IB DIPLOMA PROGRAMME
PROGRAMME DU DIPLÔME DU BI
PROGRAMA DEL DIPLOMA DEL BI

M07/3/ITGSX/SP2/ENG/TZ0/XX/M+

MARKSCHEME

May 2007

INFORMATION TECHNOLOGY IN A GLOBAL SOCIETY

Standard Level

Paper 2

22 pages

Area of Impact: Business and Employment

1. (a) Identify *two* other physical characteristics, other than fingerprints, that are currently used in biometric systems. ***[2 marks]***

Answers may include:
- hand geometry
- iris/retina scanning
- voice recognition
- facial pattern recognition.

Examiners should be aware that candidates may take a different approach, which if appropriate should be fully rewarded. If in doubt, check with your team leader.

*Award **[1 mark]** for each physical characteristic identified up to a maximum of **[2 marks]**.*

(b) With reference to the information technology (IT) that underpins biometrics, describe the process of biometric authentication. ***[4 marks]***

[1-2 marks]
Description of first scanning and storing in database
- *biometric feature is **initially scanned***
- *scanned features are **stored in database** together with other personal information.*

[3-4 marks]
Description of scanning when in need to authenticate and then matching to features stored in database
- *biometric feature is **re-scanned** when person needs to be authenticated*
- *scanned feature is **matched** with information in database and if a match then it is authenticated, if no match then it is rejected.*

(c) Explain why biometric options for payments at retail stores could be considered better than credit card signatures when authenticating the user. ***[4 marks]***

Sample answer:
"Credit card signatures are open to much fraud. Individuals often lose their credit card, or have it skimmed or stolen. Criminals, who get hold of the credit card, are able to forge the signature. Some criminals don't even bother to forge the signature as sales people often do not check the signature and, if they do, are often unwilling to confront the card-holder if they have concerns about the signature. Biometrics is considered much more reliable in determining the identity of the card-user. With fingerprint recognition considered about 99% accurate, both customers and shopkeepers feel safe using the system. Signatures are not good at proving the identity of the user – biometrics are."

Examiners should be aware that candidates may take a different approach, which if appropriate should be fully rewarded. If in doubt, check with your team leader.

[1-2 marks]
Describes advantages or disadvantages of biometrics and/or credit card when used for authentication.

[3-4 marks]
Balanced comparison of biometrics and credit card with a reason at top end of the band.

(d) Discuss the concerns that people might have with the widespread use of biometric technology by several retail stores and different institutions. ***[10 marks]***

Answers may include:

- identity theft – if the original templates, such as high resolution images of fingerprints, were stolen, they could potentially be used by criminals in an attempt to steal a person's identity
- physical concerns – some people believe that certain biometric technology can cause physical harm or discomfort. Iris/retina scanning may not always be clean, possibly leading to eye disease. People feel very sensitive and protective about their eyes
- privacy – there may be concerns that personal information taken through biometric methods, could be sold to other organizations without the individual's consent or knowledge. The information could be used for a multitude of purposes other than the one for which it was initially intended. This is known as function creep
- erosion of civil liberties – many people believe that a person's anonymity is a fundamental right. If people are forced to use biometric options, for an ID card for example, the 'state' would be intruding into our private lives, with the potential to have control over our everyday activities
- cost to citizens travelling. Biometric passports will cost much more to produce and maintain the records than traditional passport
- reliability – any biometric system is only as good as the initial enrolment system. If someone is improperly registered as a legitimate user, because the initial identification process is flawed, then the whole system is fundamentally flawed. While some biometric applications, like finger recognition, are considered reliable, other options are not and can have an error rate as high as 40%
- policies and standards – unless appropriate policies, standards and laws are developed and enforced, the system is likely to be abused
- Integrity – biometric data, like any IT data, will lack integrity when it has been changed accidentally or tampered with. Because there is human input in the processes problems could occur.

N.B. Accept examples relating to any reasonable institution or organization, including governments.

Examiners should be aware that candidates may take a different approach, which if appropriate should be fully rewarded. If in doubt, check with your team leader.

A range of concerns are expected to be discussed.

