

Markscheme

November 2020

**Information technology
in a global society**

Higher level

Paper 1

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Critical Thinking – explanation, analysis and evaluation

These trigger words often signal critical thinking. The bold words are the key terms in the various criteria.

Explanation – *Because, as a result of, due to, therefore, consequently, for example*

Analysis – *Furthermore, additionally, however, but, conversely, likewise, in addition, on the other hand, whereas*

Evaluation – *My opinion, overall, although, despite, on balance, weighing up*

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. E-voting

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) State the primary key in the Voter table in **Figure 2**. [1]

VoterID

Award [1] for stating VoterID.

- (ii) Identify **one** foreign key in the Votes table in **Figure 2**. [1]

Answers may include:

- VoterID
- CandidateID

Award [1] for identifying the foreign key up to a maximum of [1].

- (iii) Identify the data type that would be used in the Gender field in **Figure 2**. [1]

Answers may include:

- Text
- String

- (iv) State the relationship between the Candidate table and the Votes table. [1]

One – Many

- (v) Outline why a drop-down list would be used for the Party field in the Candidate table. [2]

Answers may include:

- Provides a set number of possible options.
- To remove the likelihood of data input errors.
- They conserve screen space, other alternatives such as radio button or checkbox may require all possible options to be displayed taking more screen space.
- Faster data entry.

Award [1] for identifying why a drop-down list would be used for the Party field and [1] for a development of that point up to a maximum of [2].

- (b) A number of individuals and groups were consulted during the design of the e-voting system to enable designers to create an intuitive interface for it.

Analyse questionnaires and interviews as methods of data collection to gather this information from these individuals and groups.

[6]

Answers may include:

Questionnaires:

- Provide a mechanism to get responses from a large number of people.
- Provide a mechanism to obtain quantitative answers. These answers are relatively easy/quick to analyse.
- Less labour intensive than using interviews.
- Poorly designed questions, for example the overuse or lack of closed questions, can yield almost meaningless information.
- Respondents may sometimes misunderstand or misinterpret questions; it will be very hard to correct these mistakes and collect missing data in a second round.
- Questionnaires do not have time constraints; respondents can take their time to complete the questionnaire in their own time.
- Questionnaires safeguard respondents' anonymity, which allows for complete invisibility, maximizing comfort for those answering.

Interviews:

- Provide information that may be more detailed than that obtained from a questionnaire.
- Require skillful interviewers to be able to take advantage of the face-to-face interactions.
- If the skillset of the interviewees is appropriate, the qualitative data may be used to provide more substantial conclusions than relying solely, or largely, on quantitative data.
- Can be very time consuming: setting up, interviewing, transcribing, analysing, feedback, reporting.
- Not all respondents may be comfortable taking part in interviews and may feel nervous, especially when it is being recorded.

Marks	Level descriptor
0	<i>No knowledge or understanding of ITGS issues and concepts. No use of appropriate ITGS terminology.</i>
1–2	<i>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.</i>
3–4	<i>A description, unbalanced or partial analysis of the appropriateness of the use of questionnaires and interviews. References, implicit and/or explicit, are made to the scenario in the stimulus material. There is some use of appropriate ITGS terminology in the response.</i>
5–6	<i>A balanced and detailed analysis of the appropriateness of the use of questionnaires and interviews. Explicit and relevant references are made to the scenario in the stimulus material. There is appropriate ITGS terminology throughout the response.</i>

- (c) Some states are planning to return to a paper-based voting system, where voters put a cross (X) in the column next to the party of their choice.

Discuss whether these states should retain e-voting or return to a paper-based voting system.

[8]

Answers may include:

Advantages of retaining e-voting:

- The collection of the votes is more straightforward if the voting form is online.
- Voters will have the flexibility to cast their votes from any location using online voting.
- The results of the election can be reported more quickly.
- More in-depth analysis of the voting patterns may occur, which may help political parties target voters during subsequent elections.
- Electronic voting machines with touch screens are proven to be advantageous for physically challenged people.
- Electronic voting machines can also come with audio support to assist visually impaired voters. In such cases, the visually challenged person can cast their vote without any problem.
- Electronic voting machines allow people with disabilities to cast truly anonymous ballots and ensure them equitable rights.
- A long-term decrease in expenses. Conducting a large-scale election can be a costly prospect, primarily because of labour costs.
- More convenient to transport e-voting machines than ballot papers and boxes.

