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MARKSCHEME

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INFORMATION TECHNOLOGY IN A GLOBAL SOCIETY

Higher Level

Paper 1

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.

SECTION A

1.   **Magic Medicine Cabinet**

    (a)   (i)   Identify *two* advantages of using RFID *smart* labels (tags) in the MMC.   *[2 marks]*

    Answers may include:
    - line of sight not required, just need proximity
    - hi-speed data capture
    - durability
    - can read multiple tags at once
    - high accuracy in data collection
    - automated, you do not need to scan manually
    - will recognize the medicine being retrieved – will be able to give the right message.

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

    (ii)   Identify *four* steps involved in the face recognition process used by the MMC.   *[4 marks]*

    Answers may include:
    - initial image is entered into system database during setup
    - image is read/captured when someone approaches the MMC
    - software checks image characteristics
    - image is compared to image in the database
    - system authenticates person
    - access is granted to system.

    Award [1 mark] for each step identified up to a maximum of [4 marks].

(b) **John's wife wants to take her blood pressure. Compare** *two* **methods of training that could be provided in using the blood pressure monitoring device.** *[6 marks]*

Answers may include:
- website/video conference
  – access a website with tutorials on how to use the blood monitoring device
  – may include videos, links and a chat option for further assistance
  – household may not have sufficient bandwidth to access site multimedia resources
- manual/diagrams
  – a paper manual/diagrams can be provided in box during purchase
  – include step-by-step printed instruction as well as a phone number to call for further assistance
  – may be difficult to get a hold of someone for assistance (*eg* time zones, busy signals …)
  – language of the manuals may not be the same as of the user
- onscreen tutorial
  – have a built in tutorial that walks the user through a step-by-step tutorial on the screen
  – tutorial may be customized for each family member
  – may be difficult for some users to operate
- onsite training/face to face training
  – onsite training can be provided by the MMC installer
  – might be forgotten by users after a period of time.

Do not accept "call a friend".

[1–2 marks]
A limited response that demonstrates minimal knowledge and understanding of the topic through simple statements. There is little or no appropriate ITGS terminology in the response. Award a maximum of [2 marks] if only one method of training is included in the response.

[3–4 marks]
A response that demonstrates some knowledge and understanding of how two methods of training could be provided. Some relevant examples are used within the response. There is some use of appropriate ITGS terminology in the response. There may be no explicit comparison of the two methods of training.

[5–6 marks]
A thorough response that demonstrates knowledge and understanding of the topic and makes comparisons between two methods of specific training. Relevant examples and appropriate ITGS terminology are used throughout the response.

(c)   **Discuss the advantages and disadvantages to the patient of using the MMC as a health care tool.**   *[8 marks]*

Answers may include:

Advantages

- remind patient to take the correct medication – uses facial recognition to identify patient and RFID tags on patient's medication to ensure they are taking correct medication and not someone else's
- remind patient to take medication on time – using facial recognition, identifies patient and reminds them to take medications daily
- tracking vital signs – can send information to doctor/nurse who can determine in levels are acceptable
- access up-to-date personalized health information – stores your health information (prescriptions, vital signs, *etc*) in one location
- interact online with physicians and pharmacists – if user cannot get out to office, that data collected can be accessed online by doctor/pharmacist
- used by people in remote areas with limited access to health care
- RFID-based smart labels attached to the individual medication as a safety measure
- vital sign sensors to monitor blood pressure and heart rate – like having nurse at home, and can be sent to doctor
- voice synthesis technology to allow additional audio output to what is shown on the cabinet display – gives audio cues for those visually impaired

Disadvantages

- malfunction – may stop working, and therefore may not be able to access data
- malfunction – may not work if there is a power failure
- lockout – system may lock out patients making them unable to access their prescriptions
- may cause problems if patient does not use that bathroom for a period of time (gone on holiday, uses another bathroom, *etc*)
- database may not be kept up-to-date
- face recognition may wrongly identify a person within a house where there are members that look alike, and the image is captured with poor lighting
- people become reliant. Will not be able to reliably take medicine if it breaks down because they will not know what to do.

Do not accept "it is difficult to use/handle".