Level 0	*0 marks*	*Inappropriate answer.*
Level 1	*1-2 marks*	*A brief and generalized response with very little knowledge and understanding of IT issues.* *Very little use of IT terms.*
Level 2	*3-5 marks*	*Some knowledge and understanding of IT issues, although a tendency toward fragmentary, irrelevant, 'common sense' points at the bottom of the band.* *Basic use of IT terms.* *A description that has a basic sense of structure, but it is not sustained throughout the answer. (DESCRIPTION)*
Level 3	*6-7 marks*	*A secure knowledge and understanding of IT issues.* *Appropriate use of IT terms.* *A clear and coherent examination that may be unbalanced.* *An understanding of the way IT facts and ideas are related at the top end of the band. (EXAMINATION)*
Level 4	*8-10 marks*	*Very good knowledge and understanding of IT issues.* *Good use of IT terms throughout the response.* *A detailed and balanced discussion.* *Clear understanding of the way IT facts and ideas are related.* *Opinions and/or conclusions, albeit tentative, are provided and are well supported at the top end of the band. (OPINION)*

Area of Impact: Education

2. (a) One Spanish newspaper site has the following URL:

http://www.thelocalnews.es/

(i) Identify the part of this URL that indicates the country where the web site is located. ***[1 mark]***

- es

A*ward **[1 mark]** for the correct answer*.

(ii) Identify the domain name of this web site. ***[1 mark]***

- thelocalnews.es
- www.thelocalnews.es

*Award **[1 mark]** for the correct answer.*

(b) Describe *two* ways in which a search engine can be used to locate a source of Spanish text. ***[4 marks]***

Answers may include:

- suitable search string containing the word "Spanish" or "Spain" (or other suitable country)
- search string contains sufficient other clues such as "literature" or "news".

- use search engine advanced / further features
- choose Spanish as language.

- use search engine preferences
- select language Spanish from list.

- filter for suitable country domain suffixes
- example such as .es or .ar or .cl or .pe or .mx

- search string with text in Spanish language
- examples of any text in Spanish like "animals en peligro" or "turismo en Chile".

Examiners should be aware that candidates may take a different approach, which if appropriate should be fully rewarded. If in doubt, check with your team leader.

*Award **[1 mark]** for identifying each way up to a maximum of **[2 marks]**. Award **[1 additional mark]** for describing each way up to a maximum of **[2 additional marks]**.*

(c) The web based translator shown in the screen shot has translated the Spanish passage into rather peculiar English. Explain why computer based translators often perform translations rather badly. ***[4 marks]***

Translation is a very difficult process. Language use can be variable/non standard and so translation is not a precise science. Idiomatic use of language may be difficult to translate. Unexpected word order may occur and this will be difficult for the software to interpret. Use of slang may not be understood and it is used variably. Words may not be in the dictionary or be mis-spelt. Some words may have more than one meaning and this can require very complex processing/algorithms. The meaning of words may depend on the context which requires yet further analysis to be performed by the software.

E*xaminers should be aware that candidates may take a different approach, which if appropriate should be fully rewarded. If in doubt, check with your team leader.*

[1-2 marks]
Describes the features of translators e.g. word to word, no context, synonyms.

[3 marks]
Translators must take into account more than simple matching of words (context, colloquial use of language).

[4 marks]
Coherent answer with reasons.

(d) Evaluate the use of web based-translators and other IT resources to help a student learn a new language. ***[10 marks]***

Answer may include:

- IT resources available 24/7
- Many IT resources available as free tools
- IT resources give fast response
- use of translators
  - can enhance skills by working on poor quality translation
  - single words can be tested
  - different translators may be used and results compared
- On line communications with native speakers
  - video conferencing to speak to native speakers
  - MSN / web chat to speak to native speakers
- radio streaming to listen to live radio in other countries.

Balanced discussion may include limitations, *e.g.*

- limited due to literal translations, matches words with database
- words can have two meanings
- not contextual
- no feedback compared with teacher/school
- eliminates thinking and need for vocabulary.
- IT resources may be inflexible (e.g. an interactive DVD).

Examiners should be aware that candidates may take a different approach, which if appropriate should be fully rewarded. If in doubt, check with your team leader.