Disadvantages of retaining e-voting:

- The biggest concern about electronic voting is hacking: there is always the risk that someone without authorization would be able to access and alter the results of an election. This could be done either in-person, by physically tampering with the voting machines, or remotely, if the system transmits any kind of data over the internet.
- A hurdle for implementing widespread e-voting is the high upfront cost of installation. While electronic voting can be a cost-saving measure in the long term, the cost of setting it up may be a prohibitive factor. Costs include the servers, voting machines, maintenance and installation, testing the infrastructure, and securing the premises.
- E-voting machines may require power backup, which may be a challenge, especially in remote locations.
- Technical supervisors/staff may be required at the site of e-voting to deal with technical glitches.

Advantages of reverting to paper voting:

- The cost of implementing the technology may not be cost effective.
- There are concerns about the e-voting system being hacked or fraudulent activities linked to the voting.
- Some people prefer the human element of paper voting.
- No technical training required for voters: they can mark their preference on a paper ballot and drop it into the ballot box.
- Even people with low literacy levels can easily use a paper ballot.
- No technical training is required for election officers deployed at the polling booths: no electronic capturing devices are in use.

- Paper ballots are more secure – tampering is not possible due to a physical record of votes.
- The paper ballot is effective in reducing fake and bogus votes, as the software of electronic voting machines can be manipulated with malware, which can be used to tamper with the election results.
- Statistically relevant auditing can serve as a tool to detect or deter malfunction or fraud.
- In the instance where a candidate is entitled to a recount, a full hand recount of paper ballots can determine the accurate or final results.

Disadvantages of reverting to paper voting:

- Printing of ballots ahead of time and setting them in order is a difficult task. Printing of ballots is done district-wise, making the task even more complex.
- The voter may accidentally mark two boxes on the same ballot or may not mark the choice correctly. The computer software can prevent this happening.
- With traditional paper methods, ballots must be collected from various polling locations and consolidated at a central location before a team of individuals sifts through them manually. This process is very time consuming, leading to a significant delay in the announcement of election results.
- In a paper ballot, physically challenged people may have difficulty casting their votes in private.
- The requirement to go to a polling location continues to drive down voter turnout. Some people don't have time to take off work, don't live close to a polling location, or just can't be bothered.

Please see generic markbands on page 24.

2. BYOD at Xingu Academy

- (a) (i) Identify **two** pieces of information that would be used to identify a device on the IT network. [2]

Answers may include:

- MAC address
- IP address
- User's credentials, such as username
- Computer name

Award [1] for identifying each piece of information the IT department would use to identify the device on the IT network, up to a maximum of [2].

- (ii) Identify the steps used by speech-to-text software. [4]

Answers may include:

- A student speaks a word / microphone used to capture voice.
- The software converts the analog word to digital sound.
- The software converts sound to text based on a database of sounds.
- The word is matched (against the words in a database) to see if it is a valid word.
- If the word is found in the database.
- A word is presented on screen.
- If the word is not found in the database.
- A wrong word / the closest match / software makes a suggestion / an error message appears.

Award [1] for identifying each step that the text-to-speech software uses up to a maximum of [4].

- (b) Digital citizenship is included in Xingu Academy's IT acceptable-use policy.

Explain why it is important that students at Xingu Academy are both competent users of digital technologies **and** good digital citizens.

[6]

Reasons for being competent users of digital technologies:

- To be able to use digital technologies to support their learning.
- To be able to use software tools appropriately to maximize their efficiency.
- To develop a set of transferable skills they can take beyond school.
- To be able to access a wide range of online resources.
- In order to take responsibility for their personal devices – ensure they are in working order and keep hardware and data secure. In a BYOD school, technicians may not be able to support all these diverse devices

Reasons for being good digital citizens:

- Understand that being able to use the digital technologies is not sufficient to ensure the opportunities they bring are harnessed.
- Appreciates that a number of ethical decisions occur when interactions with the digital technologies occur.
- Accept that they should be responsible for their actions when interacting with digital technologies and that some actions could have potentially negative consequences, such as employers judging prospective students by their social media profiles. So, it is important to teach students how to create online personas that project a positive and constructive image.
- See the need for good digital citizenship as no more than an extension of their own physical citizenship.
- Accept that the boundary between digital and physical citizenship can be blurred and ensure that these dual roles can be reconciled.
- Students must respect other users and be aware of the impacts of irresponsible online behavior, eg cyber-bullying.
- Students need to be aware of legal issues – illegally downloading games/music, crimes such as hacking/identity theft. Illegal games/hacking tools could be brought to school on their own devices.
- Students require digital literacy to wisely use the vast amount of information on the internet.
- Students need to understand that there is a digital divide – within the school/community/world – that may be accentuated at a BYOD school where some students own the latest technology. Children could put pressure on parents to buy newer devices.
- Students need to be aware of digital health issues – good ergonomics, risks of internet/game addiction.
- Students need to be aware of the need to protect their data using passwords/backup.

Marks	Level descriptor
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1–2	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	A description or partial explanation of why it is important that students at Xingu Academy are both competent users of digital technologies and good digital citizens. References, implicit and/or explicit, are made to the scenario in the stimulus material. There is some use of appropriate ITGS terminology in the response.
5–6	An explanation of why it is important that students at Xingu Academy are both competent users of digital technologies and good digital citizens. Explicit and relevant references are made to the scenario in the stimulus material. There is appropriate ITGS terminology throughout the response.

- (c) Discuss whether Xingu Academy should become a bring-your-own-device (BYOD) school.

[8]

Answers may include:

Reasons why Xingu Academy should become a bring-your-own-device (BYOD) school:

- There will be a significant reduction in the cost of IT hardware that can be passed on to other teachers and learning needs (such as more staff).
- The IT support team may not need to be so large, but will need to support a wide range of devices, including the latest technology as well as old technology.
- Students may find that they do not have to learn the software used by the school as they have similar (or better) software installed on their device.
- Students are already familiar and comfortable using their own technology so they can focus on the lesson.
- Students can choose their own device type, more comfortable learning on certain devices.
- Students' personal mobile devices tend to be more cutting-edge, so schools can more easily stay up to date with technology – but this could present problems (digital divide/technical support).
- With BYOD, students are more likely to continue learning outside of school hours.
- Students will be more organized with all their notes and assignments all in one place (as opposed to having them on different computers and devices in different places at school and home).
- Students can store their data on their own personal devices, so Xingu Academy is not responsible for data storage.
- BYOD allows opportunities for more personalized learning where students can excel at their own pace.

Reasons why Xingu Academy should not become a bring-your-own-device (BYOD) school:

- Some teachers may not be comfortable with the new BYOD approach and may see it as technology for technology's sake.
- Some teachers may not be familiar with the software on a student's device.
- The school network may not have the capacity to deal with the increased number of devices on the network.
- Some students will be advantaged, as they can afford much better devices than others, some may not be able to bring in a device – children may put pressure on their parents to upgrade their devices to keep up with their friends. Digital divide issues.
- Teachers may find it harder to monitor a student's digital behaviour.
- Some schools monitor students' screens – this will raise issues if monitoring software must be installed on students' personal devices.
- The IT support team may have to install network peripherals, such as printers, onto the students' devices.
- The increased levels of access may lead to security concerns.
- Students bringing in their own devices to school may increase the possibility of theft.
- Applications may not be universal across all platforms, making it difficult for teachers to assist.
- There may be more work for the IT department if they must support students' personal devices.
- Students sometimes may forget to bring their device or charge it.

Please see generic markbands on page 24.

3. Clouds under the sea

- (a) (i) Identify **two** characteristics of cloud computing. [2]

Answers may include:

- On-demand / measured service.
- Based on a network of linked servers.
- Multi-tenancy and resource pooling.
- Rapid elasticity and scalability.
- Broad network access.
- Pay-as-you-go.
- Easy maintenance.
- Low down time.
- Higher level of security, hard to breach.
- Accessible from multiple devices.
- Accessed via the internet.

Award [1] for identifying characteristics of cloud computing, up to a maximum of [2].

