N15/3/ITGSX/HP1/ENG/TZ0/XX/M

Diploma Programme
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Markscheme

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Information technology in a global society

Higher level

Paper 1

26 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.

Section A

1. Streaming media in education

(a) (i) State **two** video file types. **[2]**

Answers may include:
- .mp4
- .avi
- .flv (or similar flash video types)
- .m4v
- .mov
- .mpeg/.mpg
- .mkv
- .wmv
- .webm.

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

(ii) 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
- downloaded 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.*

(iii) Identify **two** situations where streaming the video is not possible. **[2]**

Answers may include:
- low bandwidth
- media player/file type is not compatible
- firewall blocks file type or pop-up window
- videos are offline and cannot be accessed
- copyright laws (*eg* cannot play in certain countries)
- web browser lacks necessary plugin/extension
- no or intermittent internet connection.

*Award **[1]** for any of the points identified above up to a maximum of **[2]**.*

(b) (i) Explain **one** advantage for the student when the video is compressed. **[2]**

Answers may include:
- smaller file size, more data can be stored in the same storage space
- takes less disk space on student computer
- quicker loading time requires less available bandwidth to transfer
- less data to transfer reduces data consumption/less cost.

*Award **[1]** for the advantage identified and an additional **[1]** for the explanation of that advantage.*

(ii) Explain **one** disadvantage for the teacher of compressing a video before uploading to the cloud hosting site. **[2]**

Answers may include:
- prior knowledge required how to compress, may not know how to do this so:
  - errors may occur during compression
  - can be time consuming
- lossy compression reduces video quality, may impact the effectiveness/usefulness of the video as a teaching resource.

*Award **[1]** for the disadvantage identified and an additional **[1]** for the explanation of that disadvantage.*

(iii) Explain **one** reason why data compression is used when transferring a video file online. **[2]**

Answers may include:
- compression reduces the size of the file which saves time when uploading/downloading the file
- the compression reduces the size of the file which makes file transfer faster/requires less bandwidth
- gets rid of redundancy.

*Award **[1]** for the reason identified and an additional **[1]** for the explanation why data compression is used.*

(c) The school is in the process of deciding where teachers will host these videos. There are two options:
- on an external site, such as YouTube
- on the school server.

Evaluate both options. **[8]**

Answers may include:

YouTube – Advantages
- no hosting fees
- large audience
- easy to embed on other websites
- fast and reliable servers
- videos are searchable within site
- student can view related videos and become more familiar with the concepts.

YouTube – Disadvantages
- ads – can be disruptive
- do not have full control over your videos
- people can download your videos without permission
- students can be distracted by the other videos on YouTube
- videos uploaded to YouTube are compressed by default. Can lead to a loss of quality.

School server – Advantages
- have full control over your own videos
- preserves copyright
- full control over design of video player
- no ads
- traffic stays on your own website.

School server – Disadvantages
- costs for servers and maintenance
- can slow network bandwidth
- knowledge of coding required
- slow playing videos
- technical faults/crashes may take a long time to resolve (less staff/resources than YouTube).

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 26.

2. Headcams

(a) (i) Define “cloud computing”. **[2]**

Answers may include:
- distributed computers over a network
- use of servers on the internet to store, manage, and process data
- virtual servers on the internet
- storing and accessing data and programs on the internet instead of your computer’s hard drive
- examples such as iCloud.

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

(ii) Identify **two** benefits of using a relational database instead of a flat-file database. **[2]**

Answers may include:
- data is stored once
- avoids duplicated data
- easier to modify multiple records
- better data integrity/data is less likely to be inconsistent.

*Award **[1]** for any of the points identified above up to a maximum of **[2]**.*

(iii) Outline **one** disadvantage if the videos captured by the police were only stored in the cloud. **[2]**

Answers may include:
- access – cannot access data if no internet connection
- privacy – data ownership, information could be accessed by others
- security – information could be hacked
- costs – storage, could be expensive.