Level 0	*0 marks*	*Inappropriate answer.*
Level 1	*1-2 marks*	*A brief and general answer.* *Very limited knowledge of IT theory.* *Very little or no reference to social implications.* *Significant errors and omissions of important information.*
Level 2	*3-5 marks*	*A limited, descriptive answer.* *Some knowledge of basic IT theory.* *Some reference to social issues.* *Some relevant terms explained.* *Some understanding of the ways facts or ideas may be related at the top of the band.*
Level 3	*6-7 marks*	*An understanding of the specific demands of the question.* *A coherent and logically structured answer.* *A sound knowledge of IT theory.* *Appropriate reference to social issues.* *An attempt to show underlying assumptions and important relationships at the top of the band.*
Level 4	*8-10 marks*	*Clear understanding of the specific demands of the question.* *A detailed, coherent and logically structured answer.* *Good knowledge of IT theory.* *Appropriate reference to social issues.* *Where appropriate, examples have been used.* *Evidence of appropriate evaluation, although it may be unbalanced at the lower end of the band.* *An appraisal is made at the top end of the band.* *No major errors.*

Area of Impact: Health

3. (a) (i) Define the term *GHz*. ***[1 mark]***

Answers may incude:
- gigaHertz
- one billion Hertz
- speed of processing.

Examiners should be aware that candidates may take a different approach, which if appropriate should be fully rewarded. If in doubt, check with your team leader.

*Award **[1 mark]** for either of the above points.*

(ii) Identify the component of the processor to which 1 GHz refers. ***[1 mark]***

- clock.

*Award **[1 mark]** for the correct answer.*

(b) Describe *two* other hardware features that would be necessary for voice activated input. ***[4 marks]***

Answers may include:

- microphone / headset plus description
  e.g. to convert sound (energy) to electrical impulses.

- large amount of RAM plus description
  e.g. this will increase speed of operation / reason for this, such as less need for disk access/large amount of data from sound input.

- sound card plus description
  e.g. to produce signals to be sent to loudspeaker / to receive signals from microphone.

- A/D converter plus description
  e.g. to change microphone's analogue signals to digital.

Examiners should be aware that candidates may take a different approach, which if appropriate should be fully rewarded. If in doubt, check with your team leader.

*Award **[1 mark]** for identifying each feature up to a maximum of **[2 marks]**. Award **[1 additional mark]** for describing each feature up to a maximum of **[2 additional marks]**.*

(c) Explain why the voice activated system must be trained before it can be used. ***[4 marks]***

Sample answer:
"Voice recognition allows a user to use his/her voice as an input device. Analog audio is converted into digital signals. For a computer to decipher the signal, it must have a digital database/vocabulary. This is stored on the hard drive and then loaded into memory when the program is run. People's voices differ in quality, speed, pitch and accent. The system needs to have samples of user's speech in order to recognise words as spoken by the user for comparison. The more words used in training, the better able it is to interpret words correctly."

[1 mark]
Recognise user's voice.

[2-3 marks]
Matches user's pronunciation with database of words.

[4 marks]
Reason – e.g. allow for different accents.

(d) Discuss how voice activated systems and other IT resources can be of benefit to disabled people. ***[10 marks]***

Answers may include:

- examples of common accessibility features such as colour schemes for colour blind people
- robots to carry out tasks
- how these features improve the quality of life of the disabled person
- allow disabled people to communicate/study/work
- improve self esteem
- replace disability pension
- means of income.

Balanced discussion would include difficulties *e.g.* cost of equipment, training needed.

Examiners should be aware that candidates may take a different approach, which if appropriate should be fully rewarded. If in doubt, check with your team leader.