- (ii) Servers used in cloud computing hold considerable amounts of data.

Identify **two** forms of backup that could be used for the data on these servers. [2]

Answers may include:

- Duplicate/alternative versions
- Disk-to-cloud backup / Multi-location backup
- Disk-to-disk backup

Award [1] for identifying each form of back-up that could be used for the data on these servers, up to a maximum of [2].

- (iii) A user is downloading a ZIP (zipped file) from cloud storage.

The ZIP file is 0.6 GB in size and the bandwidth speed is 8 mbps.

Calculate the total time it will take to download the ZIP file.

Note: 1 GB=1000 MB. [2]

Bandwidth = 8 (mbps) / 8 = 1 (MB)

Download time = 600 / 1 seconds or 10 minutes.

Award [1] for correct conversion of mbps to MB (ie, divide by 8)

Award [1] for correct answer.

- (b) (i) Compression software can be used to speed up the upload and download of files.

The ZIP file recently downloaded from the cloud-based server contained a number of images and videos.

Explain why lossy compression techniques would be used for the images that have been downloaded from cloud storage.

[2]

Answers may include:

- The image may not be used for printing.
- Therefore, the quality/resolution of the image does not need to be as high if it is only to be viewed on screen.
- Due to significantly reduced file size, downloading images from cloud storage will be fast and will consume less internet bandwidth.

Award [1] for identifying why lossy compression techniques would be used for the images and [1] for a development of that point, up to a maximum of [2].

- (ii) Explain why lossless compression techniques would be used for the videos that have been downloaded from cloud storage.

[2]

Answers may include:

- The quality of the decompressed video would need to be exactly the same as the pre-compressed version.
- Because the use of lossy compression techniques could lead to critical parts of the video being lost.
- Reduced file size without losing the quality of the video.

Award [1] for identifying why lossless compression techniques would be used for the videos and [1] for a development of that point, up to a maximum of [2].

- (iii) Cloud storage providers are responsible for protecting the privacy and anonymity of the individuals whose data is held on their servers.

Distinguish between privacy and anonymity.

[2]

Answers may include:

- Privacy is knowing who the person is, but not knowing what they are doing / privacy is a concept describing activities that one keeps entirely to themselves, or to a limited group of people.
- Anonymity is knowing what a person may be doing, but not being able to identify the person.

Award [1] for identifying each difference between privacy and anonymity, up to a maximum of [2].

Note: *It is acceptable to correctly define each term for [2].*

- (c) Evaluate Microsoft's decision to build data centres on the seabed.

[8]

Answers may include:

Reasons why Microsoft should build data centres on the seabed:

- The water surrounding the data centre can be used to cool it.
- The percentage of the world's water used for this purpose is almost infinitesimally small, so there is going to be almost no environmental effect.
- They can be hidden and will not be unsightly.
- They may not take up valuable sites on land that could be used for housing.
- They are likely to need less maintenance.
- The underwater data centers will take relatively less time compared to land constructions.

Reasons why Microsoft should not build data centres on the seabed:

- The technology has existed for 10 years, but there has been no commercial development of these data centres – why is this the case?
- The data centres may need to be backed up terrestrially, so it may not be as environmentally friendly as suggested.
- Maintenance will be more difficult.
- The data centres may have an impact on local ecosystems e.g. heat from the plants / chemicals leaching from the equipment.
- The cables to the data centres may be damaged by ships.
- Seabed data centres may be significantly more expensive than land-based ones.
- Finding efficient ways of delivering backup power suppliers to an underwater site may be problematic.

Please see generic markbands on page 24.

Section B

4. Your personal avatar

- (a) (i) Identify **two** stakeholders that George, the Project Manager, must consult before implementing the IT updates.

[2]

Answers may include:

- Programmers
- Developers or avatar developers
- Information systems manager
- End-users

Award [1] for identifying each stakeholder up to [2 max].

- (ii) Identify **two** responsibilities of the Project Manager in addition to consulting stakeholders.

[2]

Answers may include:

- Resource planning.
- Managing the project team.
- Ensuring the project is kept within the budget.
- Managing project risk.
- Monitoring progress.
- Developing schedules.

