

Information technology in a global society
Standard level
Paper 1

Wednesday 17 May 2017 (afternoon)

1 hour 30 minutes

Instructions to candidates

- Do not open this examination paper until instructed to do so.
- Answer two questions. Each question is worth **[20 marks]**.
- The maximum mark for this examination paper is **[40 marks]**.

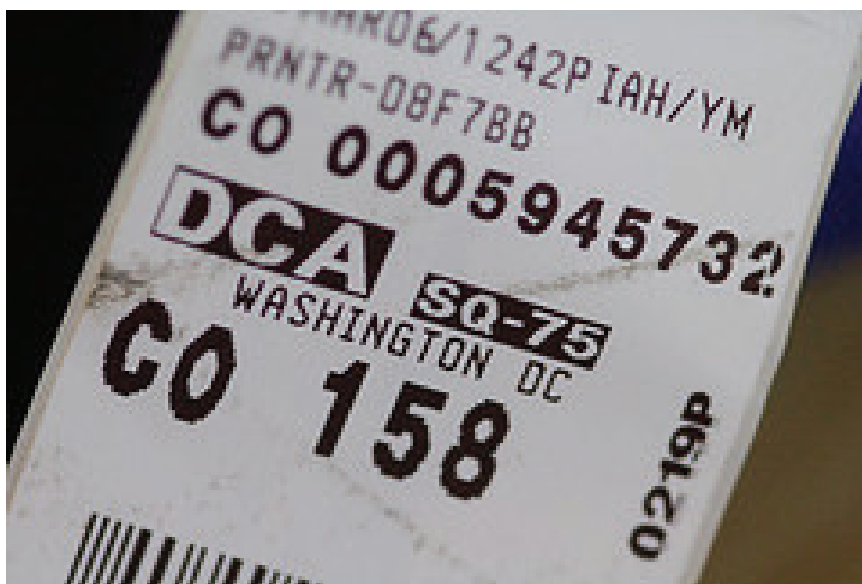
Answer **two** questions. Each question is worth [20 marks].

1. Airport luggage control

Large airports need to handle thousands of pieces of luggage (including suitcases and other types of baggage) from the moment passengers check them in at the counter until the moment they arrive at their final destination. Sometimes a passenger will change airplanes during their journey, so their bags will need to be transferred by conveyor belt from one plane to another.

When the passenger checks in at the airline counter, a tag is printed and attached to each piece of luggage (see **Figure 1**). This tag has information about the passenger and their journey printed on it and also shows both a barcode and a ten-digit number that are unique to each piece of luggage.

Figure 1: A luggage tag



[Source: https://en.wikipedia.org/wiki/Bag_tag#/media/File:Dca-baggage-tag.jpg]

The luggage then goes on to a number of conveyor belts that take each bag to where it needs to go. Conveyor belts connect to other conveyor belts that direct luggage from the airport building to the correct airplane, or from one airplane to the next if the passenger changes airplanes during the journey, or to the baggage reclaim area at the end of the journey. The airport luggage control system will know when to push the bag from one conveyor belt to another to ensure it gets to the correct destination.

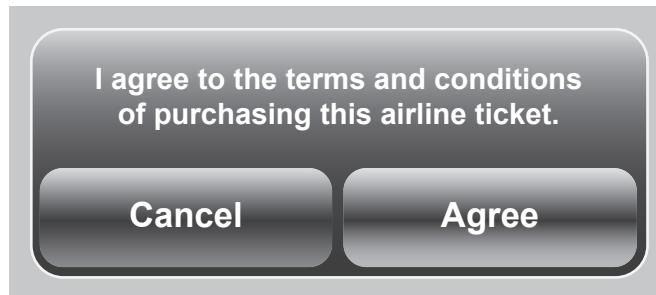
[Source: Adapted from: <http://science.howstuffworks.com/transport/flight/modern/baggage-handling.htm/printable>]

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(Question 1 continued)

- (a) The barcode allows the airport’s luggage control system to access a database containing information about each piece of luggage.
 - (i) Identify **two** pieces of information about the luggage that may be obtained from this database. [2]
 - (ii) Identify the steps taken by the luggage control system to decide which conveyor belt to choose when a bag reaches a junction between two conveyor belts. [4]
- (b) Analyse the decision by some airports to attach radio frequency identification (RFID) tags to luggage when it is checked in by the passenger, instead of barcode paper printed tags. [6]
- (c) Airlines have databases that contain data about passengers when tickets are booked. This data includes travel dates, itineraries, contact details, passport details and passengers’ home addresses. When passengers purchase a ticket online from an airline company, they have to accept the airline’s terms and conditions by clicking “Agree” (see **Figure 2**).

Figure 2: Acceptance of airline terms and conditions



[Source: © International Baccalaureate Organization, 2017]

Within these terms and conditions, it states that the airline may receive a request to share this data with the government of the country to which the passenger is flying.

Discuss whether airlines should share passengers’ data with the governments of the countries to which they are flying. [8]

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2. Apurimac Health Centre

Apurimac, a village in the mountains of Peru, is five hours away from the nearest hospital in Cusco. Apurimac Health Centre is equipped to attend to basic medical needs, such as minor surgery and delivering babies.

