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INFORMATION TECHNOLOGY IN A GLOBAL SOCIETY
STANDARD LEVEL
PAPER 2

Tuesday 16 November 2010 (morning)

2 hours

INSTRUCTIONS TO CANDIDATES

- Do not open this examination paper until instructed to do so.
- Section A: answer all parts of the question.
- Section B: answer two questions.

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SECTION A

*Answer **all** parts of the question.*

Area of impact: Business and employment

1. The recording industry is taking court action against private individuals and peer-to-peer (P2P)* file sharing services that are involved in the illegal downloading of music files.

    A US federal jury has found a woman guilty of sharing copyrighted music online, and ordered her to pay US$222 000 in damages to the six record companies represented by the *Recording Industry Association of America*.

    The woman had downloaded 24 songs without permission and shared them online through a P2P file sharing account. However, the woman denied the charges and testified that she did not have an account. During the trial, the woman's Internet service provider (ISP) presented evidence that copyrighted songs were offered by the woman as a P2P file sharing user under the name "tereastarr".

    [Source: http://cbsnews.com/stories/2007/10/04/national/main3330186.shtml, 4 July 2009]

    _____

    *   peer-to-peer (P2P): technology that allows Internet users to locate each other through the use
                       of an online server and exchange files directly between their computers

    (a)   Identify **two** characteristics of a P2P network.   *[2 marks]*

    (b)   Users of illegal P2P file sharing networks run the risk of downloading viruses. Describe **one** indication that a computer has a virus and **one** preventative measure that a user can take to avoid viruses on their computer.   *[4 marks]*

    (c)   Explain **two** kinds of evidence that could have been presented in court to prove that copyrighted songs were offered by the woman using a P2P file sharing account.   *[4 marks]*

    (d)   A range of online solutions have been developed to provide customers with legal access to music files.

           To what extent have online solutions been made available to meet customers' needs? Use specific examples in your response.   *[10 marks]*
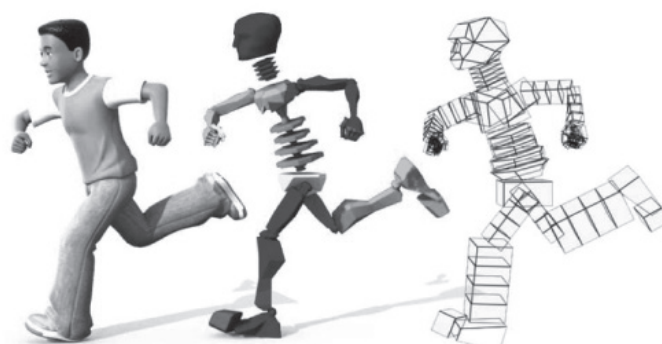
SECTION B

*Answer **two** questions.*

Area of impact: Education

2. Video game books illustrated with computer-generated images are the latest attempt to encourage students to enjoy reading. *Project X* books have been designed to appeal to children up to the age of nine and have been tested in over 2000 schools. Some schools bought *Project X* CD-ROMs for students to use in a class on individual laptops. Other schools display the CD-ROM from the teacher's laptop on a smartboard.

Each CD-ROM contains stories brought to life on the screen using page-turning technology with images, audio, animations and video clips. Students can use a full range of tools to explore and annotate the text. A character image collection and writing frames are provided to support children's writing.

Project X has been both a creative and technical challenge. All the characters and environments have been built from start to finish. Every visible object in the illustrations had to be modelled and textured. Unique skeleton figures enable the characters to move and create a believable world.

Skin mesh   Bones for animation   Underlying bone system for deforming skin mesh

[Extract from Project X: Strong Defences: Attack of the X-bots (OUP, 2009) and from Project-X website, copyright © Oxford University Press 2009, reproduced with permission of Oxford University Press.]

