

BCS THE CHARTERED INSTITUTE FOR IT

**BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 6 Professional Graduate Diploma in IT**

IT AND THE ENVIRONMENT

Wednesday 28th September 2016 - Morning

Answer **any** THREE questions out of FIVE. All questions carry equal marks.

Time: THREE hours

Answer any Section A questions you attempt in Answer Book A

Answer any Section B questions you attempt in Answer Book B

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

Calculators are NOT allowed in this examination.

SECTION A

Answer Section A questions in Answer Book A

General comments on candidates' performance

Now in its fifth year, the overall pass rate for the module continues to be satisfactory.

The candidates showed a reasonable knowledge of the syllabus topics. A number of answers were focused more on the facts around which the questions were based. Better answers could discuss the implications of those facts to the issues raised, showing a deeper understanding. As stated in previous reports, candidates should look for the pointers in the questions so that they can relate their answer to the questions asked.

There were a small number of very good answers where the deeper understanding expected at this level was shown. As with the previous years, there were also many "threshold" marks where candidates had repeated the facts for a question, which may or may not have been a "pass mark" depending on how well articulated and complete they were. At Graduate Diploma level, candidates are expected to provide evidence of knowledge but also to show the application of that knowledge to the given scenario.

Instructors teaching candidates for this module are encouraged to continue to help the candidates prepare to discuss the issues. The candidates would benefit from classroom discussions of scenarios, followed up by candidates preparing written reports about the issues.

Question A1

A1. Power management features are now commonly available in both laptop and desktop computers.

- a) A lot of the corporate use of personal computers is in an office environment. Discuss THREE areas of power use which need to be addressed in order to optimise energy use in this situation. **(12 marks)**
- b) Write a brief report discussing the difference in approach which you should use when looking at the purchase of new equipment and the management of legacy hardware. **(13 marks)**

Answer pointers

Part (a)

These could include, but are not limited to:

- Use of sleep mode for screen, processor and disk.
- Automatic shut-down of systems after business hours.
- Use of wake-up-on-LAN/keyboard/mouse as appropriate.
- Agreement of appropriate energy/performance profiles for different roles in the organisation.
- "Dumbing down" processor clocks where high performance is not required.
- Nature of the job and the system location delivery variables.

Syllabus Section: The Environmental impact of Information Systems

Part (b)

This part of the answer should preferably be in a business report format. It should compare and contrast the different performance abilities and restrictions of existing legacy hardware compared to the specification of new technology with more advanced power saving features.

Examples of this could include:

- Removal of older equipment which doesn't meet even the (now dated) EnergyStar requirements.
- Review of types of business use to ensure that the most energy efficient systems are being used in the areas of work where this will bring most benefit relative to the work profile.
- Creation of a range of profiles of power use which enable either the network manager or the user to choose the most appropriate performance/efficiency compromise for a particular role.
- Using monitoring tools to review the use of these profiles to show probably energy gains through their use - and allowing the ranking/reward of those who engage with energy saving.
- Building into the procurement process indicators which steer the outcome towards intrinsically energy efficient solutions.

The idea of this is to show that the candidate can translate a policy into a set of practical outcomes for the organisation - expressed in terms of a business report.

Syllabus Section: The Environmental impact of Information Systems

Examiners' Comments

The question was attempted by 78% of the candidates, 43% of whom achieved a pass mark.

Very few good answers were provided. In many cases, very limited, simplistic answers were provided which could not score highly at this level.

In part (a), many candidates only provided lists - or lightly-annotated lists – rather than the discussion which was requested in the question. This inevitably scored a lower mark than a full answer. Some candidates provided either too many or too few examples – both of which led to loss of potential marks.

Part (b) requested a report format, which a number of candidates failed to deliver – reducing the number of marks available to them. In addition, a number of candidates failed to distinguish adequately between the approach used for new equipment and that for legacy hardware.

Question A2

- A2. a) Briefly describe FOUR technologies which can be used for the remote sensing of environmental data. **(8 marks)**
- b) For ONE of these technologies, discuss how data collected by such a technology could be stored and managed as part of a long-term project. **(8 marks)**
- c) With reference to a specific example, write a brief article or blog-post discussing how the remote sensing technology you described in (b) could benefit the natural environment. **(9 marks)**

Answer pointers

Part (a)

The technologies discussed could include, but are not limited to, the following:

Visible light imaging, Infra-red imaging (including traditional aerial photography and satellite imaging), LiDAR, synthetic aperture RADAR, multi- and hyper-spectral imaging systems, ground based sensor arrays.

