Examiners' report

Overall comment

The overall pass rate for this paper was over 60%, indicating that candidates are preparing for the exams. There were still a few candidates who waste time attempting more questions in one section and not enough in the other section.

A1

A business man has bought a farm by the sea and developed a new campsite containing on-site caravans and tent pitches which can be booked. Each caravan is given a unique number and description. Each tent pitch will also be uniquely numbered. He requires a new on-line system to deal with enquiries and bookings. Customers will log on and enter the required date and number of weeks indicating whether they wish to book a caravan or a tent pitch. The system will check and confirm if the required dates are available. If the dates are available, the customer will be asked if they wish to continue with the booking and to enter their personal details. The system will also require a deposit to be paid using a secure on-line payment system. When the deposit is received a confirmation invoice will be emailed to the customer detailing the outstanding payment which must be paid four weeks before the arrival date.

a) List the external entities, processes and data stores in the above scenario and draw a high level logical data flow diagram.

(12 marks)

b) Identify the systems entities and relationships and draw an entity relationship diagram dealing with the booking process only.

(12 marks)

c) Briefly describe the role and skills of the following:
    (i) System analyst/designer   **(3 marks)**
    (ii) Programmer   **(3 marks)**

Answer pointers

(a) External entity – customer and external payment system.
Processes – enquiry, booking detail, enter personal details, pay deposit, send
confirmation invoice, and receive final payment.
Data stores – booking, customer, caravan, tent pitch, caravan availability, tent availability,
deposit, final payment.

(b) Entities – customer, booking, caravan, caravan availability, tent, tent availability.
Relationships – customer confirms booking, booking relates to either caravan availability
or tent availability (arc), caravan has caravan availability, and tent has tent availability.

(c) A system analyst/designer is responsible for the feasibility, fact finding, analysis and
design, system testing and implementation of business problems using tools, techniques
and methods. A programmer or developer is responsible for the coding and testing of
programs to provide processing functions in a variety of applications. Both need to be
methodical, logical and pay attention to detail as well as dealing with both developers and
users.

Examiners' comments

A pass rate of almost 60% was achieved although this was the second least popular
question. Writing down the processes, external entities and data stores assist with drawing
the diagrams. However high level data flow diagrams do not go down into too much detail as
can be seen in the answer pointers. Too many answers included the physical rather than the
logical processes. There were few mentions of the availability. The entity relationship
diagram was poorly answered. There was little recognition of the booking.

A2

a) Briefly describe the following methodologies:

   (i)   Waterfall   **(5 marks)**
   (ii) Object oriented   **(5 marks)**
   (iii) Agile   **(5 marks)**

b) Briefly describe **FIVE** different fact finding methods giving advantages and
disadvantages of each

                                                            (5 * 3 marks)

Answer pointers

(a) Typical waterfall methods involve stage by stage progressive development of a system.
The following processes are included: preliminary survey and feasibility, systems
analysis, design, coding, testing, implementation and maintenance.

Object oriented methods are based on object models containing class diagrams. Classes
contain attributes and methods and diagrams detail the relationship between classes.
Dynamic models are produced detailing behaviour, control and events over time, such as
state transition diagrams, use case diagrams and event driven diagrams. Functional
models are also produced using the Unified modelling language UML.

Agile methodology relies on the main principle of user and developer interaction with processes and using tools. It is a customer/people centric process. Comprehensive documentation is produced relying on collaboration and being able to respond to change of plans. Small teams, time-boxing, sprints and the management by a scrum manager providing an iterative and flexible approach are typical of this method.

(b) Typical answers would include interviews – proactive, interactive, and useful for feedback but can be time consuming, interruptive and unpopular. Questionnaires are useful for simple questions, can be spread over a variety of sites and can be easy to quantify but difficult to design and often results in poor returns. Sampling of records, old files and documentation can be useful to obtain facts but may concentrate on older systems and miss problem areas. Prototyping is a useful tool for feedback and interaction with users but too often users expect quicker solutions leading to thorough analysis, design and implementation being ignored. Observation is another time consuming option and useful for identifying bottlenecks and problems but is unpopular and can be disruptive. Research looking for potential solutions to the problem already in existence is acceptable. JRP/JAD or group sessions are also acceptable answers.

