BCS HIGHER EDUCATION QUALIFICATIONS

Level 4 Certificate in IT

September 2012

EXAMINERS' REPORT

Information Systems

General comments on candidates' performance

The pass rate has improved and there were some very high marks on all questions. Once again, there are some very poor centres with very few passes and very poor attempts.

A1. A new business is being set up by a group of parents to organise a toy and book lending library in aid of a local charity. None of the parents are IT literate and require an IT technician to help with setting up a small database and a manageable system. Advertisements will be placed in local newspapers, shops and local community halls asking for donations of suitable books and toys. After inspection for their suitability, the toys and books will be classified into age group categories and priced accordingly. This data will need to be stored on the database. Potential borrowers will need to register and provide contact details such as name, address, phone number and email address. A small charge will be imposed to register. The parents have arranged to hire a local community hall and will pay a small rent each month to the community hall committee, and have to pay for the newspaper advertisements so require enough money to cover the cost as well as make money for the charity. They also intend to make money by providing refreshments. Toys and books can be borrowed for a specified period, usually one week, with a fine being imposed if it is not returned within that period.
Toys or books which are no longer suitable for hire are offered for sale or destroyed if they cannot be sold and will be removed from the database.
The system is required to record the details of the toys and books, borrowers' details, hall rental due dates and payments, charity donations and simple accounts.

a) Identify the processes, data stores and external entities in the above scenario. **(12 marks)**

b) Write brief notes on each of the following giving an example using the above scenario :
   (i) Dataflow diagrams **(4 marks)**
   (ii) Class diagrams **(4 marks)**
   (iii) Entity life histories **(4 marks)**

c) Describe the role of the following:
   i) Systems Analyst **(3 marks)**
   ii) Database Administrator **(3 marks)**

Examiners' comments

This was the second most popular question, with a pass rate of 45% - an improvement on previous papers. Despite the fact that part a) did not ask for a detailed dataflow diagram, several candidates drew a context and high level dataflow diagram. These were accepted as answers to part a) and b) i). Some external entities were 'invented'. The weaker students did not know what a class diagram was and could not describe entity life histories.

Indicative answer pointers

a) Processes – Pay for adverts, classify stock, update stock, register borrower, deal with hire, process accounts.
   Data stores – advertisement providers (newspapers etc), stock (toy/book), borrower, hire, rental dates, accounts (this will contain all money paid and received.
   External entities – Newspaper/local shops/local community hall committee, Borrower, Charity, Donators

b) A dataflow diagram depicts the hierarchical and logical flow of data from external entities through processes into data stores, using specific symbols to identify each element; e.g. A request for a hire from a borrower will be processed, payment made and the 'hire' stored. It is used as an analysis tool for discussion with users to clarify requirements and understanding. Class diagrams are used to depict an object within a system, its attributes and methods which apply. Stock (toy/book) is an object with

details such as identity, age category, price and the method of borrowing (or hiring), being updated. An entity life history describes the 'life' of an entity. An example would be the stock which goes through the process of categorisation, hired and removed from the system.

c) A system analyst acts as liaison between the users at all levels and the development and implementation of the system according to their requirements. System methodologies such as hard and soft methods, object oriented methods and prototyping are often used. A database administrator is responsible for the database management system. This includes the data, its definitions, the processes, the security, integrity, constraints etc.

A2

a) Describe what issues need to be considered when designing screens and reports for the system described in Question A1. **(8 marks)**

b) Design a set of screens which will deal with logging onto the system described in Question A1 and the borrowing of toys and books. Explain the process and validation behind each screen. **(12 marks)**

c) Give the main reasons why a methodology is used to analyse an information system describing briefly the stages in a relevant methodology with which you are familiar. **(10 marks)**

Examiners' comments

This was the least attempted question with a pass rate of 37%. This was due to the poor attempts at screen design. The case study was very simple and candidates should have produced simple screens. Unfortunately, many seemed to misunderstand the process and introduced shopping carts, displaying and selecting books/toys, payments for borrowing etc, complicating the whole process. Although, these were accepted, the screens were mostly poorly designed with very little evidence of design issues. Surprisingly, part c) was not answered very well.