Syllabus Section: Remote Sensing

Part (b)

The response to this section will depend largely on the experience of the candidate and their exposure to particular technologies. It could be any cogent and self-consistent set of elements which together formed a professional environmental data management system. Note that “long term” is a key element in the answer – as the value of environmental data sets generally grows over time.

Syllabus Section: Remote Sensing

Part (c)

This section is intended to test the knowledge of the candidate regarding the practical application of the environmental data set in practical, “real world” situations. It could be as simple as providing early warning of a plume of pollutant gas (such as the recent case in California) or part of a much more complex, long-term environmental study aiming to provide an evidence base with which to call for the halting of a long-term undesirable change in climate. The style should be accessible and appropriate for the context.

Syllabus Section: Remote Sensing

Examiners' Comments

The question was attempted by 44% of candidates, 46% of whom achieved a pass mark.

A few good answers were received, but many candidates provided poorly structured and badly thought out responses.

In part a), some candidates provided only very basic lists of the technologies they were addressing, rather than describing them as requested in the question. In addition, some candidates attempted to make distinctions between very similar technologies – which did not gain them significant benefit. Some candidates failed to provide the correct number of descriptions, which meant they lost marks unnecessarily.

In part b), several candidates provided largely unstructured general data management material which did not adequately discuss the specific challenges of long term projects involving environmental data collections.

In part c) the response provided by some candidates was generic and failed to provide a coherent message regarding the potential benefits of the chosen technology to the environment. Some candidates failed to deliver the material in the requested format, and lost some marks unnecessarily as a result.

- B3. You work for a company which makes and installs air conditioning units. You have been given the job of developing and implementing a system to manage the air conditioning (a/c) systems in a city's major shopping malls. There are three malls, each of different sizes: each has a different "maximum" capacity (the biggest number of people who can be inside at a time).

The requirements for the a/c system are for it to cool the mall to a target temperature of 25 degrees; to operate during the hours of 0900 – 2000 and to be active only when the number of people in the mall is over 35% of its capacity. Each mall will have two separate a/c systems: a state-of-the-art free air cooling system and an older refrigeration system which should only be used when the outside temperature exceeds 35 degrees. Currently these older systems run continuously from 0900 – 1900, and are set to deliver 30 degrees.

The cost of this new system will be paid for by the city council increasing the rental for each shop in the malls by 1%. Some shop owners have objected to this, and you have called a meeting to explain the new system.

Give an outline of the presentation you will make, focusing on the following areas:

- a) How the overall system will operate, with particular reference to the IT components. Your answer must include an explanation of the sensors required, and how they will be used to control the a/c units. **(15 marks)**
- b) It is also proposed that the individual shops in the malls will be supplied with smart meter technology, and that these smart meters and the a/c control unit will be linked to the energy company's smart grid. Explain how a smart grid would operate to try to increase energy efficiency in the malls and in the energy network. **(10 marks)**

Answer pointers

Part (a)

Should address:

- List of sensors needed – temperature, some form of “people counting”
- Some details of what the sensors will do / the data provided
- Should address frequency of data polling – too often and there will be little change (hence inefficient); too infrequent and changes may be missed.
- Basic operational sequence for 0900 - 2000
- Poll temperature, poll numbers
- If numbers > 35% capacity and temp > 25 switch new a/c on
- If numbers > 35% and temp > 35 switch old a/c on
- If numbers \leq 35% switch both a/c off
- If temp \leq 25 switch both off

Syllabus Section: Environmental Impact Analysis

Part (b)

Smart grid technology will allow energy suppliers to be more aware of current and predicted future demands, therefore allowing them to meet those demands as efficiently as possible – e.g. not adding extra capacity unless it is needed, controlling the output of generation facilities to meet the demand, not to exceed it.

The smart meters can also be part of the control system – negotiating with the energy supplier to balance (even out) demand over the day, preventing unnecessary high-demand activities during peak load times etc.

Smart meters might also be used to control user actions to keep them in balance with the overall mall a/c system e.g. not allowing a shop’s heating systems to start at the same time as the mall is being cooled.

Syllabus Section: IT in the service of power generation & energy conservation.

Examiners’ Comments

The question was attempted by 34% of the candidates, 84% of whom achieved a pass mark.