Examiners' comments

This was the most popular question attempted by over 70% of the candidates who attained a pass rate of 76%. Most were able to describe waterfall methodologies, although once again candidates should be reminded that the answer is only worth 5 marks, so too much detail was not necessary. OO and Agile methods were not described so well. The purpose of fact finding is to investigate the current system in order to understand how it works and to be able to identify requirements and solve problems. It is not time wasting, it is essential. The use of telephoning the public and newspapers are not relevant. However, the research on the internet in order to find existing software solutions may be relevant.

A3

a) What makes a good screen design? Discuss the techniques that can be used to assist the users.

(10 marks)

b) Draft a series of on-line screens depicting the booking process in question A1, displaying available dates and indicate the validation of each field.

(10 marks)

c) Describe the theory and main features of a relational database.

(10 marks)

Answer pointers

(a) Screens should be simple, consistent, display understandable error messages, provide good navigation, use of radio buttons, check buttons, drop down lists to aid choice and reduce errors. The use of colours should be limited particularly if the screen is input only. A variety of multimedia could be used but the designer must be aware of the performance and purpose of the screen.

(b) The screens should be simple and consistent in style containing suitable headings, indicating the flow of input fields, allowing cancellation and confirmation. The functions to

be covered are enquiry, availability, displaying the price, entering personal details, confirmation of booking, deposit etc. Using pictures of the caravans or tent pitches are useful.

(c) Relational databases are used to define, store, manipulate, maintain and control data. They are based on relational calculus theory involving projection, selection, joins etc. as proposed by E F Codd. The data is stored in rows or tuples of columns within a normalised table. Each row is accessed by a primary key and can be related to another table by the use of a foreign key. Duplication of data is reduced using normalised techniques. Referential integrity constraints are supported. They are process independent; changes can be made to tables without affecting the process.

Examiners' comments

This was the least popular question but still with a pass rate of 60%. Screen functionality needs to be thought through, candidates need to envisage how the screens could be used for the booking process. The description and theory of relational database management systems was poorly answered and indicates an area to be studied.

A4

a) Discuss how a testing strategy should be prepared. Include various techniques which could be used and describe the difference between black and white box testing.

(8 marks)

b) Briefly describe the advantages and disadvantages of the following:

   i) Stage implementation   **(4 marks)**
   ii) Direct implementation   **(4 marks)**
   iii) Parallel implementation   **(4 marks)**

c) Outline measures you would use to protect data from malicious and accidental loss/access.

(10 marks)

Answer pointers

(a) A test plan needs to include all stages within the life cycle and should be prepared well in advance of implementation. Various techniques include structured walkthroughs, validation and verification techniques, unit tests, and system integration testing and stress and performance metrics. Test data should be designed to cope with all possibilities. Black box testing tests the expected input and output of the system. White box testing tests the internal code and logic carried out by programmers.

(b) Stage implementation occurs when only part of a system is implemented either within one department in an organisation or in a branch. It is useful to test the system on a small scale similar to a pilot implementation. Errors can be corrected quickly without effecting the whole organisation. Problems could occur if not all the facilities are used in that stage. It is also time consuming. Direct implementation is risky and the system needs to be tested

(c) Data can be protected in many ways. Usernames, passwords and roles prevent unauthorised access. Passwords need to be changed regularly and should contain a mixture of letters, characters and numbers. Data should be validated and verified on input. Physical systems and software also provide protection. Networks should be

secured by secure sockets, SSL layers, system software, power surge protectors etc. Back-ups should be taken both physically and as icloud storage. The use of sophisticated commercial software products should be installed to prevent viruses, worms and hacking.

Examiners' comments

A popular question with a good pass rate of over 80% indicates that theory questions are answered well.

B5

Using the BCS Code of Conduct as a starting point, state how you would expect a computing professional to behave in the work place.   **(12 marks)**

Answer pointers

The starting point to this answer would be to reference the code which is currently found at

http://www.bcs.org/category/6030

The code has 4 sections (listed below) and so for high marks the answer should cover a range of issues and topics.

Public Interest

Professional Competence and Integrity

Duty to Relevant Authority

Duty to the Profession

Marks were awarded for discussion in areas perhaps not listed above, but are within the realms of behaving as a computing professional, and behaving according to ethical and legal constraints of the computing profession.

Examiners' comments

This was a poorly answered question. A lot of answers described dress code, time keeping etc. which are outside the realms of this question.

Answers were expected to refer to ethics, morals, duty of care, professionalism, updating skills, adhering to legislation on race, age, disabilities etc.

