M15/3/ITGSX/SP1/ENG/TZ0/XX/M

Diploma Programme
Programme du diplôme
Programa del Diploma

Markscheme

May 2015

Information technology in a global society

Standard level

Paper 1

21 pages

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

In the case of an "identify" question read all answers and mark positively up to the maximum marks. Disregard incorrect answers. In all other cases where a question asks for a certain number of facts *eg* "describe two kinds", mark the **first two** correct answers. This could include two descriptions, one description and one identification, or two identifications.

It should be recognized that, given time constraints, answers for part (c) questions are likely to include a much narrower range of issues and concepts than identified in the markband. There is no "correct" answer. Examiners must be prepared to award full marks to answers which synthesize and evaluate even if they do not examine all the stimulus material.

1. BodyGuardian

Note to examiners.
- *All part a questions are marked using ticks and annotations where appropriate*
- *Part b and part c are marked using markbands. Use annotations and text comments to provide a rationale behind the marks you awarded.* ***Do not use ticks***

(a) (i) Identify **two** health indicators that could be measured by the BodyGuardian device. **[2]**

Answers may include:
- body temperature
- respiratory rate
- blood pressure
- sugar levels (blood glucose)
- heart rate/pulse rate
- electrocardiogram (ECG).

Award ***[1]*** *for each of the above up to a maximum of* ***[2]****.*

(ii) Identify **four** steps taken by the software to decide if a health indicator measurement needs to be sent to a doctor for a decision. **[4]**

Answers may include:
- device takes the measurement
- measurement converted to digital data/ analogue to digital conversion (ADC)
- data sent from BodyGuardian device to smartphone
- patient data is uploaded to mHealth system for analysis
- value is compared with the “normal” value stored in device for patient
- if value is outside accepted range, then signal is sent to doctor for action to be taken
- if value is inside accepted range, then no signal is sent
- device waits for next time interval to take new measurement.

Consider any four steps in the response.

Award ***[1]*** *for each step up to a maximum of* ***[4]****.*

(b) The managers of mHealth are investigating the nature of passwords used by doctors to access patient information. The two options being investigated are:
- the doctor creates a password that does not need to be changed
- the mHealth system requires doctors to create a strong password that must be changed every 40 days.

Analyse these **two** options. **[6]**

Answers may include:
- Option: password created by doctor that does not need to be changed
  - familiar for doctor and probably easy for him to remember
  - no need to write it down therefore it will not be found by others
  - others with access to the computer may "guess" it if they know the doctor well
  - if the password is discovered/cracked it can be used for an indefinite time period. the doctor may not be aware that the password has been compromised
  - may allow doctor to access account faster as no need to look-up the password
  - a password that is never changed creates a security problem as people close to doctor may find out the password (*ie* see it, guess it)
  - may not be a strong password
- Option: strong password created by doctors that must be changed every 40 days
  - secure as it may not be related to the doctor – therefore difficult to guess
  - the need of constantly updating the password in mHealth will improve the security as it may be harder to guess
  - may be difficult for doctors to remember which variant of the password they have used
  - doctor may need to keep it written down – therefore it has the risk of being found by others
  - may have difficult characters that may not be in a keyboard of mobile devices.

[1–2]*: A limited response that demonstrates minimal knowledge and understanding of the topic and uses little or no appropriate ITGS terminology. Only one of the options is addressed in the response.*

[3–4]*: A partial analysis, either lacking detail or balance, that demonstrates some knowledge and understanding of the topic. Some relevant examples from the scenario are used within the response. There is some use of appropriate ITGS terminology in the response. Both options are either explicitly or implicitly implied in the response.*

[5–6]*: A balanced and detailed analysis of the issue which demonstrates thorough knowledge and understanding of the topic. Relevant examples from the scenario are used throughout the response. There is appropriate ITGS terminology throughout the response. Both options are explicitly addressed in the response.*

(c) As part of the development of the BodyGuardian device, it is being tested in clinical trials by doctors and patients.

Discuss the implications for doctors and patients of trialling the BodyGuardian device before it is sold publicly. **[8]**

Answers may include:

- may have to do double checks: with and without the device – this will take more time and put the patient under unnecessary stress / may take time from busy doctors
- if doctors/patients discover that incorrect information is being sent from the device they may not trust it / feel uncomfortable about having to use it
- if device works well doctors/patients may advertise it positively, making others more willing to use it
- doctors/patients may need training to use the device
- patients in the trial may feel their health is being more effectively monitored
- patients and/or doctors may provide feedback to improve final device
- patients may need to be assured that security measures have been taken to protect the privacy of their data
- doctors may have an opportunity to learn how to use the device before it is sold publicly.