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 25.

2.   Who has my data?

(a)   (i)   Identify *four* **characteristics that may be required by a system when setting up a strong password.**   *[4 marks]*

Answers may include:
- minimum length required
- combination of numbers, symbols, lowercase **OR** uppercase letter
- lowercase **AND** uppercase letters
- avoid sequences or repeat characters
- avoid dictionary words
- password cannot be the same as the username
- is different than previous passwords.

Award *[1 mark]* *for each characteristic identified up to a maximum of* *[4 marks].*

(ii)   Passwords are often set to expire periodically, such as every 90 days. Identify *two* **reasons why passwords are set to expire on a regular basis.**   *[2 marks]*

Answers may include:
- narrows window of opportunity for hacker
- old passwords cannot be reused if found as they have expired
- it is a way to disable accounts that are not being used/are not active
- secures data from previous employees who once had access
- protects the account in case the owner has been sharing the password
- when same password is used for too long it is easier for hackers to crack it. Some methods to crack a password (brute force and dictionary) may take some time to discover a password.

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

(b)   **Compare the security of typing a password with the security of using a finger scan.**   *[6 marks]*

Answers may include:
Typing
- could be viewed by an individual watching keyboard
- keylogger programs can record passwords typed into system
- typed password could be guessed or hacked by an individual
- user writes down the password as he/she may not remember the password
- user constantly change password regularly and to remember them they will write them down.

Finger scan
- someone else cannot login to your account – more secure, but can also be a problem if you need someone else to login for you
- someone cannot steal your password
- users do not need to memorize a password – no need to write down the password
- scan never changes because finger biometric patterns do not change – it cannot be used by a different person
- technology experts can duplicate a fingerprint, major security issue as user cannot change his/her fingerprint
- sensitivity of equipment may change over time, making the process less secure.

[1–2 marks]
A limited response that demonstrates minimal knowledge and understanding of the topic through simple statements. There is little or no appropriate ITGS terminology in the response. Award a maximum of [2 marks] if only one method of security is included in the response.

[3–4 marks]
A response that demonstrates some knowledge and understanding of comparing the security of typing a password with the security of using a finger scan. Some relevant examples are used within the response. There is some use of appropriate ITGS terminology in the response. There may be no explicit comparison of the two methods of security.

[5–6 marks]
A thorough response that demonstrates knowledge and understanding of the topic and makes comparisons between the security of typing a password and the security of using a finger scan. Relevant examples and appropriate ITGS terminology are used throughout the response.

(c) **To what extent is it acceptable for the State of Furlong to hold sensitive data in its criminal database?** *[8 marks]*

Answers may include:
Benefits
- would allow them to solve crimes using stored information, (*eg*, data in a DNA database)
- provides protection for children, holds a list of offenders in database
- allows background safety checks (jobs, schools)
- companies such as grocery stores and clothing stores already collect information with loyalty cards, many people are already giving out their information publically
- sensitive information as DNA may allow to identify a dead body.

Concerns
- could open doors to misuse of information collected, who is authorized to access information
- database can be hacked, leads to possible loss of personal data
- data sharing between departments can be misused by others
- people have right to privacy, Human Rights Act
- accuracy of data, if not always kept current then incorrect information will be shared
- human error can occur during data input
- false positives can occur if persons are linked incorrectly by similar name or birth date
- source of information not always reliable, do not know where the information in the database originally came from
- identity theft can occur if this information can be stolen and misused.

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 25.

3. **Donating or disposing of old computers**

(a) **(i)** **Identify *two* peripheral devices.** *[2 marks]*

Answers may include:
- keyboard
- mouse
- monitor
- speakers
- printer
- scanner
- cameras
- external hard drive.

Award [1 mark] for each peripheral device stated up to a maximum of [2 marks].

(ii) **Identify *two* methods the C&R Company can use to save data from the hard disk before they delete it.** *[2 marks]*

Answers may include:
- copy files to an external hard drive
- copy files to a server
- copy files to a CD/DVD/memory stick
- move it to the cloud.

Award [1 mark] for each of the methods identified up to a maximum of [2 marks].

