

**BCS THE CHARTERED INSTITUTE FOR IT**  
**BCS HIGHER EDUCATION QUALIFICATIONS**  
**BCS Level 4 Certificate in IT**

**INFORMATION SYSTEMS**

Tuesday 27<sup>th</sup> September 2016 - Afternoon  
Time: TWO hours

Section A and Section B each carry 50% of the marks.  
You are advised to spend about 1 hour on Section A (30 minutes per question)  
and 1 hour on Section B (12 minutes per question).

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

**Answer the Section A questions you attempt in Answer Book A**  
**Answer the Section B questions you attempt in Answer Book B**

Calculators are <b>NOT</b> allowed in this examination.
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**General comments**

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

**SECTION A**

**Answer 2 questions (out of 4). Each question carries 30 marks.**

**A1**

A house cleaning company has been set up to provide cleaners in the local area. They require a system which deals with customers, jobs, staff, allocation of jobs, purchase and provision of cleaning material, paying both staff and suppliers.

- a) What is the purpose of system analysis and what skills are required by a system analyst?(8 marks)
  
- b) Identify the processes, data stores and external entities in the above case study(10 marks)
  
- c) Give THREE reasons why DFDs should be used and give an example from the above case study(12 marks)

### Answer Pointers

- a) Systems analysis is the process of analysing a current system identifying problems and producing and implementing a specification according to requirements. Systems analysts must be methodical, logical, personable, qualified, have management and problem solving skills.
- b) Deal with customers, allocate staff to jobs, providing cleaning materials, purchase cleaning materials, pay staff, pay suppliers. – Processes. Customer, supplier are the external entities. Customer, supplier, staff, job allocation, staff payment, supplier payment – data stores.
- c) A DFD (data flow diagram) is a pictorial representation of data, based on data rather than process, produced level by level with a top down approach, thus decomposing the system into its lowest component process. The diagrams are used in discussion with users. The diagram should be able to show the process, flows and data stores and their interaction with the external entities identified above.

### Examiner's Comments

This was attempted by 50% of the candidates who attained a 57% pass rate. This was mainly due to the candidates being able to demonstrate recognising processes, data stores and external entities, although translating these into a data flow diagram appeared to be a challenge. The evidence shows that there was some confusion over systems analysis and system analysts. Analysis is the process of investigation and an analyst is the person carrying out the investigation.

### A2

- a) Describe the functions of a feasibility study, discussing its place in the System Development Life Cycle (SDLC).  
(10 marks)
- b) Identify FOUR fact finding techniques, giving one different advantage and one different disadvantage of each  
(8 marks)
- c) Briefly describe TWO different approaches to the system development life cycle and techniques used in each  
(12 marks)

### Answer Pointers

- a) A feasibility study is the first phase after the preliminary study, which is used in large projects to identify budgets and resources as costs increase as development progresses, important areas – requirements, problem definition, cost justification, resources, timing, and planning, social and ethical, legal issues.
- b) Questionnaires – large numbers, geographic diversity but are difficult to design and often have poor returns. Interviews, useful for communication and gaining ideas, time consuming and difficult to conduct unless interviewer is experienced and well trained, observation – identify bottlenecks, disruptive and can cause resentment, sampling useful for low level data, potential for missing important but useful or outdated information.

- c) Waterfall, SSADM, OO, Agile, RAD etc two different approaches are expected. The waterfall approach is a traditional staged approach. Technique would be – DFDs, ERM, ELH, normalisation (SSADM), object, class, abstraction, inheritance, persistence, UML, information hiding, encapsulation – OO, JAD, JSP, prototyping techniques, workshops, - RAD/DSDM. Agile – customer centred and an incremental approach to small development modules as change can be expected – SCRUM.

### Examiner's Comments

This was the most popular and successful question attempted by 73% of the cohort with a 70% pass rate. However, there is evidence that some candidates could not differentiate between the word 'approach' and 'techniques' and described two techniques rather than two different ways a system can be developed.

### A3

- a) Write brief notes describing the advantages and drawbacks of each of the following:

- |                               |           |
|-------------------------------|-----------|
| i) Ecommerce                  | (5 marks) |
| ii) Data Warehousing          | (5 marks) |
| iii) Client Server technology | (5 marks) |
| iv) End user computing        | (5 marks) |

- b) Briefly describe the most common features of relational database systems.