In part (c) of this question it is expected there will be a balance in the ITGS terminology between IT technical terminology and the terminology related to social and ethical impacts.

Please see generic markband information sheet on page 21.

2. 3D printing

Note to examiners.
- *All part a questions are marked using ticks and annotations where appropriate*
- *Part b and part c are marked using markbands. Use annotations and text comments to provide a rationale behind the marks you awarded.* ***Do not use ticks***

(a) (i) Identify **two** ways that a 2D image file can be input into the 3D printer software. **[2]**

Answers may include:
- 2D images *imported* imported into the 3D printer software
- 2D images are *opened* by the 3D printer software
- 2D file is converted into a format required by the 3D printer software by another file conversion program.

Award ***[1]*** *for each way up to a maximum of* ***[2]****.*

(ii) Identify **four** of the steps required to produce Charlie's replacement foot. **[4]**

Answers may include:
- images of the other duck's foot are imported into the 3D printer/modelling software
- the software creates a 3D image/model of the foot from the images
- the 3D image/model is edited to make it the same size as Charlie's foot
- printer is loaded with the type of raw material needed for creating the foot
- the 3D image/model of the foot is sent to the 3D printer
- the 3D printer creates the replacement foot

Award ***[1]*** *for each step up to a maximum of* ***[4]****.*

(b) Analyse Alejandro Toys's decision to either use open source software or to purchase proprietary software to produce the company's 3D toys. **[6]**

Answers may include:

- open-source software is often free or low-cost, allowing the company to aquire more software within a limited budget / proprietary software may demand a higher level of investment by the company
- open-source software can be changed or customised to suit the company's requirements – the source code is available for programmers to modify / proprietary software can only be modified by the manufacturer
- open-source software may have "bugs" that have not yet been reported which affect the company's production (ie may take time to be fixed) / proprietary software manufacturers may release patches/bug-fixes on a regular basis
- open-source software may not have all the options/features needed by the company / proprietary software often has a greater range of options/features
- manufacturers of proprietary software can provide support and assistance to the company / open-source software often has limited support
- using open source software for producing the 3D toys may require hiring more programming staff to upgrade the software

***[1–2]**: A limited response that demonstrates minimal knowledge and understanding of the topic and uses little or no appropriate ITGS terminology. Only open-source software or proprietary software is explicitly referred to in the response.*

***[3–4]**: A partial analysis, either lacking detail or balance, that demonstrates some knowledge and understanding of the topic. Some relevant examples are used within the response. There is some use of appropriate ITGS terminology in the response. Both open-source software and proprietary software are explicitly or implicitly referred to in the response.*

***[5–6]**: A balanced and detailed analysis of the issue which demonstrates thorough knowledge and understanding of the topic. Relevant examples are used throughout the response. There is appropriate ITGS terminology throughout the response. Both open-source software and proprietary software are explicitly referred to in the response.*

(c) It is now possible to use a 3D printer to print a large range of products in addition to toys. These include guns, bicycles and human prosthetic limbs. However some governments are concerned about the software for 3D printers being freely available on the internet.

To what extent should governments regulate the access to software for 3D printers? **[8]**

Answers may include:
Regulation of the access to software for 3D printers

- could aim to ensure good quality of the 3D objects being made. 3D software may allow for sub-standard / faulty 3D objects to be manufactured, creating risks for users
- could aim to prevent the manufacture of artifacts that are only sold with a licence (eg guns). However if similar shapes are needed for other articles, their manufacture may be prevented by mistake Eg: if a certain shape is recognized the software may not allow it to be printed
- could protect manufacturers of copyrighted products. Owners of 3D printers would be prevented from making them
- could prevent owners of 3D printers making their own objects freely, stifling innovation
- could mean an invasion of privacy. It is possible to know what blueprint is being downloaded to which IP address
- to what extent is regulation possible.

In part (c) of this question it is expected there will be a balance in the ITGS terminology between IT technical terminology and the terminology related to social and ethical impacts.

Please see generic markband information sheet on page 21.

3. Small town book shop moves to computer-based records

Note to examiners.
- *Part a and part b questions are marked using ticks and annotations where appropriate*
- *Part c are marked using markbands. Use annotations and text comments to provide a rationale behind the marks you awarded. Do not use ticks*

(a) (i) Daniela needs to see the books in alphabetical order, with the "Subject area" sorted from A to Z and then the "Number of books" sorted from largest to smallest.