(iii) **Identify *two* methods to remove all of the information from these hard disks that does not physically destroy the disk.** *[2 marks]*

Answers may include:
- software to wipe data, data destruction software (*eg* DiskWipe)
- overwriting media – overwrite data/use random numbers/file shredding software
- use a strong magnet
- formatting hard disks.

Do not accept "destroy with hammer".
Do not accept "delete".

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

(b)   **Explain *three* factors that could influence the decision by the school in Haiti to use open source or proprietary software on the donated computers.**   *[6 marks]*

Answers may include:
- cost – if development is done in-house by the company there are minimal development expenses / open source is free or cheaper than proprietary software, more licences can be installed (on more computers) and more software can be installed providing the donated computers with a greater variety of applications for the new users to have
- customization – open source software is designed for developers to adapt and extend. Proprietary software cannot make non-cosmetic changes
- flexible – open source software tends to adopt new trends faster than proprietary software
- integration – open source software integrates better with other systems. Proprietary software is often locked
- security – open source software fix problems quicker than proprietary software
- responsibility – proprietary software supports the product. Open source software has no direct support
- compatibility – proprietary software may offer different applications that use similar toolbars, making it easier for users / when installing open source different applications may have very different user interfaces, making it harder for users as they have to learn each.

Award [1 mark] for each factor identified that have influenced the decision whether to use open source or proprietary software up to a maximum of [3 marks].
Award an additional [1 mark] for each explanation of the factor identified that have influenced the decision whether to use open source or proprietary software up to a maximum addition of [3 marks].

(c)   **Other companies are considering whether it is better to donate or dispose of obsolete equipment. Evaluate these** *two* **options.**   *[8 marks]*

Answers may include:
Donate
- give to organization in need – good publicity
- charitable companies will often pick up used equipment for free when donating equipment
- environmental issues – recycling is environmentally friendly way to get rid of older equipment, no waste
- tax friendly – is a charitable donation and eligible for a tax receipt
- age of equipment – if equipment is too old, no one will want it
- responsibility – company may feel responsibility that machines are working properly if they donate them to a school or charitable company, so they may not want to get involved
- donating will help in education/training
- gives those in need computers that they might not otherwise afford
- others can recycle/reuse these parts
- others can sell the parts for profit.

Dispose
- security of data – need to ensure data is completely removed from hard drives
- environmental concerns – hazardous materials, need to be disposed of properly
- cost – often a fee for disposing of equipment properly
- functionality – if equipment is not working, it is easier to dispose of it as no one will want broken items.

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 25.

SECTION B

4. **Disaster management strategies**

(a) (i)   **Identify *two* actions that should have been taken to ensure the backing up of data was done reliably.**   *[2 marks]*

Answers may include:
- install emergency systems to back up the main network server
- maintain emergency systems to back up the main network server
- set the parameters for what will be backed up
- determine when backups will take place
- backup to a reliable source
- verify that the backups were done, and try them to make sure they are accessible and work.

Award [1 mark] for any of the points stated above up to a maximum of [2 marks].

(ii) **Identify *two* methods that could be used to reinstall licensed software on the client machines.**   *[2 marks]*

Answers may include:
- install from a CD
- push from the server
- download from the internet
- copy into a folder and execute it.

Award [1 mark] for any of the points stated above up to a maximum of [2 marks].

(iii) **Outline the purpose of an uninterruptable power supply (UPS) for the tax office.**   *[2 marks]*

Answers may include:
- provides emergency power when the input power source fails
- protects computers in the event of power disruption
- protects telecommunication equipment
- emergency lighting for evacuation
- continued operation of critical equipment
- maintain power until equipment can be shut down.

Award [1 mark] for any of the points stated above up to a maximum of [2 marks].

(b) **The management team of the tax office is considering installing a virtual private network (VPN) to allow employees to work away from the office. They will be carrying out a feasibility study.**

Explain *three* considerations that should be included in a feasibility study to ensure that the VPN meets the requirements of the tax office.   *[6 marks]*

Answers may include:
- system requirements, such as CPU requirements, RAM requirements, whether it is technically feasible
- costs involved in setting up the VPN versus benefits, such as replacing remote access servers and long distance network connections
- training/skills issues for staff, will the system be sufficiently intuitive to allow staff to work away from the office and not require specialist support in person
- limitations, such as reliability, performance, and compatibility. Methods of addressing security issues and troubleshooting technical problems.

