Diploma Programme
Programme du diplôme
Programa del Diploma

Information technology in a global society
Higher level
Paper 1

Wednesday 16 November 2016 (morning)

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.
- Each question is worth **[20 marks]**.
- The maximum mark for this examination paper is **[60 marks]**.

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Section A

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

1. **Choosing a search engine**

Disney Studio films are frequent targets of movie piracy. *Disney* does not believe that today's search engines provide enough protection from piracy. For this reason, *Disney* has filed a new patent to create a search engine that filters undesirable results, such as piracy websites.

Most of today's search engines, such as *Google*, judge a site's value by its popularity. *Google* uses Googlebot software to crawl the web, following links from page to page, and then uses PageRank to rate web pages based on a score. Sites are assigned scores based on whether links to them come from well-established, credible pages. The sites are then shown in the search result list, allowing the searcher to select the right sites. PageRank is intelligent enough to differentiate between the quantity and quality of links on a site. If one site has five high-quality links from important sites and another has 10 low-quality links from unimportant sites, the site with the high-quality links will be given a higher PageRank score.

Disney's new search engine ranks pages based on authenticity values, and decides which movies are from authentic websites and which are from pirated websites. Simple searches, such as the one below, return a title, description and a URL when typing in a movie title. However users can use more advanced search tools, such as Boolean operators, to help limit, broaden, or define their search.

Figure 1: The Disney search engine
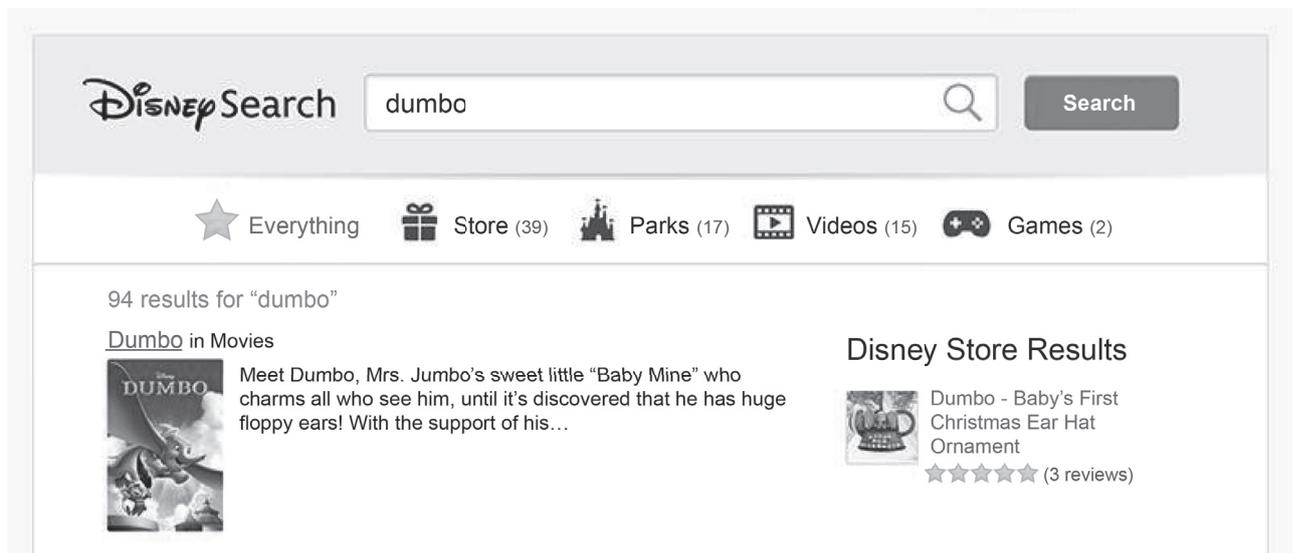
[Source: Used with permission of Digital Trends Copyright © 2016. All rights reserved.]