Level 0	*0 marks*	*Inappropriate answer.*
Level 1	*1-2 marks*	*A brief and generalized response with very little knowledge and understanding of IT issues.* *Very little use of IT terms.*
Level 2	*3-5 marks*	*Some knowledge and understanding of IT issues, although a tendency toward fragmentary, irrelevant, 'common sense' points at the bottom of the band.* *Basic use of IT terms.* *A description that has a basic sense of structure, but it is not sustained throughout the answer.*
Level 3	*6-7 marks*	*A secure knowledge and understanding of IT issues.* *Appropriate use of IT terms.* *A clear and coherent examination that may be unbalanced.* *An understanding of the way IT facts and ideas are related at the top end of the band.*
Level 4	*8-10 marks*	*Very good knowledge and understanding of IT issues.* *Good use of IT terms throughout the response.* *A detailed and balanced discussion.* *Clear understanding of the way IT facts and ideas are related.* *Opinions and/or conclusions, albeit tentative, are provided and are well supported at the top end of the band.*

Area of Impact: Arts, Entertainment and Leisure

2. (a) Define the term *MP3*. ***[2 marks]***

Sample answer:
"MP3 stands for MPEG – Audio Layer 3. It is an audio compression format that allows files to be downloaded from the internet. It discards audio signals that the human brain cannot hear ("lossy" method), and then compresses the remaining audio signal."

Examiners should be aware that candidates may take a different approach, which if appropriate should be fully rewarded. If in doubt, check with your team leader.

*Award **[1 mark]** for identifying that it is a file format/audio encoding and **[1 additional mark]** for mentioning file compression.*

(b) Describe *two* tasks a user can perform with digital jukebox software. ***[4 marks]***

Answers may include:
- download music to an iPod
- organize and sort music collection
- create a list of music to play (playlist)
- change file formats
- view digital photos on the screen
- random selection ("shuffle")
- burn play list to CD
- play music/radio/video on computer
- subscribe to podcast for automatic updates
- add descriptive text/edit/add title/author
- control quality and size of imported files
- import music from CD
- access iTunes store, buy music and download to iTunes library.

Examiners should be aware that candidates may take a different approach, which if appropriate should be fully rewarded. If in doubt, check with your team leader.

*Award **[1 mark]** for each task identified up to a maximum of **[2 marks]**. Award **[1 additional mark]** for the description of each task up to a maximum of **[2 additional marks]**.*

(c) Explain the implication of bit rate when downloading music. ***[4 marks]***

Bit rates refer to the number of data bits required per second of audio.
The higher the bit rate:

- the better the quality
- the more space the file requires and
- the more time it takes to transfer.

Examiners should be aware that candidates may take a different approach, which if appropriate should be fully rewarded. If in doubt, check with your team leader.

[1-2 marks]

- *Bit rate affects the time it takes to download a file.*
- *The higher the bit rate then the file will be larger.*

[3-4 marks]
Reasons why large files may take more time to download taking into consideration other factors such a quality of modem, internet connection, processor speed of computer.

OR

Bit rate can be defined as:
"the ratio of the number of pieces of information that are transferred between devices in a specified amount of time, typically one second"

[1-2 marks]

- *Bit rates affect the time it takes to download a file.*
- *The higher the bit rate the quicker the data will be downloaded.*

[3-4 marks]
The bit rate may be affected by other factors, such as quality of modem, internet connection, processor speed of computer.

(d) Evaluate the impact digital audio players have had on the music industry. ***[10 marks]***

Answers may include:

- it has enabled easy and cheap access to a vast amount of music
- new artists and their music may be promoted/music of new artists may be produced and reproduced to be shared between audio player users
- new business models are being developed for online business with music files
- the development of anti-piracy software to prevent unauthorised copying of MP3 files
- less sales because easier to make illegal copies of commercial songs/people carrying devices may surreptitiously steal music files from computers available
- less music being written because of loss of income to musicians and the music industry
- changes to laws to protect the copyright holders of the music.

Examiners should be aware that candidates may take a different approach, which if appropriate should be fully rewarded. If in doubt, check with your team leader.