Award [1 mark] for each consideration that should be included in a feasibility study up to a maximum of [3 marks].
Award an additional [1 mark] for the explanation of each consideration up to a maximum of [3 marks].

(c)   **The management team of the tax office have realized that their previous disaster recovery plan was insufficient. As part of the analysis phase for the development of a future disaster recovery plan, they are considering various plans for setting up offsite backup. Two possible options are:**
- **in a different office in a nearby city**
- **cloud storage.**

Evaluate these *two* options.   *[8 marks]*

Answers may include:

Advantages of cloud storage
- data transfer – files are automatically copied through the internet
- cost – low monthly fee
- space – it does not take up valuable space (physical and system's memory)
- security – storing confidential or sensitive information in the cloud is often more secure than storing it locally. Data is encrypted both during transmission and while at rest, ensuring no unauthorized users can access the files
- automation – the user selects what and when he wants to back up, and the service does the rest
- accessibility – account can be accessed from any internet connection
- syncing – syncing ensures files are automatically updated across all the devices
- sharing – online storage services allow easily sharing files
- collaboration – online storage services allow multiple people to edit and collaborate on a single file or document
- protection – cloud storage serves as an added layer of data protection. Backups are kept in a secure location that is physically removed from the originals
- recovery – in the event of catastrophic data loss, one will have backups of all the original files.

Disadvantages of cloud storage
- requires network connection – not accessible when the network is down
- expensive when done on a small scale
- security issues – do we accept hackers here?
- bandwidth issue – insufficient bandwidth can cause very slow upload/download
- cost – with cloud storage, subscriptions for multiple computers may be costly
- there is no easy migration from one cloud storage to another Cloud Service Provider
- tied to the financial health of another company – if the Cloud Service Provider has financial issues, that can bring negative consequences to the service provided to the tax office
- dependency (loss of control) – with cloud storage, everything is in the hands of the Cloud Service Provider
- integration – with cloud storage, integration with equipment hosted in other data centres is difficult to achieve.

Advantages of offsite data backup
- privacy and security – users might not be comfortable handing over their data to a third party, that is, control remains with the tax service
- privacy and security – in offsite data backup, only authorized employees of the tax office can access, retrieve or order the retrieval of the stored information.

Disadvantages of offsite data backup
- if data transfer is done electronically, security issues arise
- if data transfer is done electronically, connectivity issues arise
- requires staff, a building, *etc* – could be costly
- if done by physically transporting the data – labour intensive.

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 25.

5. **Waterfall versus agile**

(a) **(i)** **Identify** *four* **components of an information system.** *[4 marks]*

Answers may include:
- people / human resources
- data
- processes / procedures
- policies
- information technologies *ie*: hardware, software, networks.

Award [1 mark] for any of the points stated above up to a maximum of [4 marks].

(ii) **State** *two* **aspects of the project that need to be agreed upon with the client during the initial interview.** *[2 marks]*

Answers may include:
- budget (cost)
- deadlines
- technologies to be used
- methodology to be followed (*eg* Agile or Waterfall)
- testing dates and testing procedures.

Award [1 mark] for any of the points stated above up to a maximum of [2 marks].

(b) **(i)** **Explain** *one* **advantage of using a Gantt chart.** *[2 marks]*

Answers may include:
- illustrates a project schedule in the form of a visual representation
- shows start and finish dates, shows milestones, shows progress and delays.

Award [1 mark] for each of the answers above up to a maximum of [2 marks].

(ii)   **Distinguish between the use of the waterfall method and the agile method in the development of a new information system for Earlet.**   *[4 marks]*

Answers may include:
Waterfall method
- sequential design process
- progress is seen as flowing steadily downwards (like a waterfall) through the phases
- sequential, non-overlapping phases
- at the end of every phase, there is a gate where a decision is made
- the product is only finished at the end of the last phase.

