INFORMATION TECHNOLOGY IN A GLOBAL SOCIETY
HIGHER LEVEL
PAPER 1

Monday 17 November 2014 (afternoon)

2 hours 15 minutes

INSTRUCTIONS TO CANDIDATES

- Do not open this examination paper until instructed to do so.
- Section A: answer two questions.
- Section B: answer one question.
- Section C: answer one question.
- Each question is worth *[20 marks]*.
- The maximum mark for this examination paper is *[80 marks]*.

SECTION A

*Answer **two** questions. Each question is worth [20 marks].*

1.　　**Magic Medicine Cabinet**

A new product is being developed for your bathroom, the Magic Medicine Cabinet (MMC). It is a *smart* appliance for supporting family health care. It includes a number of technologies that can remind the user to take the right medication, track vital signs, access up-to-date personalized health information, and interact online with doctors and pharmacists. John Dudley has recently purchased one for the family.

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The MMC recognizes which medication John is holding, and warns him if he is taking the wrong medication.

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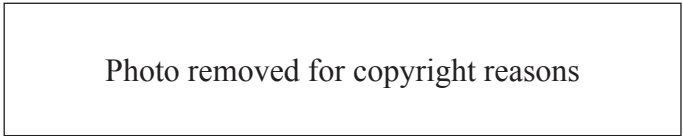
Measuring blood pressure using the monitoring device attached to the MMC.

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(Question 1 continued)

The MMC can remind John to take medication through both audio output and the embedded display while he is looking in the mirror. The implementation of the MMC incorporates the following technologies:

- face recognition of people who approach the cabinet
- radio frequency identification (RFID) based *smart* labels (tags) attached to the individual medication
- vital sign sensors to monitor blood pressure and heart rate
- audio output to speak the text that is shown on the cabinet display.

John interacts with the MMC through its touch-sensitive screen, voice input, and the different sensors such as those to monitor blood pressure.

Some health authorities are considering introducing the MMC in remote areas or in the homes of patients who cannot easily get to a doctor's office.

[Source: adapted from www.guardian.co.uk/technology/2012/aug/30/ifa-2012-gadgets
and www.accentureconsulting.ie/.../PDF/magicmedicinecabinethuc99.pdf]

(a) (i) Identify **two** advantages of using RFID *smart* labels (tags) in the MMC.   *[2]*

(ii) Identify **four** steps involved in the face recognition process used by the MMC.   *[4]*

(b) John's wife wants to take her blood pressure. Compare **two** methods of training that could be provided in using the blood pressure monitoring device.   *[6]*

(c) Discuss the advantages and disadvantages to the patient of using the MMC as a health care tool.   *[8]*

2.   Who has my data?

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(a)   (i)   Identify **four** characteristics that may be required by a system when setting up
            a strong password.   *[4]*

      (ii) Passwords are often set to expire periodically, such as every 90 days. Identify **two**
            reasons why passwords are set to expire on a regular basis.   *[2]*

(b)   Compare the security of typing a password with the security of using a finger scan.   *[6]*

(c)   To what extent is it acceptable for the State of Furlong to hold sensitive data in its
      criminal database?   *[8]*

3.   Donating or disposing of old computers

The C&R Company will be buying 200 new computers and donating their existing equipment to a school in Haiti. The peripheral devices will be donated along with the computers.

Some C&R employees store personal data on the hard disk (drive) of their computer. This data must be backed up before it can be deleted. The school will decide what kind of operating system will be installed on the donated computers.

The company will deliver completely functional computers to the school in Haiti.

The school in Haiti will be responsible for acquiring and installing all software except for the operating system.

(a)   (i)   Identify **two** peripheral devices.   *[2]*

        (ii)   Identify **two** methods the C&R Company can use to save data from the hard disk before they delete it.   *[2]*

        (iii)   Identify **two** methods to remove all the information from these hard disks that does not physically destroy the disk.   *[2]*

(b)   Explain **three** factors that could influence the decision by the school in Haiti to use open source or proprietary software on the donated computers.   *[6]*

(c)   Other companies are considering whether it is better to donate or dispose of obsolete equipment. Evaluate these **two** options.   *[8]*

SECTION B

*Answer **one** question. Each question is worth [20 marks].*

4.   **Disaster management strategies**

Cyclone Betty struck Mackay in Northern Queensland, Australia in 2013. This led to the tax office being flooded and the IT network being severely damaged. The server room was located in the basement where most of the flooding occurred.