*Award **[1]** for any of the points identified above and **[1]** for an additional development of that point up to a maximum of **[2]**.*

(b) The data collected from the headcams is stored in its data centres. The police department is concerned about the environmental effects of these data centres.

Explain **three** environmental concerns that may result from data centres. **[6]**

Answers may include:

- consume vast amounts of energy to run the data centres, much wasted energy
- use more metals, plastics and other materials which contribute to waste
- waste cause increased pollution, harmful to environment
- most data centres require volumes of water for cooling
- generators used emit exhaust that can be harmful to environment.

*Award **[1]** for **each** environmental concern identified and **[1]** for the development of the environmental concern identified up to a maximum of **[2]**.*

*Mark as **[2 + 2 + 2]**.*

(c) Discuss whether the benefits to the police department of using video headcams are more important than the citizens' concerns about the misuse of the video recordings. **[8]**

Answers may include:

Concerns

- security – information may be hacked
- privacy – who has access to the data recordings, does the information about citizens provided infringe on their right to privacy
- privacy – interviews of a sensitive nature may be recorded (*ie* assault victim, informants, *etc*)
- anonymity – does the information remove a citizen's anonymity. Can this information be used against a citizen if their anonymity is compromised?
- selective recording – cameras may only be turned on when it helps the officers.

Benefits

- videos keep police better informed than text or images so they can better protect citizens
- holding all accountable by providing additional evidence
- modifies police behavior, if they know they are being recorded on video
- video can be used and review to help solve crimes
- allows senior officers to see what their subordinates are doing
- allows other officers to monitor the situation and respond if needed.

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 26.

3. Next Generation Cane

(a) (i) State **two** items of data that Joe must enter into the navigation software on the PC to guide Carol to the supermarket. **[2]**

Answers may include:
- address of starting location/Carol's location
- address of final destination, or GPS coordinates of final destination/supermarket.

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

(ii) After Joe has input the data identify the steps used by the GPS system to guide Carol to the supermarket. **[4]**

Answers may include:
- data from PC is sent to the cane
- GPS analyses radio signals from satellites
- it calculates the distance to the satellites from the time the signal takes to arrive
- three satellites will be used to calculate the cane's exact location (mathematical process called trilateration)
- GPS updates the user's position as she moves
- arrows light on cane show direction to walk.

*Award **[1]** for any four of the above points up to a maximum of **[4]**.*

(b) The product development life cycle (PDLC) was used to ensure that the original design for the Next Generation Cane met the needs of the end user. Three of the PDLC stages are:
- investigation of existing system
- feasibility study
- requirements specifications.

Explain how each of these three stages of the PDLC were used to contribute to the successful development of the Next Generation Cane. **[6]**

Answers may include:
- **Investigation of existing system** – look at current situation for existing canes, prepared a proposal with expectations and project ideas for a new cane
- **Feasibility study** – look at proposal for the new cane with regards to several areas: economic – cost-benefit analysis for new cane, technical – look at existing technology and resources available, social – would the new cane be acceptable to use for the end user
- **Requirements specifications** – gather, analyse and validate specifying requirements for a new cane (*eg* what the cane must be able to do, what features it should have).

*Award up to **[2]** for each stage fully explained up to a maximum of **[6]**.*
*Award **[1]** for each partial explanation.*
*Mark as **[2 + 2 + 2]**.*

(c) Fujitsu is planning to make future improvements to the cane, such as adding a camera and audio commands.

To what extent will these further improvements to the functionality of the Next Generation Cane also lead to increasing benefits for Carol and her family? **[8]**

Answers may include:

- accessibility – easier to navigate with added features
- audio commands – would make it easier if visual impairment develops/becomes more profound
- safety – elderly do not have to look down to see arrows to guide then, they can listen to commands and not risk looking away from where they are walking
- can program more features on the cane
- camera – family can see where she is going/where she has been
- she can document outings with camera.

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 26.

Section B

4. Introducing a new IT system

(a) (i) Identify **two** advantages of using the direct changeover method. **[2]**

Answers may include:
- the fastest changeover method
- least disruptive to organization.