Indicative answer pointers

a) The designer needs to take into account the user; in this case, the users are not used to computers. Screens must be simple, easy to use, have good help facilities, have common look and feel, good colour combination etc. There will be few reports, mainly simple and easy to read. The accounts will need to be produced.

b) The screen should be functional, neatly designed and the functionality described properly. Logging on will include some security checking. The borrowing screen will contain the borrower's registration number which will be verified – possibly accepting a name rather than a number for ease of use and selection. The item required could be entered by description (as for the name) or number but bearing in mind the user is not computer literate help will be required to locate the required item and price.

c) Methodologies are used to provide a rigorous and integrated approach to systems analysis and design. Typical answers will describe a hard method such as SSDAM or Yourdon, a soft system such as ETHICS or an object oriented method such as OMT.

A3

a) Describe, with the aid of a diagram, each of the three main levels of information in an organisation. Provide an example of this information at each level. **(10 marks)**

b) Briefly discuss the differences between the following specification techniques and give examples of each:

i) Flowchart **(4 marks)**
ii) Decision Table **(4 marks)**
iii) Pseudocode **(4 marks)**

c) Give examples of the following concepts used in relational data modelling:

i) Optionality **(2 marks)**
ii) An arc **(2 marks)**
iii) Intersection entities **(2 marks)**
iv) Involuted relationships **(2 marks)**

Examiners' comments

The pass rate was 40%, which is a little disappointing considering the straight forward nature of the question. The low pass rate was probably due to the popularity of this question with the weaker students. There was a common theme amongst the answers for one centre - no collusion suspected, but poor teaching and understanding is likely to be the main problem. Part c) was mostly ignored but where answered was mainly answered poorly.

Indicative answer pointers

a) These are strategic, tactical and operational and the diagram indicates the information flow from top to bottom. Strategic information is the top level and is the management level. The information is unstructured and random, assisting with long term decision making such as new markets, diversification, investment etc. The information can be internal (aggregated and calculated from the systems) or external such as share price, market influences etc. Tactical level is the information used by middle management. It is timely such as monthly, periodically or annually and is more structured. It consists of accumulated operational information – the lowest level of information. Examples are monthly forecasts and results, budgets etc. Operational is the lowest and most detail of all the information. It is this information which is used to process the daily applications and processes, such as orders, invoices, jobs etc.,

b) Flowcharts are not used as much today, but they can still help particularly in the above situation. They were popular in the early days of computing. They depicted the flow of the process using the logic elements of select, sequence and iteration symbols. Files are included using specific symbols. A decision table identifies conditions and actions and the rules to be obeyed. It does not show sequence of events, but is useful for decisions. Pseudocode is similar to structured English containing simple understandable commands consisting of a limited set of verbs. It also uses the table (file) and attributes (record names). It rigorously and precisely describes the process.

c) Optionality in a relationship indicates that the relationship is not mandatory; the relationship does not have to exist it only may exist. It is represented by a dotted line. E.g. A borrower may not hire a toy. An arc indicates a relationship between three entities where the relationship is only between one entity and the other not both. E.g. an invoice can be related to a newspaper or the village hall committee (normally customer/supplier) but not both. A many to many relationship is inefficient and has to be resolved using an intersection entity. E.g. A toy may be borrowed by many borrowers and many borrowers may borrow any toy. This is resolved by using 'hire' as an intersection entity, showing the individual hire. An involuted relationship is a relationship between an entity and itself; e.g. the staff entity has a relationship showing who manages the staff.

A4

a) There are three ways a new system can be introduced to the user. Briefly describe the advantages and disadvantages of the following:

i) Direct changeover **(4 marks)**

ii) Parallel running **(4 marks)**

iii) Pilot running **(4 marks)**

b) Testing is a vital part of system development.

i) Discuss how you would prepare a testing strategy. **(6 marks)**

ii) Describe the differences between black and white box testing. **(4 marks)**

c) Protecting company data is vitally important. Outline measures you would take to protect the data. **(8 marks)**

Examiners' comments

By far the most popular question and answered very well, with a pass rate of 72%.

Indicative answer pointers

a) Direct changeover is the simplest and cheapest but the most dangerous of the implementation approaches. It is normally used when converting from a manual system or introducing a completely new system. Testing and training has to be very thorough. Data is uploaded onto the system which is implemented immediately, the old system is stopped (if it exists) and the new system started. Parallel running is the safest but expensive method. It involves running the systems side by side until the new system is accepted. It helps discover anomalies, amendment requirements and improvements. A pilot system is used when the system can be used in part of an organisation, such as branches or different departments. Staged/phased/retrospective methods could also be described. After thorough testing it can be implemented in all areas and is relatively a safe method. Problems may occur if branch requirements, for example, may be different.

b) Test plans need to be drawn up, including validation tests, unit tests, integration tests, system tests etc. All paths including performance need to be tested. Test data should

be designed to cope with both usual and unusual processes from top down and bottom up. Black box testing tests the expected inputs and outputs of the system often used by the actual users. White box testing tests the internal code and logic, carried out by the program developers.

c) Data is protected by many methods both logically and physically. The use of usernames, passwords, and user roles protect the data from unauthorised access, validation controls and rules ensure the data is correct. Physical systems such as network protection, physical access controls, back-ups, cloud computing, fire proof safes, power surge protectors etc. A disaster recovery process is also very necessary.

