International Baccalaureate®
Baccalauréat International
Bachillerato Internacional

INFORMATION TECHNOLOGY IN A GLOBAL SOCIETY
STANDARD LEVEL
PAPER 2

Friday 4 November 2011 (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.

Blank page

SECTION A

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

Area of impact: Business and employment

1. Biometrics makes use of pattern recognition in order to identify individuals. It is no longer confined to major physical characteristics such as fingerprints. More subtle measures, such as a person's gait (the way a person walks), are now being used to identify individuals through video matching.

    Recently, gait recognition using recorded video images was admitted as evidence in UK courts. One man was convicted of a burglary after experts used video matching to compare video images of him at the crime scene with images of him in custody.

    [Source: http://news.bbc.co.uk/2/hi/programmes/click_online/7702065.stm, 15 October 2009]
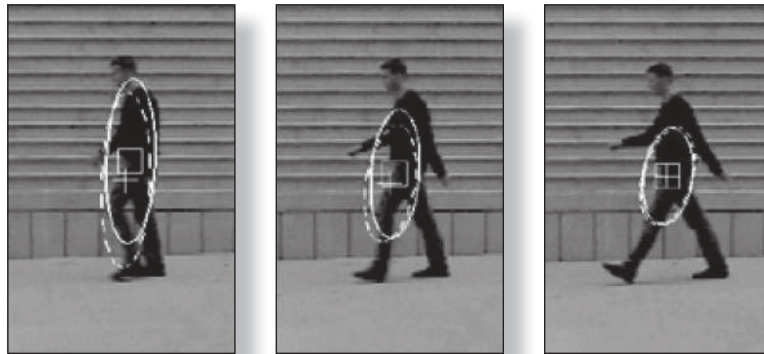
    [Source: adapted from http://lfb.rwth-aachen.de/en/education/Workshop/s.meyer.html, 23 March 2011]

    (a) Define the term *pattern recognition*. *[2 marks]*

    (b) In addition to fingerprints, describe **two** other methods of biometric recognition. *[4 marks]*

    (c) Explain why biometrics is increasingly used to authenticate employees entering a building. *[4 marks]*

    (d) Discuss the advantages and disadvantages of using the way a person walks (video gait pattern recognition) to verify the person's identity. *[10 marks]*

SECTION B

*Answer **two** questions.*

Area of impact: Education

2. *Simplified Alerts* is an internet-based, mass SMS* alert notification system. It is designed for schools to send SMS advisory, weather, and emergency alerts to the cell (mobile) phones or e-mail addresses of parents and school staff. Administrators can customize a sign-up form, pre-set text messages, and send to user categories or entire lists. Parents need to sign up and opt in to receive messages. This ensures that messages will not be treated as spam.

    [Source: adapted from http://simplifiedalerts.com/schoolalerts/index.html, 12 October 2009, used with permission]

    _____
    *   SMS: a text message sent on a cell (mobile) phone

    (a) Define the term *spam*.   *[2 marks]*

    (b) Many schools no longer print and post newsletters.

         Describe **two** ways schools can distribute newsletters electronically to parents and the school community.   *[4 marks]*

    (c) Many parents receive the SMS alerts on their smart phones. The latest smart phones come with up to 32 GB of storage.
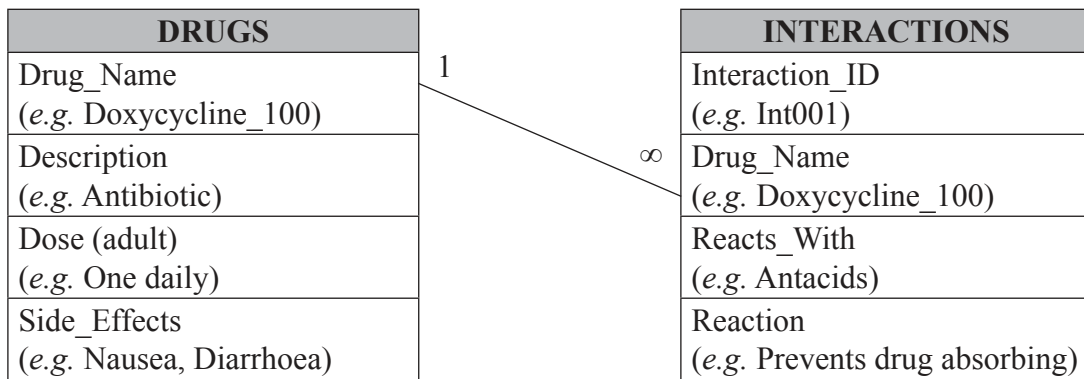
         Explain the reasons why many people want this amount of storage on their smart phones.   *[4 marks]*

    (d) Discuss the advantages and disadvantages of introducing *Simplified Alerts* for schools **and** parents.   *[10 marks]*

Area of impact: Health

3. In the past, during a medical visit, it was common for the doctor to consult a textbook before prescribing drugs for a patient. This book listed prescribed doses, any side effects, interactions with other drugs the patient is taking and warnings for patients with certain conditions such as pregnancy.