*Award **[1]** for any of the advantages identified above up to a maximum of **[2]**.*

(ii) Identify **two** advantages of using the phased changeover method. **[2]**

Answers may include:
- the risks to the business are less than for direct changeover
- there is a wait until the new system is fully operational
- workers have time to adjust to the new system.

*Award **[1]** for any of the advantages identified above up to a maximum of **[2]**.*

(iii) Lizerts carried out an economic feasibility study. Describe **one** other feasibility study that should have been carried out at this time. **[2]**

Answers may include:
- technological feasibility study – considers the technical requirements of the proposed project; it is an evaluation of the hardware and software and how it meets the need of the proposed system
- legal feasibility study – determines whether the proposed system conflicts with legal requirements
- operational feasibility study – reviews the willingness of the organization to support the proposed system; measures how well a proposed system solves the problems
- schedule feasibility study – a rough estimate of the project schedule; an estimate of how long the system will take to develop, and if it can be completed in a given time period
- resource feasibility study – involves questions such as type and amount of resources required.

*Award **[1]** for any of the points identified plus award **[1]** for a description of stated point up to a maximum of additional **[2]**.*

(b) Lizerts is considering two possible options for training users of the new system. Both will include video demonstrations of the new system, but Lizerts must decide whether to use either completely asynchronous discussion forums or synchronous discussions using voice over internet protocol (VoIP).

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

Answers may include:

Completely asynchronous discussion forums

- occurs remotely
- participants partake in the course according to their own time frame, their own schedule, or their own choosing as it fits into their lifestyle
- it does not require participants and instructor to be online or in person at the same time for instruction
- participants can go through on their own with little or no help from an instructor
- participants can skip or test out content they already know
- there is no immediate access to an instructor for questions or problems
- even though message forums allow for collaboration, there may be a lack of interaction
- self-paced training requires a level of self-motivation to complete.

Completely synchronous discussions using VoIP

- participants learn the content material at the same time, or in synch with each other
- discussions occur on a predetermined schedule
- for the synchronous discussions the instructor and participants have to be logged at the same time
- subject matter video and audio happens live, in real time
- instructors can recognize when participants are confused or frustrated
- instructors can provide additional instruction or examples to clarify concepts
- learners can get their questions answered immediately and receive instant feedback
- the course is only as good as its trainer
- the pace of the course must be matched to the slowest learner, and this prevents opportunities for more advanced learners to jump ahead.

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

***[1–2]**: A limited response that indicates very little understanding of synchronous or asynchronous training or the reasons are not clear. Uses little or no appropriate ITGS terminology. No reference is made to the scenario in the stimulus material.*

***[3–4]**: A description or partial analysis with limited knowledge and/or understanding of the different synchronous or asynchronous training of users of the new system. Some use of appropriate terminology relating to the topic. Some reference is made to the scenario in the stimulus material. Award a maximum of **[3]** if only one training method is addressed.*

***[5–6]**: A thorough analysis with a detailed knowledge and understanding of the different options for training users of the new system. An examination that uses appropriate ITGS terminology. Explicit and relevant references are made to the scenario in the stimulus material.*

(c) Two primary stakeholders of the new system are:
- senior managers of Lizerts
- authors of the articles who will use the new system.

To what extent does the success of the project depend on the data collected from these two primary stakeholders during the analysis stage? **[8]**

Answers may include:
Through the data collected from these two primary stakeholders, it will be possible to identify:
- the problems the solution is aimed to solve
- adjustment needs to be made to the system
- the benefits expected from the solution
- the needs of the stakeholders and of the users
- what is expected not to be changed from the previous system
- what features will motivate stakeholders in the use of the new system
- what system features are important to the stakeholders
- what features will demotivate stakeholders in the use of the new system.

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 26.