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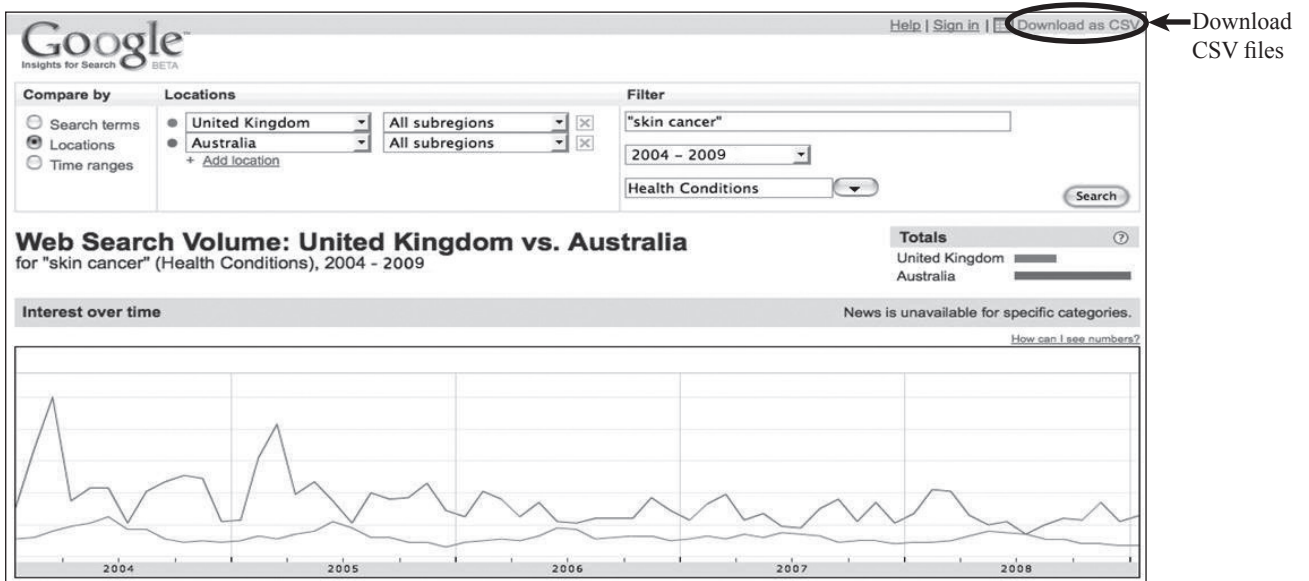
(Question 2 continued)

(a) Identify **two** types of software licence a school may need to consider when purchasing the CD-ROMs. *[2 marks]*

(b) Describe **two** software considerations that must be taken into account when developing *Project X* animated books. *[4 marks]*

(c) Interactive multimedia productions are often stored as compressed files to reduce storage space. Explain **two** disadvantages of using data compression for this purpose. *[4 marks]*

(d) The head of a primary school has decided to invest in *Project X* technology rather than in sets of printed reading books. Evaluate this decision. *[10 marks]*

Area of impact: Health

3. Until recently, the occurrence of illnesses was tracked using only traditional methods. One method for tracking the spread of influenza (flu) in the United States relies on a network of more than 1500 doctors who treat 16 million patients each year. The doctors record the percentage of their patients who have a flu-like illness. The US health agency and state health departments collect and analyse this data on a weekly basis. It usually takes one to two weeks until all of the data is collected and the results are released to the public.

However, *Google* plans to develop a software tool, *Google Flu Trends*, for the US government. The system uses data gathered from web searches for flu-related keywords to notify the US health agency of where an outbreak of the illness could be happening. When *Google Flu Trends* was tested, it was found that there is a close relationship between how many people search for flu-related topics in a geographical area and how many people actually have flu symptoms.

Private individuals can use similar online trend tools to analyse other health issues by searching for terms, locations or time regions. For example, the following chart shows the comparison for the search term "skin cancer" in the United Kingdom (bottom line) and Australia (top line), from 2004 to 2009.

[Source: www.google.com/trends.]

The information generated by the search can be downloaded by the user in the form of a CSV file (comma separated values), which contains some ASCII characters.

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(Question 3 continued)

    (a)   Identify **two** characteristics of ASCII. *[2 marks]*

    (b)   Describe the steps by which *Google Flu Trends* could associate flu-related keywords entered by users within the United States to the occurrence of flu in the various regions. *[4 marks]*

    (c)   Explain why an Internet search engine would get different results when *skin cancer* (without quotation marks) is entered and when *"skin cancer"* (with quotation marks) is entered. *[4 marks]*

    (d)   To what extent should analysis tools such as *Google Flu Trends* be used as the main providers of information for governments and health organizations in planning resources to manage illnesses? *[10 marks]*

Area of impact: Arts, entertainment and leisure

4. Sarah Warner has started to learn the guitar as a leisure activity. Unable to find a local teacher, Sarah searches the Internet and makes contact with Carlos Martinez, a music teacher in Paraguay who is offering his services online. Carlos is using a new three-dimensional (3D) web cam and broadcasting on *Skype*, an audio/videoconferencing program, to teach guitar lessons. He has a *Minoru* 3D web cam which connects to his personal computer's (PC) USB port, just like any other web cam. Carlos can log into his *Skype* account and broadcast his lessons to students online. His students can ask questions and Carlos can comment on their guitar playing in real-time through *Skype*.

The *Minoru* 3D web cam is a single piece of hardware with two cameras spaced approximately the same distance apart as human eyes, which make the user tend to look into the eyes of the camera. The *Minoru* 3D web cam can be used for videoconferencing with programs such as *Windows Live Messenger* and *Skype*. It can record 3D videos for posting on video web sites. It can also be used as a normal web cam, recording video or taking still pictures.

