags or a textual description of what the image is. The language should be simple and not use slang or a large number of TLAs. Perhaps there is a text only version of the page.

Feedback needs to be given. The page needs to be consistent within the site and consistent with accepted internet norms

A third party tool has been used to check the page for consistency issues with respect to legislation.

Training should be taken / given to make sure that developers are fully aware of any issues / legislation.

Examiner's comment

The evidence shows that the majority of answers provided by candidates were to use voice recognition and screen readers along with AI or natural language processing. Three or four marks were awarded for those answers.

A visually impaired person does not have to “speak” to the computer, mobile phones etc. They can use a normal interface and the machine reads the screen back to them. They can use the textual version of Facebook, for example, not the version with loads of images. Facebook have developed alternative means of using their web site therefore discussion of using touch screen, braille keyboards, etc which were not necessary.

The question is about having alternative designs of web site that assist those who cannot access them using traditional means.

B7

Discuss, using examples, the advantages and disadvantages of closed and open questions in a questionnaire.

(2 * 6 marks)

Indicative Answer Pointers

Closed question.

Multiple choice or a selection from a list
Maybe a scale from 1 to 10 (i.e. comment on how good / bad this product is)
Restricts the user's choice
Very good for mass audiences
Can be machine marked
Very poor for allowing the user to add value to the answers
Very efficient

Open ended questions

The user is free to express an opinion
Hard to machine process as the user can answer how they wish
Very good for getting personal opinion or where the requirements may be unclear
Usually structured, but when it comes to face to face interviews usual to be prepared and have a structure
Very good for small groups
Time consuming

Examiner's comment

The evidence shows many responses about how the style the person used to answer the questionnaire could tell whether they were lying or not. There is no real evidence to support this theory.

Where any answer was a list of notes on questionnaires (no reference to open or closed) limited marks were awarded as limited knowledge was shown.

The biggest weakest in the answers was a lack of examples, which were required.

B8

With reference to an example and the type of information shown, describe:

- a) Pie Charts
- b) Scatter Charts
- c) Bar Charts

(3 * 4 marks)

Indicative Answer Pointers

Three times 2 marks for a reasonable attempt at drawing each chart with a decent example
Three times 2 marks for a discussion on why you would use that graph

Pie Charts

Used to display percentages as slices of a pie
The arc length is proportional to the amount represented
Very good for representing fractions of the whole (i.e. what is the breakdown on the monthly shopping bill)
Soon can become unreadable if there is a reasonable amount of data

Scatter charts

Can suggest correlations between variables
Able to show non-linear relationships between variables
Needs enough data to make the correlation
May also require a domain expert to interpret the results

Bar Charts

A graph that represents grouped data
Maybe grouped or stacked to show more data
Usually scaled and can be in any order
Can be used to show data over time

Examiner's comment

The evidence shows that there appeared to be a lack of knowledge about scatter charts.
Most answers showed a line graph.

Another area of weakness was lack of examples to support answers.

B9

Discuss methods of ensuring that a data centre is physically secure.

(12 marks)

Indicative Answer Pointers

Opened end question
1 or 2 marks for each reasonable point

This is a question about physical not logical security, therefore there are no marks for reference to logical security

Examiner's comment

You do not tell anyone where your data centre is – no employee who has access to the data in the data centre need direct access physical access

Keep access to the data centre to a minimum – cleaners, operations staff etc.

Have security on the front / bad doors.

Ensure there are CCTV camera

Ensure all employees are recognised and wear badges.

Ensure backup power generators are maintained and have the required amount of fuel to function for the agreed time.

Any reasonable and relevant comment will be awarded marks

Examiner's comment

The evidence shows that many answers were extremely short and lacked depth of knowledge.

A significant portion of responses demonstrated a lack of understanding of what a data centre is, and assumptions were made that it was a server.

Marks were awarded for passwords, encryption etc but often answers did not say why encrypt and how it helps with security.