5. New technology park in East Africa

(a) (i) Identify **two** ways how the use of either Gantt charts or PERT charts can assist in the development of the technology park project. **[2]**

Answers may include:
- tools such as Gantt charts provide a framework
- provides an excellent presentation tool for illustrating sequence of the task and demonstrating individual resources scheduled to time
- visualizing the project schedule makes it very easy for the project manager to communicate the project schedule to various stakeholders as well as to the project team
- allows visibility into possible extreme delivery dates
- provides a visual overview of milestones and other key dates
- can make clear how various tasks are interrelated
- by being able to look ahead on the charts, users can clearly discern where resources need to be anticipated, allocated or shared to maximize the use of those resources
- PERT facilitates identification of the critical path and makes this visible
- people responsible for particular states may be identified so that developers will know who to contact if needed.

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

(ii) Identify **two** possible ways how the project manager can ensure the success of a project such as the development of the new technology park. **[2]**

Answers may include:
- Project Managers have the responsibility for the initiation, planning, execution, and closure of a project
- accomplishes human resource objectives (by actions such as recruiting, selecting, orienting, training, assigning, scheduling, coaching, counseling, and disciplining employees)
- ensures that the client's requirements are met
- ensures that the project is completed on time
- ensures that the project is completed within budget
- ensures that everyone on the project team is doing their job properly
- meets with the government to understand requirements.

*Award **[1]** for any of the points above up to a maximum of **[2]**.*
Reject "The Project Manager manages the project".

(iii) Outline the role of the analyst in a project such as the development of the new technology park. **[2]**

Answers may include:

- communicates with stakeholders in order to gather requirements
- analyzes, reviews and documents the requirements of a project throughout its lifecycle
- ensures the project meets the requirements and demands of the project's key stakeholders
- provides recommendations to ensure that the end products will solve the problems at hand
- recommends solutions that enable the organization to meet its goals
- creates, manages and disburses reports related to the project
- maintains project assets, communications and related database(s)
- evaluates and monitors the overall project
- reviews and reports the project's budget and finances
- notifies the entire project team about abnormalities or variances.

*Award **[1]** for any of the points above up to a maximum of **[2]**.*
Reject "The analyst conducts the project analysis".

(b) The project manager for the technology park project has not decided whether to use an agile or waterfall project management methodology.

(i) Explain **one** difference between agile and waterfall project management methodologies. **[2]**

Answers may include:

Waterfall methodology	Agile methodology
• Is a sequential design process. This means that as each of the stages are completed, the developers move on to the next step.	• Follows an incremental approach. Developers start off with a simplistic project design, and then begin to work on small modules.
• Once a step has been completed, developers cannot go back to a previous stage and make changes.	• Allows for changes to be made after the initial planning.
• If a requirement error is found, or a change needs to be made, the project has to start from the beginning with all new code.	• It is easier to add features that will keep the project up to date with the latest developments in the area.
• The plan does not take into account a client's evolving needs.	• At the end of each sprint, project priorities are evaluated. This allows clients to add their feedback.
• The client knows what to expect. They will have an idea of the size, cost, and timeline for the project. They will have a definite idea of what their program will do in the end.	• The final product can be grossly different than what was initially intended. With a less successful project manager, the project is likely to come in late and over budget.
• The whole product is only tested at the end. If bugs are written early, but discovered late, their existence may have affected how other code was written.	• The testing at the end of each sprint ensures that the bugs are caught and taken care of in the development cycle.

*Award **[1]** for any of the differences outlined above up to a maximum of **[2]**. Reject any answer that does not state a difference.*

(ii) Explain **two** criteria that could be used to determine whether an incident is classified as high priority. **[4]**

Answers may include:

- criterion: does the incident affect the core business? – and reason why the work affects the core business so servers are critical to the operation of the business and must be given a high priority
- criterion: does the incident affect more than n users? – servers affect all organizational users so need to be given a high priority
- criterion: how senior is the complainant? – more senior colleagues may need work for external organizations or business critical requirements
- criterion: does the incident affect the image/reputation of the business? – if the incident could affect the reputation of the organization it needs to be given a relatively high priority
- criterion: is the occurrence of the incident intermittent? – less critical, but needs to be addressed as it could become a serious issue.