State the author that would appear in the first row of the sorted spreadsheet using only the books shown in **Figure 5**. **[1]**

- Badke

*Award **[1]** for the correct answer shown above.*

(ii) State the formula that would be required to add up the cost of all the books in the book store. **[1]**

Answer may include:
- =SUM(G2:G401)
- =SUMA(G2:G401)
- =ADD(G2:G401)
- =∑(G2:G401). (where xxxx is another valid formula which adds the numbers in cells G2 through G401)
- =G2+G3+...+G401

*Award **[1]** for any one of the above.*

(iii) Daniela now thinks that she should have installed a database for the information about the books. Outline **two** advantages that a database would have over a spreadsheet for the El Hoyo book shop. **[4]**

Answers may include:

- queries can be done to select specific records, *ie* English books
- reports can be made (ie summary of all the books that have been purchased, labels can be printed to label the books/bookshelves etc.)
- databases may reduce data redundancy and allow for more efficient storage & updating of data than spreadsheets
- a user interface can be included for the book shop staff without much IT knowledge, using spreadsheets may require a greater level of IT capability
- databases allow for data for a large number of books to be stored and accessed without increasing complexity for the user.
- databases allow the field choices to be set so that only certain types of data may be entered (e.g. Type of book, language etc.). Spreadsheets to not have this possibility.
- a database can limit the view of the data for particular users (e.g. Daniela as the shop manager, may be able to view more data than the rest of the staff), a spreadsheet does not have this capability

Note:. If an advantage is generic with no reference to the book shop, a maximum of 1 mark is awarded for identifying the advantage.

*Award **[1]** for identifying an advantage and an additional **[1]** for an outline for that advantage.*

*Award up to a maximum of **[4]** for the question.*

(b) Explain **three** impacts that the new computer system may have for the staff at the book shop. **[6]**

Answers may include:

- the salesperson may have to learn/receive training on how to use the computer and software. This may involve additional time commitment.
- the salesperson may request new software applications (ie image editing software to create posters about the books) or hardware (ie barcode scanners) and this may involve costs
- shop owner may now expect the salesperson to perform analysis of sales/inventory
- having a computer may allow the salesperson to perform additional tasks (ie printing of advertisements about new books, mail merged letters, ordering books from their supplier)
- employees work will be easier and faster as they can check directly in the computer if they have a copy of the book
- staff will no longer have to calculate the costs of books manually leading to less errors in charging customers/fewer customer complaints
- staff are able to query the book database for specific information (e.g. all of the books written by a certain author, all books which cost less than $200).

*Award **[1]** for each impact identified, and an additional **[1]** for an appropriate explanation of that impact.*

*Award a maximum of **[6]** for the response.*

(c) El Hoyo receives a large number of tourists during the summer when the fruit festival takes place, but suffers from periods of poor internet connectivity. Daniela has now created a separate area in the book shop that has several computers with free broadband internet access so that tourists can use them to check their emails and find information about the local area.

Evaluate the impacts of this initiative for Daniela as shop manager. **[8]**

Answers may include:

- additional staff with IT expertise may be needed to work in that area if the demand is high installation. Daniela may need to meet additional wage costs
- maintenance and repairs may be needed if the equipment is used frequently, increasing costs to the shop
- website blocking software, antivirus and firewalls may be needed to be installed which may increase costs to the shop
- the shop may become a popular place and sales of books may increase
- Daniela's investment may not be cost effective if demand for the bookshop's internet access decreases
- Daniela may need to develop an acceptable use policy
- Daniella may have access to the browser histories on the computers and could use that information to help decide what books to stock

Note: Do not award marks for references to staff being able to search faster or more easily for information relating to books. This is stated in the scenario.

In part (c) of this question it is expected there will be a balance in the ITGS terminology between IT technical terminology and the terminology related to social and ethical impacts.

Please see generic markband information sheet on page 21.

4. Digital citizenship

Note to examiners.

- All part a questions are marked using ticks and annotations where appropriate
- Part b and part c are marked using markbands. Use annotations and text comments to provide a rationale behind the marks you awarded. **Do not use ticks**

(a) (i) Outline **one** difference between streaming and downloading videos. **[2]**

Answers may include:

- streaming video is content sent in compressed form over the internet and displayed by the viewer in real time / downloaded videos are stored on a local device and played later
- streaming video can start to be played as soon as sufficient data arrives / downloaded videos must finish downloading before they can be played
- streaming video requires a network connection to be maintained throughout the playing / downloaded video can be stored for offline playback
- streaming videos may pause or stutter if the bandwidth/data transfer rate is too low / downloaded videos are more likely to play without interruption from the hard disk
- Download videos occupy storage space on the local device / streaming videos are only stored temporarily while they are being played

*Award **[1]** for identifying a difference for either streaming or downloading videos with an implied reference to the other.*

*Award up to a maximum of **[2]** for an outline of a difference between streaming and downloading videos that explicitly refers to both methods of watching videos.*

(ii) Define the term “bandwidth”. **[2]**

Answers may include:

- bandwidth is often used as a synonym for data transfer rate
- amount of data that can be transmitted in a given amount of time
- expressed in bits per second (bit/s) (accept kb/Mb/Gb, accept answers expressed in Bytes).