Agile method
- emphasize values and principles rather than processes conceptual model
- project priorities are re-evaluated on a continuing basis
- especially beneficial for small teams with rapidly changing requirements
- allows for testing of the product in components.

[0 marks]
No knowledge or understanding of ITGS issues and concepts.
No use of appropriate ITGS terminology.

[1–2 marks]
A limited response that indicates very little understanding of the topic or the reason is not clear. Uses little or no appropriate ITGS terminology. No reference is made to the scenario in the stimulus material. The response is theoretical and only describes the models.

[3–4 marks]
A detailed comparison with a detailed knowledge and understanding of the Waterfall method and of the Agile method making explicit references to Earlet. Appropriate ITGS terminology is used throughout the response.

(c) **The project was not a success because the final product did not meet the client's requirements.**

Discuss how Eliboms (the developer) could involve various stakeholders during the different stages of the project system to ensure it meets the needs of Earlet (the client).   *[8 marks]*

Answers may include:
- identification of the role of different stakeholders of the new Information System (IS) such as the different staff users (managers, admin assts *etc*) at Earlet, technical staff at Earlet, IS users such as customers for Earlet
- description of the nature of interaction of different stakeholders with the IS
- discussion of methods to gather appropriate information from stakeholders such as questionnaires, interviews
- identification of best practices at different stages, such as interaction with the client and end user to gain consensus on the details of the requirements
- discussion about the compromises that may have to be made in terms of cost, time, staff knowledge (training requirements)
- Eliboms development team need to discuss/confer among themselves during the creation of the product.

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 25.

SECTION C

6.   **Malpractice victim's family sues maker of faulty surgical robot**

(a)   (i)   **Identify *three* sensors used in robotic surgery.**   *[3 marks]*

Answers may include:
- blood pressure monitor
- heart rate monitor
- distance sensor
- motion sensor
- temperature sensor
- heat sensor
- force sensor.

Award [1 mark] for any of the points stated above up to a maximum of [2 marks].

(ii)   **Identify *three* stakeholders that should be consulted in the purchase of the da Vinci robotic surgical system.**   *[3 marks]*

Answers may include:
- hospital managers
- hospital surgeons/professionals who assist the surgeon
- hospital Finance Director
- hospital IT Department Director
- manufacturer of the robot
- IT manager/technicians.

Accept "hospital patients" if indicated that they would be consulted as part of a feasibility study (possibly in a survey regarding whether they would be willing to go through a surgery performed by the da Vinci robotic system, if they were given the choice). Do not accept it otherwise.

Award [1 mark] for any of the points stated above up to a maximum of [4 marks].

(b) **Analyse a patient's decision to choose between an operation performed by a surgeon:**
  - **without robotic surgery**
  - **using robotic surgery.** *[6 marks]*

Answers may include:
Advantages of robotic surgery over a surgery performed by a doctor
- the patient can be treated and operated on with a minimum of staff; consequently, less costs (relevant to patients that are not fully insured)
- doctors will tire and become fatigued. With robotic surgery this concern is reduced, even eliminated
- robotic surgery will allow for a much greater degree of precision and accuracy
- simpler procedure
- minimally invasive
- better technique
- reduced bleeding
- less painful
- smaller scar
- faster healing
- decreased hospital stay.

Disadvantages of robotic surgery in comparison to a surgery performed by a doctor
- lack of tactile sensation for the surgeon, which may lead to errors
- robotic technology is extremely expensive – high cost of the equipment and thereby the procedure (relevant to patients that are not fully insured)
- robotic technology requires the training of specialized personnel
- amount of time required for a surgeon to master its use
- large space occupied by the side-cart (da Vinci example) reduces the access for the health professionals assisting the surgeon in the surgery, so fewer professionals may be involved, which could endanger the success of the operation
- emergency responsiveness – robotic technology might not be able to effectively respond to an emergency situation during the surgery
- patient might feel more comfortable with a human in charge.

Do not accept answers that are clearly relevant only to the hospital or to the surgeon, but not to the patient.

[0 marks]
No knowledge or understanding of ITGS issues and concepts.
No use of appropriate ITGS terminology.