*Award **[1]** for each criterion identified and **[1]** for the explanation of that criterion up to a maximum of **[2]**.*
*Award a maximum of **[4]** for the answer.*
*Mark as **[2 + 2]**.*

(c) Concerns have been expressed about the ability of the help desk at the technology park to manage all incidents. The managers of the technology park are considering two options:
- increasing the training for staff at the technology park
- moving the help desk to the head office in the capital city.

Evaluate the **two** options. **[8]**

Answers may include:

Help desk at the technology park
- firsthand knowledge of specific IT structure
- immediate response to problems
- direct communication with technicians enjoying a one-on-one tech support
- on-site technicians can handle a number of different tasks, and help multiple users
- easily troubleshoot networks and other issues which are difficult to address remotely
- limited expertise
- high cost (*ie* IT support salaries, cost of specialized support software, training for IT support staff)
- it is difficult to hire people with the desired skills
- it might not need support on a full-time basis, so on-site support may not be cost effective
- help desk personnel at the technology park will lose their jobs if they are not asked to move to the capital city/ or choose not to move.

Help desk at the capital city
- combined knowledge and expertise across a wide range of IT areas
- many situations require technical skills that the helpdesk on site might not employ
- 24/7 expert availability to fix problems
- more cost effective (*ie* do not need to maintain an IT support department)
- enables management to focus on core competencies and critical projects
- able to deal with issues without having to waste time driving to the location for something that can be done over the phone and/or from the capital city
- lack of personalized support
- difficult to explain problem in detail.

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 26.

Section C

6. Robotic cars

(a) (i) Identify **three** sensors that could be used by self-driving cars. **[3]**

Answers may include:
- proximity sensor/ultra sonic sensor/sonar
- GPS
- vehicle speed sensor
- camera/visual/colour sensor
- tilt sensor/gyroscope
- radar sensors
- lidar (light detection and ranging sensor)
- motion sensor
- Infrared sensor (detects heat or motion).

*Award **[1]** for any of the sensors identified above up to a maximum of **[3]**.*

(ii) Identify **three** characteristics that a self-driving car would need to have in order to be considered a robot. **[3]**

Answers may include:
- computer-controlled
- sensors
- moving parts
- source of energy
- intelligence
- interacts with the physical world in some way.

*Award **[1]** for any of the characteristics that a self-driving car would need to have in order to be considered a robot identified above up to a maximum of **[3]**.*

(b) Self-driving cars may encounter a number of potential problems when driving in real traffic and roads, rather than on special test track.

Explain **three** potential problems that might occur when self-driving cars are used on public roads. **[6]**

Answers may include:

- **Problem**: driving in snow or heavy rain – sensors could stop functioning
- **Explanation**: sensor may not be protected from the elements

- **Problem**: inability to detect potholes / new road architecture
- **Explanation**: the software in the autonomous car does not have the most up to date information about the roads on which it drives

- **Problem**: inability to distinguish between different kinds of pedestrians / vehicles
- **Explanation**: the expert system in the autonomous car does not have sufficient information to be able to make this, and other similar types, of distinction

- **Problem:** reacting in time for unexpected situations
- **Explanation:** driver in other vehicles may have an accident or take an unexpected sudden action driving into self-driving car

- **Problem:** sensors might simply fail
- **Explanation:** driver depends on sensors to work properly.

*Award **[1]** for identifying each problem self-driving cars may encounter when driving in real traffic and roads rather than on special test track and **[1]** for an explanation of why this may be a problem up to a maximum of **[2]**.*
*Award a maximum of **[6]** for the answer.*
*Mark as **[2 + 2 + 2]**.*

(c) Several companies expect to put self-driving cars on the market within the next three to 10 years. Many people have concerns about using self-driving cars.