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(Question 1 continued)

(a) (i) Identify **two** advantages to parents if their children use the *Disney* search engine. [2]

(ii) Identify **two** ways that the authenticity of a user may be determined. [2]

(iii) Identify **one** Boolean operator. [1]

(iv) State a Boolean search that would return the Mickey Mouse movies made in 1931. [1]

(b) (i) Explain **two** reasons why the *Disney* search engine would use cookies. [4]

(ii) Explain **one** reason why the *Disney* search engine would use authenticity as the key factor in ranking a website. [2]

(c) Evaluate the decision by *Disney* to promote their search engine. [8]

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2. Restaurant automation

Many restaurants in Hokkaido, Japan are installing "self-ordering" kiosks, as well as cell/mobile phone and tablet ordering systems. Automation is not new to retail; banks rely on automatic teller machines (ATMs), and grocery stores have used self-service checkouts for many years. In many of these restaurants the tablet systems also include games and opportunities to provide feedback.

A number of restaurants have joined together to provide the Hokkaido (HK) loyalty card, which offers discounts and other benefits to customers in restaurants in a number of locations. The data collected when customers sign up for and use the HK loyalty card programme is held by a third party. While customers may enjoy the benefits of the HK loyalty card programme it may have implications for their privacy, security and anonymity.

[Source: Based on Patrick Thibodeau, "Automation arrives at restaurants", ComputerWorld (2014)]

Figure 2: A customer ordering food at an automated restaurant

[Source: www.youngadultmoney.com]

(a) (i) Identify **two** types of data that would be input into the restaurant's self-ordering kiosk system by a customer. [2]

(ii) Outline **two** advantages to customers of the restaurant moving to a self-ordering kiosk or mobile ordering system. [4]

(b) Explain **three** reasons why a customer may be uncomfortable about sharing their personal information with a third party to obtain the HK loyalty card. [6]

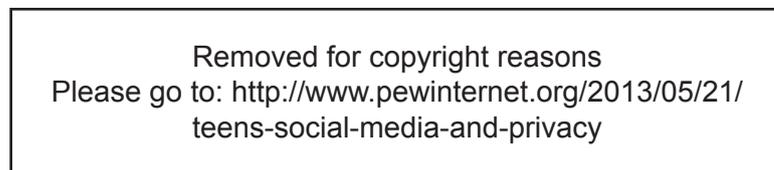(c) Discuss the advantages and disadvantages of restaurants joining the HK loyalty card programme. [8]

Turn over

3. **Digital citizenship**

The internet is used for for accessing, sending and exchanging information. It provides resources that would not be available otherwise. These include virtual libraries and multimedia resources.

The large amount of information on the internet means that students must decide what information they need and what they do not need. The quality of the information can also be questionable. Students must be taught how to distinguish between appropriate and inappropriate information. Since anyone can post online, it is almost impossible to control what can and cannot be published.

The statistics in **Figure 3** below show a significant increase in what teenagers posted online from 2006 to 2012.

Figure 3: Social media profiles – what teenagers post: 2006 versus 2012

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Please go to: http://www.pewinternet.org/2013/05/21/
teens-social-media-and-privacy

Universities, companies and individuals are able to see how students act on social networks. The increased posting of personal information suggests that students need to have a greater awareness of the concept of personal privacy, safe internet use and the need to comply with websites' terms and conditions.

There is a lot of discussion about what students should be taught within the digital literacy and digital citizenship curriculum. Creating an acceptable-use policy (AUP) is just one example of how schools can provide guidance to students.

[Source: adapted from www.venturebeat.com]

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(Question 3 continued)

(a) (i) Define the term "digital citizenship".   [2]

(ii) Identify the steps required to produce the chart in **Figure 3** using spreadsheet
software.   [4]

(b) (i) Explain **one** benefit to students of learning about digital literacy in schools.   [2]

(ii) Explain **two** characteristics of a website that can be used to determine whether it
is a reliable source of information.   [4]

(c) To what extent can a school's acceptable-use policy (AUP) ensure that students will
become responsible digital citizens?   [8]

Section B

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

4.   **Swarm technology**

A navy is developing robot boats that can cooperate and communicate with each other to form a swarm. Each boat is autonomous, and is fitted with radar and infrared technology that enables it to calculate its own path and to navigate around obstacles.