(10 marks)

### Answer Pointers

- a i) Ecommerce is the use of the internet for trading and global communication. It is very cost effective in terms of advertising, increased productivity, handling orders, dealing with customers/clients and payments. Drawbacks –security – particularly payment and client details, lack of trust, legal aspects, reliability of the software, delivery problems.
- a ii) A data warehouse is used for storage, access and manipulation of large amount of historical data from old legacy systems which can be filtered, categorised and transformed using OLAP data mining tools giving companies a different corporate view of their activities. Design of the data warehouse is difficult.
- a iii) Client servers consists of 3 elements, a client managed user interface preventing the user from needing to know or control the location of their application, the server which serves clients, optimising processing and performance, the network which facilitates communication. Multiple hardware platforms can be incorporated into organisations' processing needs. Problems - skill shortage, lack of standard and control.
- a iv) Over the years, the role of user has changed from being naive data entry to a more sophisticated environment. Benefits – improved productivity, operational efficiency, informed decision making and increased involvement. Risks lack of management control, distraction
- b) Relational database systems provide support for data and object model definitions, high level access and query languages, transaction management in a multiuser environment, control of access and data ownership, support for validation and consistency checking. This also includes data recovery from system and hardware failures with minimum loss of data, access large volumes of data efficiently and securely. They are based on using relational calculus as a model as proposed by E J Codd, a computer scientist

### Examiner's Comments

This was the least popular question attempted by 32% and with a low pass rate of 35%, even though part a) covered a wide area of computing terms which are required knowledge for systems analysts. There is evidence that candidates appeared to confuse data warehousing with database back up storage rather than the aggregation of historical data. Few candidates could describe client server technology or relational database systems.

### A4

- a) What is HCI and why is it important in application design?  
(4 marks)
- b) What techniques are used for good interface design?  
(8 marks)
- c) Briefly describe the role and responsibilities of a project manager within the development of a computerised system.  
(9 marks)
- d) Briefly discuss why documentation should be produced for a computer system and give examples of THREE different types of documentation explaining the basic content of each.  
(9 marks)

### Answer Pointers

- a) HCI is Human Computer Interface. It is important to provide a simple, easily understood, easy to use, efficient front end to an application hiding the process using GUI or CLI interfaces.
- b) Typical examples of good design are clarity of screen, good use of colours, simplicity, flow from left to right, providing short cuts, consistency, good help facilities, simple error messages and support, navigation aids, the use of drop down lists, check and radio buttons, hints etc
- c) A project manager is responsible for planning, organising, staffing, resources, budgeting, control, feedback, quality assurance, reporting to top management etc. The role is to co-ordinate the development and implementation of a system.
- d) Documentation is important for the continuous maintenance and support of the system. Typically a specification manual would contain the detailed design, code, test plans, implementation of the system, a user manual will contain instructions as to how to use the system providing detailed instructions, how to handle error messages and troubleshooting guidance and a technical manual would contain details of the hardware and software used within the system.

### Examiner's Comments

Although not a popular question, those who attempted it attained a 71% pass rate.

## SECTION B

Answer 5 questions (out of 8). Each question carries 12 marks.

**B5**

a) Define what is meant by the following mathematical terms:

- a) Mean
- b) Mode
- c) Median

(3 x 2 marks)

b) For the following selection of numbers,

1, 1, 1, 1, 2, 2, 3, 3, 4

calculate, showing workings, the

- i) Mean
- ii) Mode
- iii) Median

(3 x 2 marks)

### Answer Pointers

a i)

The average of a set of numbers; that is, the total divided by number of values

a ii)

The most often occurring number; need to have a frequently table, or sorted and highlighted

a iii)

The middle number of the list when sorted; if even number of values, mid value of the middle two numbers

b i)

$$\begin{aligned} &1+1+1+1+2+2+3+3+4 / 9 \\ &= 18 / 9 \\ &= 2 \text{ is the mean} \end{aligned}$$

b ii)

Number	times
1	4
2	2
3	2
4	1

Therefore 1 is the mode

b iii)

Nine numbers, so value in position 5 when sorted is the value 2

### **Examiner's Comments**

A well answered question but this average could have been higher.

There is evidence that a significant portion of candidates wrote answers for the mode and medium correctly but failed to show how that answer had been derived. As requested in the question, candidates need to show their workings.