Carlos has had to install *Skype* and the software supporting the *Minoru* 3D web cam.

Students such as Sarah only need to purchase special coloured glasses in order to view the lessons in 3D. She also needs to purchase a basic web cam and install *Skype* in order for Carlos to see and hear her play her guitar.

[Source: www.minoru3d.com. Used with permission.]

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(Question 4 continued)

(a)   Identify **two** hardware requirements that are needed by the student on their computer in order to watch these 3D videos online. *[2 marks]*

(b)   Sarah's guitar lessons with Carlos are carried out in real-time via videoconferencing.

    (i)   Define the term *videoconferencing*. *[2 marks]*

    (ii)   Describe **one** technical limitation in using real-time videoconferencing. *[2 marks]*

(c)   Carlos wants to upload his pre-recorded videos to an online video hosting site such as *YouTube*, but he has no idea how to do this. Explain **two** IT-based strategies that he could use to learn how this is done. *[4 marks]*

(d)   In recent years, advances in 3D technology and significant increases in the processing capability of computers have seen greater numbers of people adopting these technologies.

To what extent do you agree with the statement that "the development of interactive online learning environments will never satisfactorily replace face-to-face contact"? *[10 marks]*

Area of impact: Science and the environment

5.   David Hanson, Chief Executive of *Hanson Robotics Inc*, is a leader in creating robots that are among the most advanced in the world. He has created Jules, an example of a "social robot" that uses artificial intelligence, integration of natural language processing, automatic speech recognition and text-to-speech. It is possible to have a natural, interactive conversation with Jules. Frubber is an elastic material that has been developed by *Hanson Robotics Inc* which looks like natural skin and makes Jules' realistic facial movement and speech possible.

Jules also uses "computer vision" through a device in his eye which captures the image of the person talking to him. "Computer vision" includes face recognition and face tracking to simulate complete verbal and non-verbal interaction, such as maintaining eye contact and turning the head to follow the movement of the human to whom Jules is talking.

David Hanson also teaches his robots their history, vocabulary, and develops their basic "personality", either based on a real person or an imaginary character. Hanson's robots have been used in games and toys, research and psychiatry scenarios, military training and animations.

[© Hanson Robotics Inc. Reproduced with permission.]

(a)   Identify **two** input devices that are required in order for Jules to interact with a real person.   *[2 marks]*

(b)   Describe the steps that Jules would take in order to follow the movement of the person talking to him.   *[4 marks]*

(c)   Jules may have difficulty understanding a sentence in a conversation with a human. Explain why this could happen.   *[4 marks]*

(This question continues on the following page)

(Question 5 continued)

(d)   The organizers of an important tennis tournament are considering using a robot similar to Jules, named Tennis-Umpire, for the purpose of umpiring some of the games. This robot, which remains seated throughout the match, uses its own cameras to analyse the game and then communicates its decisions to the human spectators using speech.

[Image reproduced by permission of Mark Chandler, UK Student Life.]

Evaluate whether the organizers should go ahead with this decision to replace human umpires with robotic umpires such as Tennis-Umpire.   *[10 marks]*

Area of impact: Politics and government

6.   Free microblogging services have become very popular, allowing millions of users to send messages and read other users' messages.   The text-only messages may be up to a maximum of 140 characters in length.   Users can choose to "follow" someone, allowing them to view all of the posted messages from this person, their details, and access their other "followers" directly. Messages can be sent and received using the services's website, by SMS, RSS, or e-mail.

While a user is logged into a microblogging website, information about them is automatically recorded by the site's server in a data log which includes: IP address, browser type, the web pages visited by the user, the search terms used, and any advertisements on which the user clicks. The server uses administrative, physical and electronic measures to protect the user's personal information and personal messages from unauthorized access.

A US Army intelligence report has identified that terrorists may be using a combination of social networking and microblogging services, Global Positioning System (GPS) with online maps and voice-changing software as potential terrorism tools. Terrorists may be using social networking in the following ways:
• Cell (mobile) phones for the mass sending of propaganda
• Cell (mobile) GPS for terrorist targeting
• Cell (mobile) phones as surveillance tools
• Voice over Internet Protocol (VoIP) telephone calls
• Microblogging sites to communicate and integrate other tools, such as online maps, in messages

(Question 6 continued)

(a) Identify **two** IT-based methods of sending text messages simultaneously to a number of people. *[2 marks]*

(b) Describe **two** types of information that would be held in a cookie by a microblogging service. *[4 marks]*

(c) Explain how a location determined by cell (mobile) phone technology may be different from that determined by a Global Positioning System (GPS). *[4 marks]*

(d) Under certain circumstances, government authorities require organizations, such as microblogging services, to provide them with information about individuals and data that has been collected from individuals' online activities. To what extent is this acceptable? *[10 marks]*