At the time, the tax office was handling sensitive financial data of over 1 million people.

As a result of the flooding, much of the data held on the tax office servers was lost and due to inadequate backup procedures, much of it could not be recovered. Even though there were regular backups, it became clear the way they were done was not reliable. The network manager was the person in charge of backing up the data.

The tax office IT staff needed to reinstall the licensed software on the new servers.

(a)   (i)   Identify **two** actions that should have been taken to ensure the backing up of data was done reliably.   *[2]*

(ii)   Identify **two** methods that could be used to reinstall licensed software on the client machines.   *[2]*

(iii)   Outline the purpose of an uninterruptible power supply (UPS) for the tax office.   *[2]*

(b)   The management team of the tax office is considering installing a virtual private network (VPN) to allow employees to work away from the office. They will be carrying out a feasibility study.
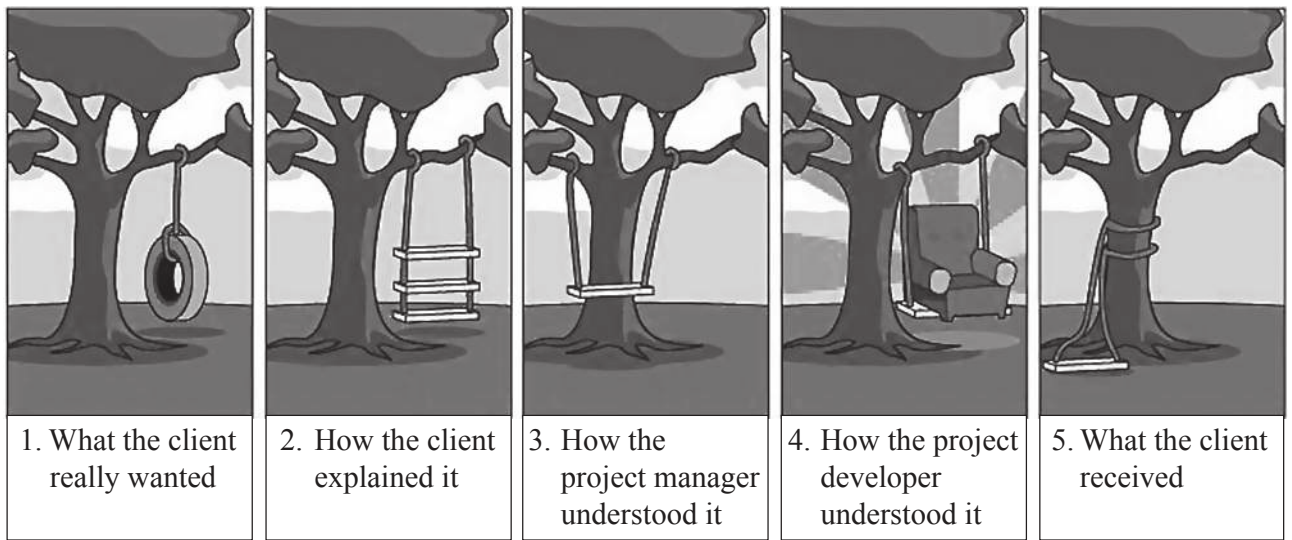
Explain **three** considerations that should be included in a feasibility study to ensure that the VPN meets the requirements of the tax office.   *[6]*

(c)   The management team of the tax office have realized that their previous disaster recovery plan was insufficient. As part of the analysis phase for the development of a future disaster recovery plan, they are considering various plans for setting up offsite backup. Two possible options are:
   • in a different office in a nearby city
   • cloud storage.

Evaluate these **two** options.   *[8]*

5.   Waterfall versus agile

Sometimes projects do not work out as planned.

| 1. What the client really wanted | 2. How the client explained it | 3. How the project manager understood it | 4. How the project developer understood it | 5. What the client received |

[Source: adapted from www.projectcartoon.com/create/, 16 November 2012]

Earlet, a major Canadian clothing retailer, has commissioned Eliboms to develop a new information system that will replace the existing one. As part of the project, a thorough stakeholder analysis was carried out.

Once this analysis had been carried out, a Gantt chart was created to show the proposed timeline of the development of the project. The project will be managed using a waterfall method.