One use of this swarm technology is to protect ships that have valuable cargo. Once the swarm detect a suspicious boat that might be coming too close to the ship they are protecting, they will work together to encircle it and give a warning to the captain of the suspicious boat with loud speakers and flashing lights.

Figure 4: Swarm technology

[Source: Office of Naval Research (ONR), www.onr.navy.milt]

The manufacturers of the autonomous robotic boats (robot boats) are considering whether to develop a version that is able to carry passengers and replace ferries for short journeys.

[Source: www.news.discovery.com and defence1.com and www.gizmag.com]

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(Question 4 continued)

(a) (i) Identify **two** characteristics of a robot.   [2]

(ii) Identify **four** steps that could be taken by an autonomous robotic boat (robot boat) to enable it to work cooperatively with the others in the swarm.   [4]

(b) In the future, autonomous robotic boats (robot boats) may be used to carry passengers.

Explain **three** concerns that would need to be addressed before these robot boats could be used for carrying passengers.   [6]

(c) Sometimes suspicious boats approach the ship that the autonomous robotic boats (robot boats) are protecting. The robot boats have on-board weapons that they can fire in dangerous situations. Currently, a navy officer must decide what the robot boats should do if a suspicious boat does not respond to the swarm's warnings.

Discuss whether the navy should develop the robot boats so that they are able to make their own decision about whether to open fire on suspicious boats.   [8]

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5.

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5.

(Question 5 continued)

(a) (i) Identify **two** training methods that could be used to enable medical staff to use the new eHospital electronic health record system. [2]

(ii) Identify **two** responsibilities of the IT support staff. [2]

(iii) Identify **one** advantage of using questionnaires to survey medical staff about the eHospital system before its development. [1]

(iv) Identify **one** disadvantage of using questionnaires to survey medical staff about the eHospital system before its development. [1]

(b) Analyse the project manager's decision to use a parallel changeover of the eHospital system instead of a direct changeover. [6]

(c) The introduction of new information systems, such as the eHospital electronic health record system, can prove problematic.

To what extent is the success of a new information system dependent on **both** the training of the staff that use it **and** the information system itself? [8]

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6.   Lowell High School learning management system (LMS)

Lowell High School is considering whether to develop its own learning management system (LMS). The school intends to develop the LMS using the agile project management methodology, so that new features can be introduced to meet the needs of the students and teachers.

The first feature of the LMS will be to provide online access to course materials for students at school and at home. The teachers will upload the course materials, including lecture notes, videos and links to websites. Some of the videos will be instructional "mini lectures" created by the teacher.

Investigations were carried out by the school administrators into possible additional features for the LMS. The most popular suggestions were for students to be able to submit assignments online and for discussion forums for each course, so that students can respond to questions set by the teacher.

(a)   (i)   Identify **two** methods that Lowell High School could use to collect feedback from the students.   [2]

(ii)   Identify **four** design requirements the teachers should consider when creating videos for mini lectures.   [4]

(b)   Analyse the decision to use an agile rather than a waterfall project management methodology for the development of Lowell High School's LMS.   [6]

(c)   The Lowell High School administration has two options for developing the learning management system:
• use an in-house programmer, such as the computer science teacher or network manager
• use an external software development company.

Evaluate these options.   [8]

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7. Facial recognition technology

A research project used cloud-based facial recognition technology to determine people's emotional responses to different types of content on social media. The findings showed that only 20 % of Facebook posts generated any emotional response, and that shocking, offensive, amusing and cute content created the most significant reactions.