Likewise, other answers stated having a backup generator but don't explain why and how long it lasts for.

The answer to this type of question needs depth and not a list of information.

B10

With reference to the type of decisions, define

- a) Operational Management
- b) Strategic Management
- c) Tactical Management

(3 * 4 marks)

Indicative Answer Pointers

- a) These are day to day decisions
 - May be done by junior management
 - Usually simple
 - Routine

Maybe what stock do we need in the next week, or do we have enough staff to cover this week's rota
Normally precise
Uses internal data mainly

- b) These are long term decisions
 - Complex
 - None routine
 - Policy decisions
 - Forecasts – estimates
 - May use external data to make decisions
- c) These are medium term decisions
 - Less complex
 - May be in the realms of middle management
 - May inform policy

Examiner's comment

The question required the candidate to show that they understand the area being discussed and not a list of facts.

This area in order in Strategic, Tactical and Operational. Or Operational, Tactical and Strategic.

The evidence shows that many candidates listed facts and did not provide a structured answer. Candidates would benefit from reading the question thoroughly before answering.

Few candidates addressed the type of decision. Some candidates did for operational - staff rotas, staff holidays, stock requirements for next week etc.

B11

Define what is meant by the following terms

- a) Multimedia
- b) Hypertext
- c) Metadata
- d) XML

(4 * 3 marks)

Indicative Answer Pointers

One mark for a reasonable point made, but not restricted to the list below:

- a) Use of different types of media to convey a message
 - Typically, a combination of text, audio, images and moving images (only 1 mark for this statement)
 - Can be used to convey a message to different types of users or users of different ability
 - Maybe linear or non-linear
 - Can be interactive

- b) Restricted to text
Text may have embedded links (hyperlinks)
Enables user to use in either a linear or non-linear manner
Underlying concept of Worldwide Web
- c) Data / information that provides data about data
Example is alt tag comments on a web page describing an image
Is used to provide additional information – for example a DTD with an XML file
Can be used as a control file for the import of data into a database
- d) Use to exchange data in text format
Consists of data within tags that are used to describe the data
Does not have to conform to the relational model for data
Can be free form in structure
May have a document type definition associated with it, which will provide information about the structure of the XML file

Examiner's comment

Answers that had depth and structure were awarded high marks.

The evidence shows that answers discussing hypertext were weak. Candidates demonstrated a confusion with HTML and hypertext. Answers needed to state that it is useful for non linear applications and learning.

Candidates felt that metadata and XML was a programming language, however it is not and you cannot build a web site with it.

B12

What is meant by the following software maintenance related terms?

- a) Legacy System
- b) Software Bug
- c) Version Control
- d) Software Patch

(4 * 3 marks)

Indicative Answer Pointers

One mark for each relevant point

a)

A legacy system is a computer system that a company no longer wishes to support. It still works but no bugs or updates will be issued.
It is possible that a third party may maintain the software, but it has deemed to have reached the end of its life.

b)

A bug is an error in the software.

It could be terminal (cause the application etc to fail) or may cause an error too to occur in an action (for example an error in a calculation).

Normally a compiler or development environment will remove syntax errors.

A bug may also be implemented due to a faulty design.

c)

Version control is related to documentation and software.

A library is established with previous versions.

Use to ensure that different version of documents and software can be maintained.

d)

A patch is used to fix an error in a piece of software.

Patch Tuesday is a traditional day when patches are released.

A reported patch may show a flaw in a piece of software that could be used for an attack.

Patch management is an important part of any company.

Examiner's comment

There is evidence that candidates were confused by the phrase Legacy Systems assuming that legacy was related to legal and answered with respect to legal issues.

Candidates did demonstrate an understanding of Software bug, however version control was mixed with version numbers and many answers were about software and how it is numbered. Very few answers addressed the need to maintain version control of documentation.

Software patch was confused with software bug but there were some answers that showed the difference.