Award [1] for identifying each responsibility, up to a maximum of [2].

- (iii) Identify **two** characteristics of quality assurance. [2]

Answers may include:

- Provides the overall guidelines.
- Attempts to prevent the possibility of the product not functioning as intended by putting in place strategies to mitigate this eventuality.
- Increases customer confidence and a company's credibility.
- Improves process and efficiency.
- Ensures the product meets the requirements of the client.

Award [1] for identifying each characteristic of quality assurance, up to a maximum of [2].

- (b) (i) Explain why the avatar developers would not use alpha and beta testing when the nightly updates are implemented.

[4]

Answers may include:

- Alpha and beta testing has already been completed prior to release.
- The beta testing is effectively the release of the product.
- The changes made are enhancements and not testing the initial system/product.

Marks	Level descriptor
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1–2	<i>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 descriptive.</i>
3–4	<i>An explanation of why the alpha and beta testing would not be used when the nightly updates are implemented. Explicit and relevant references are made to the scenario in the stimulus material. There is appropriate ITGS terminology throughout the response.</i>

- (ii) Explain one reason why the nightly updates should make use of a project management methodology.

[2]

Answers may include:

- The nightly update is time critical – the system needs to be fully functional by morning.
- The team must have a clearly defined strategy to enable the process to occur, as there may be a number of different teams who are working together to carry out this update.
- Minimizes risk – less likely to have errors/failures during updates.

Award [1] for identifying why the nightly update should make use of a project management methodology and [1] for a development of that point, up to a maximum of [2].

- (c) Matt Earle, the CEO of SBE Cruise Lines, has been investigating using artificial intelligence (AI) systems to track passengers and suggest activities they may wish to take part in based on their interactions with the touch screens on the ship. Some of his colleagues have concerns about taking this approach.

To what extent should Matt rely on the recommendations from the AI system to suggest activities to passengers?

[8]

Answers may include:

Reasons why Matt should rely on the recommendations from the AI system:

- The recommendations are likely to be based on the greatest data set possible: real-time interactions, etc.
- This should mean that they will be appropriate for individual cruise ship passengers – customized for each passenger based on data.
- Creates a unique experience for passengers – recommended activities, etc.
- Can provide changes to passenger experience quicker than if done without AI.

Reasons why Matt should not rely on the recommendations from the AI system:

- The recommendations may not be sufficiently customized to each passenger's need if enough data is not collected.
- The AI system may be expensive - the increased amount of customer satisfaction may not be sufficient to justify this cost.
- There may be particular characteristics of the passengers that the AI system may not be able to understand.
- This may be a gimmick and an example of technological determinism.

Please see generic markband on page 24.

5. Skin care app

- (a) (i) Identify **two** characteristics of artificial intelligence (AI). [2]

Answers may include:

- Based on machine learning.
- Requires significant computational power.
- May be supervised or unsupervised.
- Simulation of human intelligence by machines.

Award [1] for identifying each characteristic of artificial intelligence, up to a maximum of [2].

- (ii) Identify **two** components of an expert system. [2]

Answers may include:

- Knowledge base
- Inference engine
- User interface

Award [1] for identifying each component of an expert system, up to a maximum of [2].

- (iii) Describe the difference between backward chaining and forward chaining. [2]

Answers may include:

- Forward chaining uses available data and inference rules to extract more data (from an end user, for example) until a goal is reached.
- Backward chaining works backward from the assertion or claim until it finds data that matches the rule.

Award [1] for either defining one term or a superficial description of the differences between backward and forward chaining.

Award [2] for a description of the differences between backward chaining and forward chaining.

Note: It is acceptable to correctly define each term for [2].

- (b) Explain the importance of a requirements specification **and** feasibility study in the development of the SSP app.

[6]

Answers may include:

Importance of a requirements specification:

- Provides a document that is the consensus between the client and the developer.
- Provides an indication of the scope of the project to develop the SSP app.
- Provides an indication of what the SSP app is designed to do.
- Provides a guide for the software design.

*Award **[1]** for identifying a reason why a requirements specification is important and **[1]** for each development of that reason, up to a maximum of **[3]**.*

Importance of a feasibility study:

- Determines whether the project is likely to be manageable in terms of expertise within the app development organization.
- Determines whether the project is viable economically.
- Determines whether the project is technically possible.
- Ensures the project is legally feasible.