To what extent are self-driving cars advantageous? **[8]**

Answers may include:

Advantages

- increased mobility for the elderly and/or physically impaired people *ie* not dependent on another driver
- fuel savings as self-driving cars would be more efficient
- reduction in drunk driving
- fewer traffic collisions, due to an autonomous system's increased reliability and faster reaction time compared to human drivers
- saved lives *ie* self-driving cars would be less likely to have accidents
- passengers will be able to engage in other activities while riding in the car
- car could drop the passengers off and park elsewhere
- cars that include voice control may be more convenient.

Disadvantages

- computer malfunctions could cause accidents and possible casualties
- all driving professions would experience job loss (taxis, chauffeurs, bus drivers, truck/lorry drivers)
- security – possibility of hacking
- privacy – data could be collected from the car *ie* the GPS
- legal problems regarding who is at fault in case of an accident
- potential suburban sprawl as commutes become less stressful
- accents can confuse voice control software in the car.

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 26.

7. Computer games

(a) (i) Identify **three** characteristics of artificial intelligence systems. **[3]**

Answers may include:
- ability to seem intelligent
- power to copy intelligent human behavior
- capacity to learn
- decision making ability
- adaptation to circumstances
- well defined goals
- problem solving skills
- reasoning ability
- autonomy
- flexibility.

*Award **[1]** for any of the items above up to a maximum of **[3]**.*

(ii) Identify **three** reasons why new games cannot be played on old computers. **[3]**

Answers may include:
- incompatibility with operating system/architecture
- insufficient processing power/CPU
- insufficient memory *ie* RAM
- inadequate video display / graphics card
- cannot use the peripherals necessary to play the game.

*Award **[1]** for identifying any of the items above up to a maximum of **[3]**.*

(b) (i) Explain why fuzzy logic can be used to create more realistic computer-generated NPCs in games. **[4]**

Answers may include:

- fuzzy logic uses fuzzy variables rather than either/or variables
- movement of NPCs can be more fluid, less sudden
- NPCs behavior can be more unpredictable
- behavior of NPCs can be more varied depending on the significance of the NPCs in the game's story
- characters' attributes can be varied *ie* threat level of enemies can be varied (critical, high, medium, low)
- characters can change personality realistically as the game progresses.

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

***[1]**: A limited response that indicates very little understanding of the topic or the reasons are not clear. Uses little or no appropriate ITGS terminology. No reference is made to the scenario in the stimulus material.*

***[2–3]**: A description or partial explanation with limited knowledge and/or understanding of the topic. Some use of appropriate terminology relating to the topic. Some reference is made to the scenario in the stimulus material.*

***[4]**: A clear, detailed explanation which demonstrates thorough knowledge and understanding of the topic. Relevant examples are used. There is appropriate ITGS terminology throughout.*

(ii) Explain why a character in a game may or may not pass a Turing test. **[2]**

Answers may include the following characteristics necessary for the character to pass the Turing test:

- uses natural language, reason, have knowledge and learn
- is able to execute all human behaviors, regardless of whether they are intelligent
- is able to simulate human conversational behavior
- does not demonstrate to be more intelligent than any human can be
- does not behave in ways that are impossible for a human to behave.

*Award **[1]** for identifying any of the items above plus award **[1]** for an explanation of any of the points previously identified up to a maximum of **[2]**.*

(c) To what extent can educational video games enhance student learning and motivation? **[8]**

Answers may include:

Advantages

- enhance hand/eye coordination
- promote problem-solving skills
- multiplayer games foster teamwork
- students will be more motivated
- simulation games can enable students to learn by doing
- provide immediate feedback when students make mistakes
- can individualize student's experiences
- mistakes become learning opportunities
- video games can be personalized by the student.

Disadvantages

- costs can be high – for equipment, software, infrastructure
- teachers will need special training
- overuse of games can take away from skills not tied to a digital source
- lack of face to face interaction with a teacher and/or other students
- students will not respond to a game in which the motivating aspect of the game is obviously educational
- some students are not gamers and will not be interested.

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 26.

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.*