Whilst a small number of good answers were given, several candidates provided answers that were mostly limited to a statement of the facts relating to the question. The better answers contained more discussion, for example by expanding on the facts and comparing and contrasting facts where appropriate.

Question B4

B4. Your business has been approached by a UK-based charity which specialises in recovering unwanted computer systems from UK businesses. The charity can offer equipment for reuse, repurpose or recycling, with different cost models: reusable computers will cost you more to buy than those for repurposing; those to be recycled can be bought at very low cost. You and your business partners decide to become involved in this scheme, with the idea of selling on the equipment to your local markets.

- a) Explain the criteria you will use to decide which method (of reuse, repurpose and recycle) to apply to the equipment you collect. Your answer should also indicate any precautions you need to observe. **(15 marks)**
- b) You have received an enquiry from a potential customer, who is looking for reassurance that its company image will be secure if it buys equipment from you. What are the main points you will use in order to provide that reassurance? **(10 marks)**

Answer pointers

Part (a)

- Main criterion is age and condition – if the system is too old or in poor condition, there will be no option but to recycle and recover the components.
- For relatively new equipment, especially that which is common, it is likely that the equipment can be reused in its original condition and for similar purposes to which it was previously used.
- For more specialised equipment, or for equipment which is older or otherwise unsuitable for reuse, consider repurposing – using some or all of the equipment in a different way.
- Beware of older equipment and the possible use of HazChem and other dangerous substances.

Syllabus Section: Environmental Impact Analysis

Part (b)

- Need to ensure you and the customer's company is not seen as a "dumping ground" for otherwise redundant equipment, therefore should assure that final recovery plans are in place so there will be no dumping or illegal disposal of equipment (i.e. what happens to the equipment after the customer stops using it) The equipment supplied is of appropriate quality – in terms of its age, condition and ability to support user needs. Any sub-standard equipment is not sold on, but is recycled.
- The way in which data and programs are wiped and reinstalled will address the concern about infected computers being passed on to users.
- Corporate image assured by making sure that all legal obligations are followed.

Syllabus Section: Legislative and regulatory provisions

Examiners' Comments

The question was attempted by 81% of the candidates, 83% of whom achieved a pass mark.

A number of very good answers from candidates were seen, which demonstrated that those candidates had planned and focused their answers on the issues for the question. There was also some evidence of answers that were rushed, which might suggest that some candidates could review how they plan their time on questions.

Question B5

B5. You have been appointed to advise the government of an island nation. The nation is particularly proud of its natural environment, especially its forests and beaches. A major cloud computing service provider has proposed locating their regional data centre on the island, promising to pay for the entire infrastructure and to follow all the best practice for sustainability and energy efficiency of server farms. This will include the use of renewable energy sources. The company has also promised they will provide 50 IT jobs for local people, and to expand current energy and IT supply facilities so that local people can use them. The government has asked you to report on whether they should accept the provider's offer.

- a) What are the main issues affecting the location and operation of a large data centre which you would advise the government to consider? **(14 marks)**
- b) The service provider wants to start an advertising campaign promoting the way in which its data centre will provide computing resources without affecting the natural environment of the island. Do you think this should be approved? Explain your answer. **(11 marks)**

Answer pointers

Part (a)

Should address:

- Physical location of both building and associated infrastructure – where viewable from; how large an impact on the visual environment; proximity to water and power supplies to reduce transmission costs.
- Appearance – shape and form of building; material used in construction;
- Minimise impact during building phase.
- Post-use site recovery / reuse.
- Commitment to using renewable energy and materials at all times.
- 50 IT jobs

Syllabus Section: Environmental Impact Analysis and Environmental Impact of Information Systems

Part (b)

Arguments may include:

- Concentration of resources in data centres, allowing the IT infrastructure and support systems to be managed more efficiently.
- Data centres are very large units, run 24/7 with significant energy consumption
- No control over how or where the service providers source their electricity.
- Network access energy costs are incurred.
- Are the jobs going to be real – or will lots of work be done remotely?
- Will they do a good job on upgrading capacity, or will it be a token gesture for publicity and they actually end up using a lot of electricity drawn from the traditional power sources.

Syllabus Section: Environmental Impact Analysis

Examiners' Comments

The question was attempted by fewer than 64% of the candidates, 85% of whom achieved a pass mark.

As with B4, a number of very good answers from candidates were seen, which demonstrated that those candidates had planned and focused their answers on the issues for the question. There was also some evidence of answers that were rushed, which might suggest that some candidates could review how they plan their time on questions.