*Award **[1]** for identifying a reason why a feasibility study is important and **[1]** for each development of that reason, up to a maximum of **[3]**.
Mark as **[3] + [3]**.*

- (c) Some SSP app users have expressed concerns about the AI features in the new SSP app and have decided to change back to the original SkinSmart app despite its use of an expert system.

Evaluate the decision of some SSP app users to change back to the original SkinSmart app.

[8]

Answers may include:

Reasons why SSP app users have reverted back to the original SkinSmart app:

- There may be no perceptible benefits from the use of the new SSP app.
- There may be concerns about the data that the SSP app may be sharing.
- Users may find that the data that the SSP app is linked to may be intrusive.
- The SSP app may have other usability issue – as the increased complexity of the software may not be able to accommodate the individual requirements of the user, the user may find they have a generic profile.
- The SSP app may have glitches that have not yet been completely resolved.

Reasons why SSP app users have not reverted back to the original SkinSmart app:

- The users may be advocates of the newer technology.
- The users may prefer that they can rely on the technology (AI) to make decisions about their skin care.
- The users trust the SSP app.
- There are benefits obtained from the sharing of information that are not gained from the SkinSmart app.
- The quality of the data collected in the newer app may be better – images, question prompts, etc.

Please see generic markband on page 24.

6. Autonomous weapons

- (a) (i) Identify **two** characteristics of a robot. [2]

Answers may include:

- Able to move.
- Can be programmed.
- Controlled by a computer.
- Carries out a complex series of actions.
- Can sense its surroundings.
- Has a power source to function.

Award [1] for identifying each characteristic of a robot, up to a maximum of [2].

- (ii) Identify **two** project management methodologies that could be used in the development of autonomous weapons. [2]

Answers may include:

- Agile
- Waterfall
- Prince2
- PMBoK
- SSADM
- CMMI

Award [1] for identifying each project management methodology that could be used in the development of autonomous weapons, up to a maximum of [2].

- (iii) Outline why prototyping would be used in the development of autonomous weapons. [2]

Answers may include:

- Gives an indication about the viability of the product.
- May save costs or allow resources to be allocated more efficiently.
- Cheaper than completing the full product.

Award [1] for identifying a reason why prototyping would be used in the development of autonomous weapons and an additional [1] for outlining the reason, up to a maximum of [2].

- (b) Explain **two** reasons why the development of policies for the use of autonomous weapons may be difficult to achieve.

[6]

Answers may include:

- There are over 125 countries that may have some involvement in the development of autonomous weapons.
- Reaching a consensus may be difficult.
- Because it will be almost impossible to resolve all of the countries' different positions without the agreement being very superficial and almost meaningless.
- Countries may be unwilling to share information / technology / resources, as information may be sensitive.
- Sharing information may lead to advantaged positions – information may be used by other countries to develop the weapons in secret / countries may have invested significant resources in developing these weapons / other countries may be able to prepare counter measures.

Award [1] for identifying a reason why the development of policies for the use of autonomous weapons may be difficult and [1] for each development of that reason, up to a maximum of [3].

Mark as [3] + [3].

- (c) Discuss who would be accountable if harm were caused by the use of an autonomous weapon.

[8]

Answers may include:

Stakeholders:

- The person who orders the autonomous weapon to be used (client).
- The person who was responsible for the development of the autonomous weapon (manufacturer).
- The programmer of the autonomous weapon (developers).
- The soldiers/military/commanders (users).

Rationale:

- Was the use of the autonomous weapon lawful – did it contravene the Geneva Convention?
- Robots can't distinguish between civilians and soldiers – was the robot used unlawfully in an area where civilians are present?
- It may depend whether the autonomous weapon was used with the intent to cause harm.
- Would the use of the autonomous weapon be justified – would the use of it lead to the saving of more lives than if it was not used?
- Was the decision to use the autonomous weapon planned, or was it made in the heat of battle?
- Was it used according to previously agreed policies?

Please see generic markband on page 24.

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

Marks	Level descriptor
No marks	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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.