    Today these textbooks are being replaced by electronic versions which use relational databases to store the information. A simplified version of a prescription database is shown in the diagram below.

DRUGS
Drug_Name (*e.g.* Doxycycline_100)
Description (*e.g.* Antibiotic)
Dose (adult) (*e.g.* One daily)
Side_Effects (*e.g.* Nausea, Diarrhoea)

1 ∞

INTERACTIONS
Interaction_ID (*e.g.* Int001)
Drug_Name (*e.g.* Doxycycline_100)
Reacts_With (*e.g.* Antacids)
Reaction (*e.g.* Prevents drug absorbing)

Using this relational database a doctor can search DRUGS to check the correct dose for the patient and warn the patient about side effects. By linking to INTERACTIONS the doctor can check if the prescribed drug has any adverse interactions with other drugs the patient is taking.

By linking to another table, such as one containing information about drug warnings, the doctor is alerted to potential problems. For example, some drugs taken during pregnancy can harm the baby.

The information is stored in a relational database such as the one illustrated above. The brackets contain examples of typical data for the antibiotic Doxycycline_100.

[Source: http://mims.com.au, 13 October 2009] © MIMS Australia. Used with permission

(a) With reference to the relational database diagram above, describe the nature of the relationship between the table DRUGS and the table INTERACTIONS. *[2 marks]*

(b) It is important that the database is accurate.

     Describe **two** design features that a database designer could use to prevent data input errors. *[4 marks]*

(c) This prescription database now comes in many electronic formats. Two possible formats are a CD-ROM version and an online version accessible through a web site.

     Compare the effectiveness of these two formats in providing a doctor with the necessary information. *[4 marks]*

(d) Discuss how the use of the prescription database shown above can help a doctor to improve medical care. *[10 marks]*

(This question continues on the following page)

(Question 4 continued)

(a)   Identify the data type for:

    (i)   player's name   *[1 mark]*

    (ii)   player's account balance.   *[1 mark]*

(b)   Identify the steps involved in updating the database when a player purchases a
      street from the bank or other players.   *[4 marks]*

(c)   Explain the possible reasons for the increased interest in playing internet-based
      versions of popular board games such as *Monopoly*.   *[4 marks]*

(d)   Discuss the agreements that need to be in place between *Google* and *Hasbro*
      to retain the integrity of the *Google Maps* database and to ensure the accuracy
      of the game data.   *[10 marks]*

Area of impact: Science and the environment

5. Robots that mimic the behaviour of fish that swim in groups have been developed by a Japanese car company. The purpose of this research is to develop anti-collision vehicles that can travel intelligently, avoiding each other and obstacles.

They model the behaviour of fish by two simple rules. They must:
- travel together as closely as possible but without touching
- change travelling direction without colliding.

A vehicle is being developed as a tiny robot called *EPORO* that can move in a group without touching its travelling companions. The new three-wheeled robot is designed to travel in groups. Each uses a laser sensor to measure the distance between obstacles. The data is constantly shared between the robots, allowing the group to travel together without bumping into each other. The technique allows the cars to travel side-by-side or quickly switch direction as a group.

(a) Describe **one** way in which a robot can distinguish between another robot and a different object. *[2 marks]*

(b) Identify the step-by-step process that robots follow in order to remain within a certain distance of each other. *[4 marks]*

(c) Explain **two** real-life situations on a road that would make the model ineffective. *[4 marks]*

(d) Discuss the issues that arise when putting total responsibility for driving in the hands of robots. *[10 marks]*

Area of impact: Politics and government

6. Highly sensitive details of a United States military missile air defence system were found on a second-hand hard drive bought on *eBay*, an online auction web site. The test launch procedures to shoot down missiles were found on the hard drive. The hard drive also contained security policies, details of the layout of the facilities and personal information on military employees.

The government is keen to ensure that old computers are disposed of in a responsible way.

[Source: http://dailymail.co.uk/news/article-1178239/Computer-hard-drive-sold-eBay-details-secret-U-S-missile-defence-system.html, 7 May 2009]

(a) Identify **two** devices that can be used as portable storage media. *[2 marks]*

(b) Describe **two** ways to ensure that data cannot be retrieved when computer components are disposed of. *[4 marks]*

(c) Compare **two** different methods used to dispose of computer hardware that is no longer required by an organization. *[4 marks]*

(d) A government has introduced two policies to prevent unauthorized access to sensitive data:
    • employees must have secure passwords that they do not share with anyone
    • no sensitive data can be downloaded from the main server to any other devices.

To what extent will these two policies prevent unauthorized access to sensitive data? *[10 marks]*