Section B

B5

Write a brief description of what is meant by the following terms:

a) RAD **(4 marks)**
b) JAD **(4 marks)**
c) JRP **(4 marks)**

Examiners' comments

Section a) (RAD) was well answered, but it appeared that candidates had a very high level view of RAD and did not know any of the detail to the method.

When asked about the characteristics of RAD the word Rapid appeared a lot. It needs to be qualified; rapid for what reason? Less documentation, less formal approaches, etc. Just stating RAD is faster is not sufficient. Candidates need to explain why it is faster and doing a comparison to other methods.

Indicative answer pointers

a) Rapid Application Development, developed by James Martin, during the 1980's based on an IBM approach. Use of case tools, time boxing and parallel development are key the success.
b) Joint application development. A meeting between development team and users using storyboarding, prototyping and case tools to develop and design the application
c) Joint requirement planning. The initial meeting between the users and the project manager / systems analysis to outline the initial design of the system required

B6

a) What is meant by the following terms?
   i) (raw) Data **(2 marks)**
   ii) Information **(2 marks)**

b) Discuss the following database terms and comment with respect to data and information.
   i) Database Management System **(4 marks)**
   ii) Data Warehouse **(4 marks)**

Examiners' comments

a) A number of candidates could state that information is processed data, and then as an example give a fact (data) as an example.
   It appeared that a number of candidates had been taught the definitions without actually understanding what the definitions meant.

b) A number of answers confused what table structures give (primary, foreign keys, referential integrity) and what functions a database management systems needs to undertake (access control, security, data storage). On the whole, answers reflected some understanding of what a DBMS was.
   The second part was poorly answered. A data warehouse is not a backup of the main database. The idea of a warehouse is that it stores process data (information) which can be used for decision making. It is not a data dump, its reports, summarised data which is then used for decision making.
   The answers showed some understanding but a lack of depth.

Indicative answer pointers

a) i) Data is the raw facts, collected from the users and systems that capture data. Usually about one person, or one item
   ii) Information is data that has been processed so that it has a meaning. Perhaps summarised in a report and can be used as the basis for making decisions

b) A database management system (DBMS) stores operational data. It inserts, updates and deletes data from tables. Common examples are access, sqlserver and oracle. Because it is an operational database it will store data.

A warehouse is a database which stores data that has been processed, for example it will not store customer information, but will store information about the average salary for customers defined by age ranges. It is used as the basis for decision making, and therefore it falls in the information bracket.

B7

Describe what is meant by the following terms and how they are used?

a) PERT Chart **(4 marks)**
b) CPM **(4 marks)**
c) Gantt Chart **(4 marks)**

Examiners' comments

Candidates knew about Gantt Charts and were able to comment on what they showed. A number of candidates drew charts to reflect their comments, and most of the time these added marks because it was clear they knew the area.

There were less answers on PERT charts, and very few answers on the CPM model.

Indicative answer pointers

Project Evaluation and Review Technique is used to analyse the involved tasks in completing a project, especially the time needed to complete each task, the linkages between each event and to identify the minimum time needed to complete the overall project. It is also used to identify the slack or float time for each event in the project has.

Critical Path Method is used to construct a model of the project that includes a list of all activities required to complete the project (typically categorised within a work breakdown structure) the duration of each activity will take to complete, and the dependencies between the activities.

A Gantt chart is a type of bar chart that depicts a project schedule. A Gantt chart represents the start and finish dates of the project tasks and summary elements of a project.

B8

a) Explain what is meant by the following data modelling techniques.
   i) Normalisation **(4 marks)**
   ii) Entity relationship modelling **(4 marks)**
b) Which would you recommend to use to develop a set of database tables and why? **(4 marks)**

Examiners' comments

The answer for normalisation became a bit of a note dump on the three stages of normalisation. This is not a problem because it showed some learning. It was clear, from a number of repeated mistakes, that a group of students had learnt the answer off by heart and perhaps had limited understanding of what they were actually saying.
Most of the ERM answers were basic ERD answers. Very few answers actually stated that to turn an ERD into an ERM you need supporting documentation.
It did not matter for part b) if the candidate stated one or the other or both, as long as they stated a preference and had reasons why.