Level 0	*0 marks*	*Inappropriate answer.*
Level 1	*1-2 marks*	*A brief and general answer.* *Very limited knowledge of IT theory.* *Very little or no reference to social implications.* *Significant errors and omissions of important information.*
Level 2	*3-5 marks*	*A limited, descriptive answer.* *Some knowledge of basic IT theory.* *Some reference to social issues.* *Some relevant terms explained.* *Some understanding of the ways facts or ideas may be related at the top of the band.*
Level 3	*6-7 marks*	*An understanding of the specific demands of the question.* *A coherent and logically structured answer.* *A sound knowledge of IT theory.* *Appropriate reference to social issues.* *An attempt to show underlying assumptions and important relationships at the top of the band.*
Level 4	*8-10 marks*	*Clear understanding of the specific demands of the question.* *A detailed, coherent and logically structured answer.* *Good knowledge of IT theory.* *Appropriate reference to social issues.* *Where appropriate, examples have been used.* *Evidence of appropriate evaluation, although it may be unbalanced at the lower end of the band.* *An appraisal is made at the top end of the band.* *No major errors.*

Area of Impact: Science and the Environment

5. (a) Identify *two* possible ways that the road sensors can detect the passing of a vehicle. ***[2 marks]***

Answers may include:
- magnetic fields (detecting the metal in the vehicles)
- inductance
- pressure/weight of vehicle
- optical/laser/infrared.

*Award **[1 mark]** for each correct point up to a maximum of **[2 marks]**.*

(b) Describe *two* ways in which the active traffic management system could help to decrease journey times. ***[4 marks]***

Answers may include:
- this leads to less turbulence/bunching
- allows higher speeds when traffic flowing smoothly
- optimises road use / can open emergency lane for traffic
- slower speeds reduce number of accidents
- this results in fewer blockages
- advice for the use of alternative routes may be provided.

Examiners should be aware that candidates may take a different approach, which if appropriate should be fully rewarded. If in doubt, check with your team leader.

*Award **[1 mark]** for each way identified up to a maximum of **[2 marks].** Award **[1 additional mark]** for describing each way up to a maximum of **[2 additional marks]**.*

(c) Explain how the images from the digital speed cameras can be used to send penalty notices to speeding drivers automatically. ***[4 marks]***

Sample answer:
"The camera captures digital images of the number plates which are designed using a special font that is standardized. This is so that the graphic image obtained can then be converted by OCR software to text data. This text data can then be added to a database of vehicles that have been caught. The owner's details can be looked up in a central database (DVLA in the UK) and the address can be accessed. This address is used to mail the penalty notice."

Examiners should be aware that candidates may take a different approach, which if appropriate should be fully rewarded. If in doubt, check with your team leader.

[1 mark]
Camera captures number plate.

[2-3 marks]
Image sent to central office, matched to database of number plates (manual or automatic). Locates owner's address, post penalty notice.

[4 marks]
A clear, coherent and precise description of how the data is captured and converted with detailed description of the matching process with the owner's database. Reasons: accuracy, evidence provided.

(d) Discuss how the active traffic management system could be abused by the authorities. ***[10 marks]***

Answers may include:

- excessive data collection about people's movements
  – this could be used to investigate for irrelevant reasons
  – more intrusion by state into private lives
- overzealous use of speed cameras for revenue generation
- data might be passed to other government departments
- data might be passed to commercial organisations
  – consequences such as junk mail/criminal accusations.

Examiners should be aware that candidates may take a different approach, which if appropriate should be fully rewarded. If in doubt, check with your team leader.

Level 0	*0 marks*	*Inappropriate answer.*
Level 1	*1-2 marks*	*A brief and generalized response with very little knowledge and understanding of IT issues.* *Very little use of IT terms.*
Level 2	*3-5 marks*	*Some knowledge and understanding of IT issues, although a tendency toward fragmentary, irrelevant, 'common sense' points at the bottom of the band.* *Basic use of IT terms.* *A description that has a basic sense of structure, but it is not sustained throughout the answer.*
Level 3	*6-7 marks*	*A secure knowledge and understanding of IT issues.* *Appropriate use of IT terms.* *A clear and coherent examination that may be unbalanced.* *An understanding of the way IT facts and ideas are related at the top end of the band.*
Level 4	*8-10 marks*	*Very good knowledge and understanding of IT issues.* *Good use of IT terms throughout the response.* *A detailed and balanced discussion.* *Clear understanding of the way IT facts and ideas are related.* *Opinions and/or conclusions, albeit tentative, are provided and are well supported at the top end of the band.*

Area of Impact: Politics and Government

6. (a) Identify *two* software items needed in the government computer (Item 5 in the picture) to be able to pinpoint the location of the offender. ***[2 marks]***

Answers may include:
- mapping software (*e.g.* a Geographic Information System)
- communication software to receive signal from satellite
- database software (to manage data about offenders).