*Award **[1]** for a basic comment about bandwidth with **[1]** for each additional comment up to a maximum of **[2]**.*

(iii) The science teacher wants to show to the class a video about polar bears and how they survive living near the north pole.

The size of this video is 3.2 gigabytes (GB) and is available for download. The teacher will download it in advance to be able to show it to the class without the need for an internet connection.

The school has a bandwidth of 50 megabits per second (Mbps). Calculate how long it will take the teacher to download the video.

Use 1 GB = 1000 megabyte (MB). **[2]**

Answers may include:

- convert 3.2 Gigabytes to Megabytes – $3.2 \times 1000 = 3200\,\text{MB}$
- multiply by 8 to get it into Megabits – 25 600 Mbits
- divide by 50 to get the download time – $\frac{25\,600}{50} = 512$ seconds, or 8 minutes 32 seconds.

*Award **[1]** for the correct calculation of file size 3200 MB.*
*Award **[1]** for the correct calculation into time.*

(b) At the request of the principal, the network administrator has allowed teachers to download videos. Students are still not allowed to download videos at any time using the school internet.

Analyse the impact this will have on the teachers and the students. **[6]**

Answers may include:

- teachers can download a video and save it to use it with class in the future
- teachers may have to stay after school hours if they want to download videos using the school internet as they may not have time to do it during the day
- teachers may have fewer problems with the video in class if it has been downloaded as the internet speed will not affect the playing of the video
- teachers may be better prepared for a lesson
- students may receive the a link to the videos to watch at home before the lesson
- internet speed will not affect the flow of the lesson when watching the video during a lesson
- students may ask for a copy of the video without having to use internet to download it or watch it
- students may resort to downloading study-related videos at home which could incur costs/consumption of bandwidth
- if the video is deleted/removed from the internet the teacher/student will still have a copy to use.

***[1–2]**: A limited response that demonstrates minimal knowledge and understanding of the impact of downloading videos using the school internet and uses little or no appropriate ITGS terminology.*

***[3–4]**: A partial analysis, either lacking detail or balance, that demonstrates some knowledge and understanding of the impact of downloading of videos using the school internet. Some relevant examples related to the scenario are used within the response. There is some use of appropriate ITGS terminology in the response. Award a maximum of **[4]** if only the impact on teachers or students are addressed.*

***[5–6]**: A balanced and detailed analysis of the issue which demonstrates thorough knowledge and understanding of the impact of downloading videos using the school internet. Relevant examples related to the scenario are used throughout the response. There is appropriate ITGS terminology throughout the response.*

(c) One area that the working party will focus on is the responsible use of the available bandwidth. Some teachers have found that the internet is too slow to allow a class to investigate a topic when students in different classes are using social networking sites.

To what extent can the implementation of the digital citizenship policies ensure the responsible use of technology in the school with respect to sharing the available bandwidth? **[8]**

Answers may include:

- policies without a previous education campaign /involvement of stakeholders may not work
- teachers/students may feel they can ignore the policies because they do not apply to their situation (e.g. downloading copyrighted videos to use in class because the school has insufficient bandwidth to stream them)
- digital citizenship policies are only as effective to the extent which all the stakeholders in the school community agree to follow them (e.g. students, teachers, parents, administrators etc.)
- the school may need to use technical solutions to support responsible use (e.g. blocking certain social networking sites, monitoring students network activities)

In part (c) of this question it is expected there will be a balance in the ITGS terminology between IT technical terminology and the terminology related to social and ethical impacts.

Please see generic markband information sheet on page 21.

5. Professional photography for family events

Note to examiners.

- *Part a and part b questions are marked using ticks and annotations where appropriate*
- *Part c are marked using markbands. Use annotations and text comments to provide a rationale behind the marks you awarded.* ***Do not use ticks***

(a) (i) Define the term "picture resolution". **[2]**

Answers may include:

- the number of dots, or pixels, used to create or display an image
- higher resolution means that more pixels are used to create the image/ more dots to print the image, resulting in a sharper image/improved image quality when printing
- resolution describes the detail in a picture
- resolution measured in pixels per inch (ppi) or dots per inch (dpi).