Indicative answer pointers

Normalisation is a technique that looks at the attributes that will need to be stored about a system.
It delivers data that is in 3rd Normal form, and has versions that take 3 to 6 steps. Various shortcuts to the three basic stages could be defined as long as it conforms to the key, the whole key and nothing but the key.
An entity relationship diagram is a pictorial representation of the entities / tables that a system is to be built around.
The diagram shows PK / FK's and the degree of the relationships between them (1:1, 1:m, m:m, may be, has etc)

There is no right or wrong answer as to which to recommend. One gives a high level / top down view of the data, the other a low level / bottom up. Both could potentially provide different views of the data and how it interacts.

B9

a) Name two different styles of prototyping. **(2 marks)**

b) Discuss these two different styles of prototyping outlining the advantages and disadvantages of each. **(2x5marks)**

Examiners' comments

a) Majority of candidates could name two prototypes, most named throwaway and some form of incremental.

b) Again there seemed to be a lot of note dumps and not mapping to the question.
Lots of answers stated it was cheaper or quicker, but with no reference to how or why these processes are quicker or cheaper.
Amazingly, a portion of those candidates who discussed throwaway never mentioned that the prototype is discarded and a new system built from scratch.
On the whole, a reasonably well answered question but will a heavy reliance on note dumping.

Indicative answer pointers

There are a number of different styles; e.g.
Throwaway
Evolutional
Functional
Etc.

Prototype is developed with the user and is refined until the definition of screen design and functionality has been achieved.
Negatives – all the effect into developing the prototype is thrown away, the user might get the wrong perspective about how quick and easy it is to develop applications
Positives – requirements gather quickly, the right solution can be obtained quickly. No wasted time on development etc.

B10

a) Briefly discuss what is meant by the term *soft methodology* **(3 marks)**

b) Outline the tools and techniques you would use when applying a soft methodology **(9 marks)**

Examiners' comments

There were a number of answers which stated that a soft method is for soft problems. This answer did not address the question.
Where the candidate understood the area, the question obtained good marks. It was clear from the answers that there is a gap in the training or knowledge in this area.
A number of answers simply stated the classic SSADM tool set, which scored no marks.

Indicative answer pointers

A soft methodology is applied when it is clear that a simple engineering approach cannot be used. The problem may not be clear or there maybe social, human or political factors that need to be addressed. The area was developed by Peter Checkland and was developed to overcome problems with what is termed hard methodologies.

The tools used would typically be –
Rich Pictures
Mind maps
Conceptual Models
CATWOE

B11

With the increased use of Social Networking, there are reports that companies are monitoring their employees on Social Media sites

a) In this context, discuss what is meant by the following terms:
   i) Ethics **(2 marks)**
   ii) Social networking / Social Media **(2 marks)**

b) Do you agree or disagree with companies monitoring their employees activities on social networking sites and discuss why a company might do so? **(8 marks)**

Examiners' comments

Variable answers, showing poor understanding in this area.
A number thought that the last section was about monitoring employees at work and what they were doing at work. There were limited marks given for this.

Indicative answer pointers

a) Two marks for an answer which deals with morals, or right and wrong, virtue and vice and one mark for a relevant example
b) An online social structure that individuals (or organisations) can subscribe to with a common theme or goal
c) An open ended question where a discussion relating to ethics was anticipated. A number of articles have appeared in the press in recent times where employees have been disciplined for comments made about bosses/customers/governments, and companies managing negative feedback by placing positive comments.

B12

One possible extraction of data from a database is an Excel spreadsheet.

Discuss three different ways that an organisation could process and present the data from an Excel, or similar, spreadsheet, in a more visual manner and how this might aid decision making.

(3 x 4 marks)

Examiners' comments
A few candidates realised this was a presentation question, but on the whole is was fairly poorly answered

Indicative answer pointers
An open ended question.
One possible way is to create a pivot table based on the spreadsheet, showing grouping, averages etc. The idea of a dynamic mechanism to explore data could aid decisions.
Another possible way is to create charts from the data is via line and pie charts, for example. The visualisation of the data could help to spot tends or highlight areas of weaknesses.
Another possible way is to create a report based on the data that summarises it (with functions such as average, max, min, number of days between etc.).
The question is aimed at any approach that converts data into information.