Juan Orams is a young doctor and also the manager of Apurimac Health Centre, and has been requesting computers for a long time. The doctors at the health centre have been using Juan’s personal laptop to store patient records and write medical reports. Apurimac Health Centre has recently received a donation of six desktop computers and a small black-and-white laser printer from the Association for Rural Health (ARH).

The ARH has sent an IT specialist to install the six computers and make sure they work. Each computer has four gigabytes (GB) of RAM, a 300 GB hard disk, a DVD reader, an antivirus program, a word processor, a spreadsheet and a simple database program.

The local telephone company has offered to install an internet connection at the centre in the near future, but the health centre will have to pay a monthly fee for this to an internet service provider (ISP).

- (a) All computers have input and output devices.
- (i) Identify **one** input device. [1]
 - (ii) In addition to a printer, identify **one** output device. [1]
 - (iii) Identify **one** characteristic of random access memory (RAM). [1]
 - (iv) Identify **one** activity carried out by the health centre that would be easier to do with spreadsheet software. [1]
 - (v) Identify **two** characteristics of an internet service provider (ISP). [2]
- (b) Medical students in Peru must spend six months training in rural areas during their medical studies. Apurimac Health Centre has been selected by the medical school in Cusco as a place to send students for training every year.
- Analyse the impact on the medical student of spending six months training in a health centre with limited Internet access. [6]
- (c) Juan has a limited budget and has two options:
- install a network and pay for an Internet connection, or
 - spend the money on training the doctors to use the IT system, acquiring modern software and installing diagnostic tools on the standalone computers.
- Evaluate these **two** options. [8]

3. Updating the Wisconsin High School (WHS) database

Wisconsin High School (WHS) uses ColegiumWise, a management information system (MIS). The MIS contains a relational database that stores information about students and parents.

The administrators of WHS have found that some of the information about students and parents is not correct, so they have asked parents to ensure their information is updated or corrected when necessary by using an online form (see **Figure 3**).

It is important that the information stored in ColegiumWise is correct because some of this information, such as the students' names, will be sent to the One-to-Seven exam board, which will use it on the students' diploma certificates.

One way to ensure that the correct data has been entered into the ColegiumWise MIS is to use data validation.

Figure 3: An example of a record from the ColegiumWise MIS

Status:	Parent
Father's surname:	Presley
First name:	John
Nationality:	Canadian
Date of birth:	Day 12 Mon 01 Year 1970
Mother-tongue:	French
Education:	Master's Degree
Profession:	Industrial Engineer
Email:	J_PRESLEY@gmail.com
<input type="button" value="BACK"/> <input type="button" value="SAVE"/> <input type="button" value="NEXT"/>	

[Source: © International Baccalaureate Organization, 2017]

The school's administrators would like to ask parents for additional information to that which is already stored in the MIS. This is not possible with the current version of ColegiumWise. They will need to ask the developers of ColegiumWise to include these new fields in the MIS, as well as in some queries and reports.

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(Question 3 continued)

- (a) (i) Identify **two** ways of preventing parents from making mistakes when entering data on the online form. [2]
- (ii) Identify **two** characteristics of a relational database. [2]
- (iii) The school wants to consult a lawyer about the documentation that would be needed to send students to France during the summer holidays. They would like to search the database to find a parent who is a lawyer who has French as their mother-tongue (first language).

Outline the query that could be used to search for this information. [2]
- (b) The developers of ColegiumWise may accept requests from clients such as schools for additions or changes to the system. The developers send out system upgrades and updated user manuals on a regular basis with the changes that have been requested by the schools and other clients.

Explain **three** different ways the upgraded version of ColegiumWise could be tested before it is sent to the schools and other clients. [6]
- (c) ColegiumWise has several key functions that cannot be changed. The contract with the developers of ColegiumWise is due to expire in 2018 and the administrators at WHS have two options:
- continue with ColegiumWise, knowing that it will not have the specific functions required by the school
 - not renew the contract and develop their own school management information system (MIS) for the school.
- Evaluate these options. [8]

4. *Wei Tan Enterprises*

The company *Wei Tan Enterprises* in Seoul, South Korea has 200 employees. Email is an important method of communication, both within the company as well as with customers.

The email server is located in the head office in Seoul, and all internal emails travel over the local area network (LAN). The head of IT manages the email server and is responsible for the security, reliability and maintenance of the email system.

Wei Tan Enterprises has decided to move from a locally-hosted email service to a cloud-based email service. Internal emails will now have to go through the company’s internet connection to the cloud. Some of these emails have very large files attached. This will affect the bandwidth available to the company for other activities that require access to the internet.

(a) (i) Define “bandwidth”. [2]

(ii) Identify **two** characteristics of a local area network (LAN). [2]

(iii) Identify **two** benefits for the IT department of moving from a locally-hosted email service to a cloud-based email service. [2]

(b) Email is often a fast and convenient way for colleagues in a company to communicate. However, it can cause problems in some offices.

Analyse the advantages and disadvantages of companies such as *Wei Tan Enterprises* using email as the main form of communication. [6]

(c) The head of IT has been monitoring the digital behaviour of *Wei Tan Enterprises*’s employees. A number of bad practices have been found, such as:

- using “reply to all” when responding to emails
- downloading or streaming videos unnecessarily
- sending emails with large attachments.

Discuss whether the senior managers at *Wei Tan Enterprises* should focus on managing employees’ digital behaviour through an education programme, rather than by controlling their access to digital resources. [8]