Award ***[1]*** *for a basic comment about picture resolution with* ***[1]*** *for each additional comment up to a maximum of* ***[2]****.*

(ii) Identify **two** problems that will occur if Claudia uses photographs with a low resolution. **[2]**

Answers may include:

- photos will lack detail
- photos will be pixelated when enlarged
- videos containing Claudia's photos will be pixelated when projected on a large screen
- customers will not be satisfied with the quality and will not use her services.

Award ***[1]*** *for each problem up to a maximum of* ***[2]****.*

(iii) Claudia stores photographs and videos on the hard disk of her computer. Identify **two** additional locations where these files could be stored. **[2]**

Answers may include:

- external hard disk
- Cloud storage (accept names of cloud services e.g. iCloud, Dropbox etc.). Do not accept a generic reference to 'websites'
- a set of USB flash memory devices
- optical media (e.g. CD/DVD).

Award ***[1]*** *for each location up to a maximum of* ***[2]****.*

(b) Claudia holds large amounts of personal information, photographs and videos from her customers. Explain **three** actions Claudia could take to protect the security of the information that she holds. **[6]**

Answers may include:

- save customer's files in external devices (USBs, hard drives *etc*) and keep these devices in a secure place (locked up)
- password protect the files/folders that contain customer's information
- keep files in her laptop and never let other people use the laptop
- save files with coded names instead of using customer's names for the files
- have a firewall installed to avoid hackers entering into her computer remotely
- if files are kept on her computer, use a secure password to unlock the system
- have her computer go on standby mode and request a password to re-use after a short period of inactivity
- encrypt the files / storage device so information is unreadable unless the decryption key/password is used
- use biometric authentication (e.g. fingerprint scanner, iris scanner) to control access.

*Award **[1]** for each type of action identified, and **[1]** for an appropriate explanation of that action.*

*Award a maximum of **[6]** for the response.*

(c) Claudia needs to allow potential customers to see her work. She would like to be able to show these potential customers her best pictures and a list of former clients that they may contact. Some friends have suggested that she should create a website and other friends have suggested that she should open an account on a social networking site to post her work.

Discuss these **two** alternatives as a way of showing her work to potential clients. **[8]**

Answers may include:

Website	Social networking site
• website can be created completely and show her own design (*eg* background colour, fonts, layout) • website can be redesigned if a new interface is needed and the URL shared via email or social networking sites with others • an expert may need to be hired to create/maintain the website in order to show her work • in order to show her work, may need to pay to host the site and to get an URL.	• social networking site has its own design but it is faster to post and share her work • social networking site may have distractors on the page (eg ads, other likes) that diverts attention away from her work • social networking sites are being used by many potential customers and no need to send them a link or URL in order to see her work • social networking sites may be too public and pictures placed by Claudia may be misused by others • potential clients may need to have an account with the social network in order to access her work.

In part (c) of this question it is expected there will be a balance in the ITGS terminology between IT technical terminology and the terminology related to social and ethical impacts.

Please see generic markband information sheet on page 21.

SL and HL paper 1 part (c) and HL paper 3 question 3 markband

Marks	***Level descriptor***
No marks	• *A response with no knowledge or understanding of the relevant ITGS issues and concepts.* • *A response that includes no appropriate ITGS terminology.*
Basic ***1–2 marks***	• *A response with minimal knowledge and understanding of the relevant ITGS issues and concepts.* • *A response that includes minimal use of appropriate ITGS terminology.* • *A response that has no evidence of judgments and/or conclusions.* • *No reference is made to the scenario in the stimulus material in the response.* • *The response may be no more than a list.*
Adequate ***3–4 marks***	• *A descriptive response with limited knowledge and/or understanding of the relevant ITGS issues and/or concepts.* • *A response that includes limited use of appropriate ITGS terminology.* • *A response that has evidence of conclusions and/or judgments that are no more than unsubstantiated statements. The analysis underpinning them may also be partial or unbalanced.* • *Implicit references are made to the scenario in the stimulus material in the response.*
Competent ***5–6 marks***	• *A response with knowledge and understanding of the relevant ITGS issues and/or concepts.* • *A response that uses ITGS terminology appropriately in places.* • *A response that includes conclusions and/or judgments that have limited support and are underpinned by a balanced analysis.* • *Explicit references to the scenario in the stimulus material are made at places in the response.*
Proficient ***7–8 marks***	• *A response with a detailed knowledge and understanding of the relevant ITGS issues and/or concepts.* • *A response that uses ITGS terminology appropriately throughout.* • *A response that includes conclusions and/or judgments that are well supported and underpinned by a balanced analysis.* • *Explicit references are made appropriately to the scenario in the stimulus material throughout the response.*