[1–2 marks]
A limited response that indicates very little understanding of the topic or the reason is not clear. Uses little or no appropriate ITGS terminology. No reference is made to the scenario in the stimulus material. The response is theoretical.

[3–4 marks]
A description or partial examination with limited knowledge and/or understanding of robotic surgery. Some use of appropriate terminology relating to the topic. Some reference is made to the scenario in the stimulus material.

[5–6 marks]
A thorough examination with a detailed knowledge and understanding of robotic surgery in comparison to a surgery performed by a doctor. An examination that uses appropriate ITGS terminology. Explicit and relevant references are made to the scenario in the stimulus material.

(c) **To what extent are the surgeon and/or the manufacturer of the robotic surgical system responsible for the injuries to a patient caused during robotic surgery?** *[8 marks]*

Answers may include:
Responsibility of the surgeon
- injuries caused by surgical negligence
- injuries caused by insufficient or inadequate training
- decision of using robotic surgery without approval of patient
- injuries caused by misuse of the device.

Responsibility of the manufacturer
- injuries caused by device defects or malfunction
- inadequate warning of all possible injuries that can arise from its use
- inadequate or nonexistent system alert in case of malfunction.

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 25.

7. **Artificial intelligence in the classroom**

(a) **(i)** **Identify** *two* **of Engkey's sensors.** *[2 marks]*

Answers may include:
- sonar sensor
- sound sensor
- touch sensor
- movement sensor/video camera
- sound sensor/audio sensor/microphone.

Award [1 mark] for any of the points stated above up to a maximum of [2 marks].

(ii) **Identify the steps that Engkey would use to respond to a student asking a question.** *[4 marks]*

Answers may include:
- Engkey processes the question
- Engkey uses keywords in the question to locate and compare it with questions stored in a database in his memory
- with the use of an inference engine, Engkey finds possible matches and among those it selects the most similar question, with the corresponding answer
- Engkey provides the answer to the question
- if Engkey does not find a match, he will respond with a standard answer, such as "I do not know the answer for this question".

Award [1 mark] for any of the steps stated above up to a maximum of [4 marks].

(b) **(i)** **Explain the relationship between a knowledge base and an inference engine in an expert system.** *[2 marks]*

Answers may include:
- an expert system has three parts: knowledge base, inference engine, and user interface
- an inference engine is a computer program that tries to derive answers from a knowledge base
- the inference engine enables the expert system to draw deductions from the knowledge base using logical rules.

Award [1 mark] for any of the points stated above up to a maximum of [2 marks].

(ii)   **Explain *two* ways that Engkey could be developed to be more effective as a teacher.** *[4 marks]*

Answers may include:
- feed Engkey with more information, so that he knows more about more topics such as any relevant example for language learning
- program Engkey in such a way that he can build more information on its own (*eg* if he does not know the answer for something, he will try to find the answer for it and save this answer to its memory) – self learning
- add colloquial or children's speech tendencies to the database, so a wider range of questions or requests may be understood.

Award [1 mark] for any of the points stated above up to a maximum of [2 marks] plus award [1 mark] for an explanation of any of the points previously stated up to a maximum of an additional [2 marks].

(c)   **To what extent should robots such as Engkey replace a human teacher for teaching English?** *[8 marks]*

Answers may include:
Advantages of a robot over a human teacher
- children usually like robots and enjoy talking to one
- students are not usually intimidated with robots as they may be with an adult
- robots can be more patient than human teachers
- robots do not get tired nor feel sleepy
- robots do not get sick or are contaminated by a child's sickness
- robots can benefit schools that struggle to recruit native English teachers
- a number of robots could work together using their collective intelligence.

Disadvantages of a robot over a human teacher
- robots need a supply of power
- robots needs maintenance to keep it running
- the cost of making or buying a robot is probably higher than that of employing a human teacher
- robots lack human emotions
- to teach well, it is necessary to understand the needs of the one who is being taught
- with the present technology, robots can assist a teacher, but cannot teach
- if the robot cannot understand the pronunciation of the students, they may become disheartened with lack of progress.

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 25.

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.*