Examiners should be aware that candidates may take a different approach, which if appropriate should be fully rewarded. If in doubt, check with your team leader.

*Award **[1 mark]** for each item up to a maximum of **[2 marks]**.*

(b) Describe *two* other uses of tracking devices apart from tracking the location of criminals. ***[4 marks]***

Answers may include:
- Tracking mobile phone location – in case of emergency if someone is in danger, police may be able to quickly locate the person.
- Tracking vehicles – this is particularly relevant for trying to find stolen vehicles.
- Tracking military weapons – it is important to be able to track missiles, for example.
- Tracking airplanes and ships – so that they are not straying toward dangerous objects.
- Geocaching – allowing individuals to travel to specific places (hikers).
- Tracking of dementia patients – because if they get lost they may not be able to explain where they live.
- Tracking of young children – in case they get lost.
- Tracking of pets – again if they get lost.
- Tracking of wildlife – to investigate migrations.

Examiners should be aware that candidates may take a different approach, which if appropriate should be fully rewarded. If in doubt, check with your team leader.

*Award **[1 mark]** for identifying the uses up to a maximum of **[2 marks]**. Award **[1 additional mark]** for describing each use up to a maximum of **[2 additional marks]**.*

(c) Explain the relationship between items 2, 3 and 4 in the picture. ***[4 marks]***

Sample answer:
"The relationship between items 2, 3 and 4 in the picture indicates that the items are part of a GPS (Global Positioning System) tracking system. The belt device on the criminal indicates the precise location of the criminal using signals from the satellites (item 2). It does this at regular intervals. The information is then transmitted from the electronic transmitter on the criminal's ankle, to a telephone network (item 3) and then on to the control centre (item 4) for interpretation and action."

Examiners should be aware that candidates may take a different approach, which if appropriate should be fully rewarded. If in doubt, check with your team leader.

[1 mark]
A limited response that indicates very little understanding of the components in the graphic.

[2-3 marks]
The description clearly presents the purposes of the components.

[4 marks]
An explanation of the components in the graphic with an explanation of the processing and the relationship between each component.

(d) Evaluate the use of electronic tagging as a method of monitoring the location of convicted criminals. ***[10 marks]***

Answers may include:

- saves money for the Government as no need to house / feed prisoner and less prison staff needed
- safer for the community as offenders who may not normally be sent to prison may be monitored. Alternatively, however, some criminals who would remain in prison, are released early
- families will not be left without the company / economic support of convicted family member
- convicted criminals are not in contact with other criminals but are allowed to lead a "normal" life / more opportunity for rehabilitation into society
- there is the risk of offenders taking off the devices, surveillance much less safe than prison internment
- it does nothing to prevent further crimes.

Examiners should be aware that candidates may take a different approach, which if appropriate should be fully rewarded. If in doubt, check with your team leader.

Level 0	*0 marks*	*Inappropriate answer.*
Level 1	*1-2 marks*	*A brief and general answer.* *Very limited knowledge of IT theory.* *Very little or no reference to social implications.* *Significant errors and omissions of important information.*
Level 2	*3-5 marks*	*A limited, descriptive answer.* *Some knowledge of basic IT theory.* *Some reference to social issues.* *Some relevant terms explained.* *Some understanding of the ways facts or ideas may be related at the top of the band.*
Level 3	*6-7 marks*	*An understanding of the specific demands of the question.* *A coherent and logically structured answer.* *A sound knowledge of IT theory.* *Appropriate reference to social issues.* *An attempt to show underlying assumptions and important relationships at the top of the band.*
Level 4	*8-10 marks*	*Clear understanding of the specific demands of the question.* *A detailed, coherent and logically structured answer.* *Good knowledge of IT theory.* *Appropriate reference to social issues.* *Where appropriate, examples have been used.* *Evidence of appropriate evaluation, although it may be unbalanced at the lower end of the band.* *An appraisal is made at the top end of the band.* *No major errors.*