B6

Using the following selection of numbers:

1,2,3,4,5,1,2,5,1,1

Define, and show with full workings, what is meant by:
  a) Mean
  b) Mode
  c) Medium

(3 * 4 marks)

Answer Pointers
Mean (also known as average)

2 marks for definition

Result of summation of all elements and divided by the number of elements

2 marks for full workings, only one for putting 2.5

Mean = (1 + 2 + 3 + 4 + 5 + 1 + 2 + 5 + 1 + 1) / 10
     = 25/10
     = 2.5

Mode

2 marks for definition

The value that appears the most in the list. Can be derived by a frequency table. A set of numbers can have more than one mode

2 marks for full workings, only one for putting 1

Element   Frequency
1   4
2   2
3   1
4   1
5   2

So 1 is the mode

Medium

2 marks for definition

The sequence of numbers is sorted. The middle term in an odd sequence of number. With an even number the medium is an average of the two numbers either side of the mid point

2 marks for full workings, only one for putting 2

1,1,1,1,2,2,3,4,5,5

10 numbers in total

Therefore an average of values in position 5 and 6, both are 2
So medium is 2

Examiners' comments

This had the highest average mark across the two sections. The average mark would have been higher if candidates how shown their workings.

A number of answers were 2.5,1,2 and so could only award 3 marks.

Medium and Mode still need some work when it comes to definitions.

For example, what happens when there are an even number of numbers for mode?

B7

Discuss three different types of multimedia that could be used to enhance a web page that a school wishes to use for advertising and promotion of the school.

(3 * 4 marks)

Answer Pointers

This question was about multimedia and NOT media.

Any answer that states radio, television and newspapers were awarded zero marks

The expected types of media could be from the following list:

Text, visual (static), visual (moving) and audio.

Areas which overlap, e.g. animation and movie, were only warded marks for a single area as they are effectively the same type of media.

The answer required to be mapped to the school scenario.

Answers need to be justified, not just "takes high bandwidth" – there needs to be a reason why this is a disadvantage.

Stating that video / audio is more expensive is not necessarily a negative. Media is chosen for a reason and that reason is that it is the best media to get a message across to the intended audience,

For example,

Text is easy to build and can convey complex descriptions, for example course content and examination answers.

The school will probably only need one language to promote itself and therefore the audience will understand the presentation in words.

But if a guided tour is required then the text will need additional media like pictures or video to enhance the experience.

To attract and retain visitor it might be better to have a pupil on video / audio reading some of the text pages to enable blind users to interact with the site.

Examiners' comments

It was pleasing to see the number of answers using TV, Radio and Newspaper has dropped dramatically over the years, but there are still some.

A number of answers insisted that video was different to animated gif which was different to flash files. These three media types all display moving images – they need different tools to develop them, but they are all displaying the same type of media.

The answers need to be more focused on the positives and negatives of the media.

Where the candidate understood the three types there was generally very good answers.

B8

Internet of Things (IOT) sensors can be used as a source for gathering data.

a) Define what is meant by Internet of Things **(4 marks)**
b) Using either a medical or commercial example, describe the type of sensors that could be used and the type of data that could be collected. **(8 marks)**

Answer pointers

a)

Primarily the inter-connecting of devices. Often smart devices which share information / but the smart device may actually process the data – for example security cameras that process number plates and report to other nearby devices about stolen cars etc.

May be references as part of Smart Cities or Smart Networks

Marks awarded for any reasonable discussion

b)

A typical engine on a jumbo jet producing 10TB of data every 30 minutes.

A patient could be hooked up to a number of sensors that feedback information to allow better care (heartbeat, pressure, any vital signs monitor, temperature. Location etc).

These sensors could provide numeric data, signal abnormal levels and GIS data.

The data could be continuous, time dependant, event dependant etc.

1 or 2 marks for each reasonable point made

A disappointing set of answers. Candidates need to read up to date literature - even if it just the technology pages of newspapers

There are lots of ads for fitbits, Microsoft bands etc that showed how sensors could be linked to the collection of realtime / personal data.

Lots of answers discussed heart monitors, vital signs monitors – would a hospital really link these to the internet?

Especially weak was the type of data that could be collected.

A typical answer listed the type of machines you would find in a hospital and ignored the data produced.

There were some reasonable definitions of IOT, but there was not many.

B9

Describe what is meant by the following management structures

   a) Matrix   **(6 marks)**
   b) Hierarchical   **(6 marks)**

Answer pointers

a)

A management structure where the employee will potentially be managed by more than one manager.