(a)   (i)   Identify **four** components of an information system.   *[4]*

(ii)   State **two** aspects of the project that need to be agreed upon with the client during the initial interview.   *[2]*

(b)   (i)   Explain **one** advantage of using a Gantt chart.   *[2]*

(ii)   Distinguish between the use of the waterfall method and the agile method in the development of a new information system for Earlet.   *[4]*

(c)   The project was not a success because the final product did not meet the client's requirements.

Discuss how Eliboms (the developer) could involve various stakeholders during the different stages of the project system to ensure it meets the needs of Earlet (the client).   *[8]*

SECTION C

*Answer **one** question. Each question is worth [20 marks].*

6.   **Malpractice victim's family sues maker of faulty surgical robot**
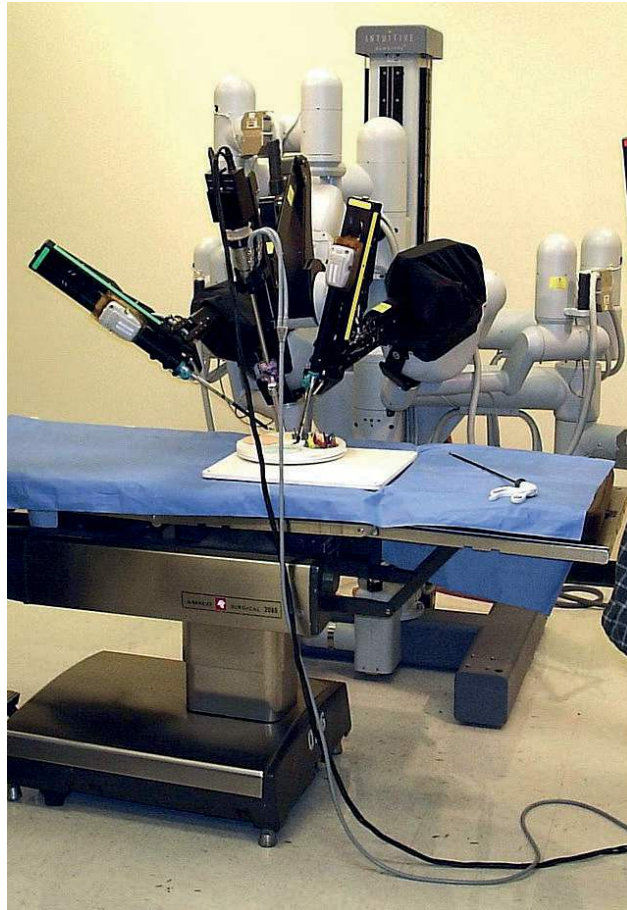
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Please go to this link:
http://www.lawyersandsettlements.com/lawsuit/da-Vinci-robot.html#.VLHc7iuUeaU

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(Question 6 continued)

(a) (i)   Identify **three** sensors used in robotic surgery.   *[3]*

(ii) Identify **three** stakeholders that should be consulted in the purchase of the da Vinci robotic surgical system.   *[3]*

(b) Analyse a patient's decision to choose between an operation performed by a surgeon:
* without robotic surgery
* using robotic surgery.   *[6]*

(c) To what extent are the surgeon and/or the manufacturer of the robotic surgical system responsible for the injuries to a patient caused during robotic surgery?   *[8]*

7. **Artificial intelligence in the classroom**

[Source: www.advancedtechnologykorea.com/6372/, 16 November 2012]

This is not a sci-fi movie! It is an English language class taught by Engkey, a first-generation robot teacher, in the coastal city of Masan in South Korea. Engkey is controlled by a teacher in the Philippines where labour costs are much lower.

Engkey says: "Where do you live?"
Student says: "I live in Masan."
Engkey says: "Good, well done."

There are plans to develop a second-generation version of Engkey, which will be able to teach autonomously. At the moment Engkey can only respond to a limited number of phrases that are stored in its database.

[Source: adapted from http://edition.cnn.com/2010/TECH/innovation/10/22/south.korea.robot.teachers/index.html, 16 November 2012]

(a) (i)   Identify **two** of Engkey's sensors. *[2]*

     (ii) Identify the steps that Engkey would use to respond to a student asking a question. *[4]*

(b) (i)   Explain the relationship between a knowledge base and an inference engine in an expert system. *[2]*

     (ii) Explain **two** ways that Engkey could be developed to be more effective as a teacher. *[4]*

(c) To what extent should robots such as Engkey replace a human teacher for teaching English? *[8]*