### **B6**

Discuss with respect to Rapid Application Development the following terms:

- a) Joint Requirements Planning
- b) Time boxing
- c) Joint Application Development

(3 x 4 marks)

### **Answer Pointers**

One mark for any reasonable comment

- a) An initial meeting between all the stakeholders to derive an initial working plan / solution.  
Needs scribes to write down actions  
Needs skilled person to chair the meeting  
Need stakeholders at the meeting who can make decisions
- b) A method of breaking projects down into smaller projects  
Deadlines are set for smaller, deliverable components  
Deadlines are fixed  
Functionality is moveable
- c) Use of CASE tools /prototyping to gain requirements  
Meeting between users and developers  
Can be used to acquire functionality rather than requirements  
Needs appropriately trained / skilled people

### **Examiner's Comments**

Parts a) and c) were confused in many answers.

JRP is an initial meeting with all the major stake holders and people who have the power to make decisions (especially financial ones). People present tend to be board members, project managers, scribes (to record the decisions).

The end product of a JRP may well be the contract for the project.

JAD are development meeting(s) once the project has been the green light. People present are developers, designers and end users.

The end product of a JAD is a design / working prototyping / analytical work etc.

Time boxing was poorly answered. Very few answers highlighted the fact that functionality is not fixed but the time is. In other words, functionality is dropped to ensure that a product is delivered on time.

## B7

Discuss the typical management structure for a computing department within a company.  
(12 marks)

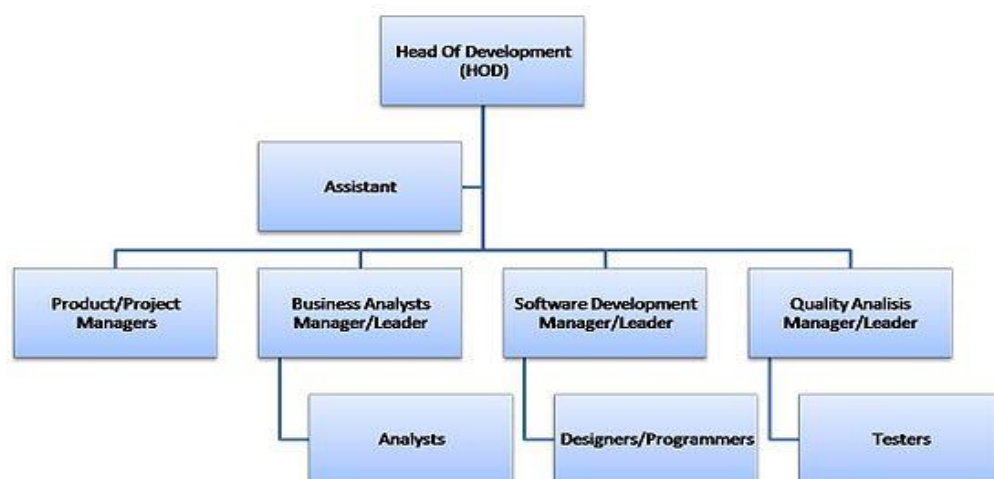
### Answer Pointers

This was an open ended question. The question asked about the computing department and not the company, so excludes CEO, company directors etc.

Job titles could include, but not constrained to

- IT Manager
- Project managers
- Team leaders
- Programmers (senior etc)
- Testers
- Technical support (network, software, hardware , database)

Structure could be similar to



### Examiner's Comments

Candidates struggled with this question. Most answers related to job descriptions rather than the management structure so did not gain high marks.

## B8

Discuss the following terms, giving examples

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

(3 x 4 marks)

### Answer Pointers

A simple question about short term, medium term and long term decision making / data.

The answers needed to make clear that different levels of management need different levels of data

- a) Operational data is the data that is needed for day to day running of an organisation
  - e.g. Balance of stock levels,
  - Number of employees off sick / holiday this week
  - Any data / information that is needed to run an organisation
  - Usually not associated with upper management but the management on the shop / factory floor
- b) Data and information that is needed for the long term
  - e.g. This could be years or many months
  - Usually associated with upper management
  - Could also include data from outside the organisation – competitor data, demographic figures etc
- c) Required to manage over the medium term
  - e.g. What is the need peak in workload, are there staff to cover it?
  - What orders need to be processed over the next month or so?
  - The time periods are relative and not fixed
  - Usually associated with middle management, but could be fed into by lower management

### Examiner's Comments

The question asked about data needs in the:

- a) Short term
- b) Long term
- c) Medium term

A number of candidates answered short / medium / long, therefore in the wrong order.