For example, a programmer may be allocated to work on more than one project at time and be allocated work by more than one project manager.

Each of those project managers may manage more than one project which is being sponsored by different departments / functional area.

Teams are built to solve problems rather than from functional areas

A reasonable overview of this area is

http://www.dineshbakshi.com/igcse-business-studies/people-in-business/revision-notes/387-organisational-structure

b)

Hierarchical is a more traditional view of management.

Each employee has one line manager who has one line manager etc

The structure is tree like and very structured.

Each employee knows their position and the teams tend to be closed in nature (i.e. from within one department)

The answer was expected to reference both the advantages and disadvantages of both management styles.

Examiners' comments

A question where candidates either knew both parts, only part b) or nothing.

Part b) was generally answered reasonably.

A number confused Hierarchical management with Hierarchical File Systems

B10

By providing examples relevant to a small retail company, define what is meant by the following terms:

   a) Data
   b) Information

(2 * 2 marks)

   c) Strategic data
   d) Operational data

(2 * 4 marks)

Answer pointers

a)

Data is a raw unprocessed item. Cannot be used to make decisions. For example, age, name, height etc

Information is data that has been processed. Can be used to make decisions. e.g. likelihood of rain therefore I'll take a coat

b)

Strategic data is data that is used for long term decisions and it is normally done by senior management.

Operational data is day to day data and is usually done by managers or supervisors. It is accurate and normally only internal data is used.

2 to 3 marks for each discussion

1 to 2 marks for each relevant example provided

Examiners' comments

Data and Information is still being confused. For example

Data is raw unprocessed item – example is John.
Information is processed data and is used to make a decision – example John is 42

It is clear that a number of candidates had learnt the answers to strategic, tactical and operation data. But unless they are in the order they were learnt they cannot put the definition to the correct label.

B11

What structures and procedures would you put in place to ensure that all documentation generated during a project was to the highest standard.

(12 marks)

Answer pointers

This was an open ended question but the answer must focus on ensuring that all documentation is of a high standard.

2 to 3 marks for each relevant discussion.

Hopefully, there is a company standard template and training is provided to ensure that all employees are aware of standards and of templates

Each document may be reviewed by the team leader or project manager. This may also be a work college – it mirrors the agile pair programming approach of having two sets of eyes looking at each document to ensure quality

Each document may be formally reviewed by a peer group and a series of sign off of the document are obtained.

Workshops may be used to ensure that best practice is obtained from the workforce and to ensure training.

Employees may be sent on external certified courses to ensure that they are working to agreed standards,

Examiners' comments

Another poorly answer question. Lots of answers basically did not address the topic.

Education, process, review, training on good practice etc were missing from lots of answers.

The question was about how to install a quality process into an organisation to ensure that all documentation was at least fit for purpose.

B12

Without reference to cost or time, discuss the advantages and disadvantages of a prototyping technique of your choice.

(12 marks)

Answer pointers

There are a range of prototype styles that could be discussed. Throwaway and Evolutionary tended to be the styles normally discussed.

A throwaway prototype is used to develop a solution where a quick prototype is developed to obtain user requirements.

No effort in placed on developing security, performance, making it robust or integrated.
As these are key features in any solution the prototype is discarded and a new application is developed from scratch ensuring that security, performance etc. are taken into account.

With any type of prototype user participation is paramount.

There needed to be discussion about lack of user involvement and also the issues of function creep if the process is not managed successfully.

A discussion on the skills required by prototyping teams could also have been included. The end users may not be computer literate and therefore the teams will need to communicate in the language of the business user, rather than in computer jargon.

Management of the prototype and user expectation could also need be discussed, A none functional prototype can be developed in a matter of hours, which may give the end user an expectation that the final system make also not take long to develop.

Depending on the style of prototype, documentation may be an issue. It is expected that development notes, analysis and design diagrams will still be developed, but there may be an over emphasis on the prototype build and less on quality documentation.

Two or three marks for each relevant point.

Examiners' comments

Another question where it was clear that a range of candidates were taught an answer about throwaway and evolutionary prototyping and therefore did not really answer the question set.

A great number of answers simply note dumped one prototype approach followed by the other.

A significant number of answers still included cost and time, and can be attributed to learning answers rather than learning the discipline.

A small number decided to write just about cost and time.

Answers need to map the question – not the classroom