Figure 6: The *CrowdEmotion* facial recognition software
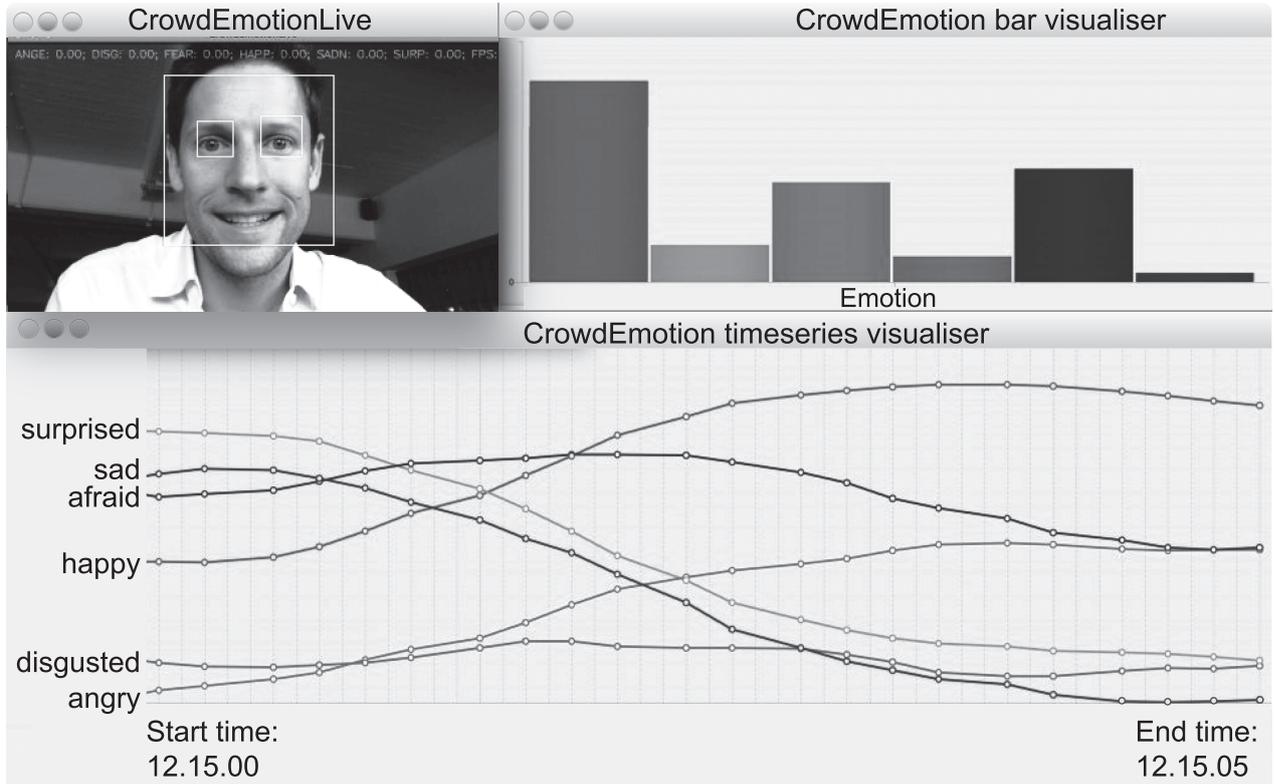
[Source: From https://web.archive.org/web/20150306193057/http://www.crowdemotion.co.uk/technology.html, used with the kind permission of CrowdEmotion.]

The facial recognition software was developed by *CrowdEmotion* and uses machine learning technology to link facial expressions with an emotional response. Using the camera on a laptop or phone, *CrowdEmotion* can read the research volunteer's facial expressions, which reveal their emotional response to what they are listening to, watching or even just thinking about. This included capturing involuntary actions, such as facial twitches, which may be a sign that the volunteer is is trying to hide their feelings.

Over time, the facial recognition system has learned to link expressions to moods, needs and actions.

CrowdEmotion is considering whether to use the facial recognition software for advertising campaigns.

[Source: www.marketingmagazine.co.uk, www.ft.com and www.businessinsider.com]

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(Question 7 continued)

(a)   (i)   Identify **two** characteristics of machine learning. [2]

      (ii)   Describe **two** ways that the privacy of the research volunteers can be ensured by *CrowdEmotion*. [4]

(b)   Machine learning is based on pattern recognition rather than inference rules.

      (i)   Distinguish between pattern recognition and inference rules. [4]

      (ii)   Explain **one** reason why *CrowdEmotion* will use pattern recognition rather than inference rules to identify the expressions shown. [2]

(c)   To what extent can facial recognition technologies like *CrowdEmotion* be effective in advertising campaigns? [8]