**B9**

Discuss the typical functions of a database administration team.

(12 marks)

**Answer Pointers**

An open ended question but answers needed to mention a range of issues

One to two marks for each relevant area

- General DB management
- Creation and management of accounts
- Security policy, implementation and overseeing
- Backup and recovery
- Education – what the DB does, new features, down time
- Performance issues / tuning
- Liaison with programmers / web team
- Etc.

**Examiner's Comments**

The database administration (DBA) team provides the binaries and the storage to enable end-users to enter data. They enable developers and designers to build data structures that enable data integrity. The DBA team does not enter the data into a database or design databases structures / tables for end user.

**B10**

What is meant by the following terms and provide examples

- a) Structured data
- b) Un-structured data
- c) XML
- d) Lob

(4 x 3 marks)

**Answer Pointers**

One mark was awarded for each relevant point

- a) Is data we find in spreadsheet and relational DBs
  - It has fixed data types
  - It has fixed and predictable structure
  - Easy to process
- b) Is data with no structure
  - For example, the data in a Facebook and twitter entry
  - It is also free form text
  - It is difficult to process
- c) Extensible markup language
  - Used to allow variation in data structures
  - Enables data to be exchange between applications if Document Type Definition (DTD) is included
  - Text based
- d) (Character) Large Object
  - An example is an XML file
  - Can be imported into a relational DB and keep the XML properties

## Examiner's Comments

Candidates struggled with this question. The evidence shows that:

- a) some candidates showed some knowledge of this area. Few stated that this type of data is easiest to process.
- b) was poorly answered. It is an indirect reference to free form text which is becoming used more and more by organisations (Facebook and twitter have free form sections which are queried to obtain knowledge)
- c) was weakly answered. XML is an industrial standard for interchange of data and is widely used.
- d) was the weakest answered. Binaries and large data sets can now be stored and processed in databases. A large XML file no longer needs to be processed and can be queried using XML extensions to SQL.

As big data and cloud becomes more of an issue within information systems more questions about data, big data, processing of social media data, processing of binary sources (CCTV, images, audio etc.) will appear on future papers.

## B11

- a) Discuss briefly what it meant by the term Evolutionary Prototyping. (4 marks)
- b) Discuss briefly the advantages and disadvantages of this technique. (8 marks)

## Answer Pointers

a)

Discussion on prototyping, rather than evolutionary prototyping, gained no more than 50% of the marks. Evolutionary Prototyping is where a prototype is built and iteratively changed into the final system

b)

Four marks for advantages

- The system is built and turned into the final system
- All the time and cost of the prototype will be seen to be used
- The end user will get the system that they see in development

Four marks for disadvantages

- The prototype may be functionality poor
- Other issues like security may be overlooked
- There may be a rush to develop the system and user's expectations need to be managed

## Examiner's Comments

A lot of answers for part a) either discussed generic prototyping, rather than evolutionary prototyping or included a list defining what throwaway and evolutionary styles are followed by a list of generic prototyping.

## B12

Normalisation and Entity Relationship Diagrams are two techniques for designing data structures.

a) Describe these two techniques

(2 x 3 marks)

b) What are the advantages and disadvantages of these two techniques?

(6 marks)

### Answer Pointers

- a) One is a top down technique. It examines the proposed entities of the system and looks primarily at the relationship of the entities

Normalisation is bottom up. It examines the attributes and looks at the relationships between the attributes

b)

Advantages

Can be used to validate each other. Any differences between the models will highlight weaknesses in the fact finding. ERD is a pictorial representation of data, easy to get a message across. Can be de-normalised for performance issues

Disadvantages

Normalisation can be a difficult skill to learn and can be difficult to show end users. Confusion over what entities are may exist

### Examiner's Comments

Normalisation was answered better than ERDs. The evidence shows a number of candidates' answers (in the disadvantages) stated ERDs do not deal with process. Neither does normalisation. Data Flow Diagrams deal with process and then are used to validate the ERD. A smaller set of answers confused ELH's with ERDs.