

Markscheme

November 2020

**Information technology
in a global society**

Higher level

Paper 3

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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.

If candidates answer more than the prescribed number of questions:

- In the case of an “identify” question read all answers and mark positively up to the maximum marks. Disregard incorrect answers.
- In the case of a “describe” question, which 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.
- In the case of an “explain” question, which asks for a specified number of explanations eg “explain two reasons”, mark the **first two** correct answers. This could include two full explanations, one explanation, one partial explanation etc.

1. (a) Identify **two** characteristics of software as a service (SaaS). [2]

Answers may include:

- Network-based access to, and management of, commercially available software.
- Activities managed from central locations, e.g. in the cloud, rather than at each customer's site.
- Enabling customers to access applications remotely via the web.
- Customers usually pay by subscription (on demand), e.g., monthly payments.
- Is easy for scalability.
- No additional hardware required by customer to install.
- Updates are applied automatically without customer intervention.
- External provider hosts the application/software.

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

- (b) Outline **one** reason why facial recognition applications are preferred to other types of biometric software. [2]

Answers may include:

- Uses a camera, and many devices already have one embedded, no specialist equipment needed.
- Less intrusive, as you don't have to physically touch any hardware to detect your face.
- More convenient as you don't need to remove items e.g. gloves for fingerprints, but just face the camera.
- Capture of the face is quicker, as the camera just needs to take a photo which is then matched against the database.
- More Universal as everyone has facial print, but not everyone has a fingerprint.
- Face print is less prone to damage as it uses nodes of the face as opposed to fingerprints or iris, which damage can prevent reading.

Award [1] for identifying a reason why the facial recognition is preferred and [1] for a development of that reason, up to maximum of [2].

2. *FaceToFace* has been informed by their clients that their facial recognition application does not always correctly them.

Explain **two** reasons why this might be the case.

[6]

Answers may include (**Note:** the two clusters are from different perspectives – each cluster needs three ideas, *ie*, one initial statement and two developments):

Factors relating to the capture –

- Size and quality of image captured.
- Camera angle in capturing the image to be processed.
- Might not capture all of the required features / lighting conditions.
- Poor maintenance of the camera may lower the quality of the image captured.

Factors relating to the person being captured –

- *e.g.*, Wearing scarf/glasses.
- Recent facial changes, *eg*, tattoo.
- Deliberate attempts to conceal the face.
- *e.g.*, looking down wearing a cap, masks, make up.
(Will impact on the ability for the algorithms to identify the key facial features to be matched, therefore, it may not be possible to make a match.)
- People with similar facial features and metrics *e.g.* twins.
- Natural changes in the face, due to ageing and losing weight.
- Changes in facial hair – AI in modern FR systems can recognise someone with or without a beard, but older systems may not.

Issues with the programme:

- Bias introduced by the programmer.
- Algorithms – the programming of the algorithm and how it is written.
- Training data used – the size and quality of the database that stores the training data impacts the ability to compare the new image.
- False positives – an image is matched up to an image in the database, but it is incorrect.
- False negatives – an image is not matched up but should be.

Award [1] for identifying a reason why the facial recognition application does not correctly identify a person and [1] for each development of that reason, up to a maximum of [3].

Mark as [3] + [3].

3. Sandra wants to create an ethical framework for *FaceToFace*. Based on her research, she is considering using the ACM Code of Ethics and the ACTIVE ethics framework as a starting point.

Discuss whether Sandra should use ethical frameworks like the ACM Code of Ethics or ACTIVE ethics to help her create an ethical framework for *FaceToFace*.

[8]

The student may approach this in two ways. They may look at the appropriateness of applying a specific framework or they may compare the two frameworks.

The ACM Code of Ethics or ACTIVE ethics is appropriate:

- It is a general, standard approach that can be applied to any organisation.
- It is easier to train staff on a standard approach, as they may have had to follow it in a previous job.
- Employees who come from similar organisations will already be familiar with these codes and/or frameworks, adapting easily to the ethical position of *FaceToFace*.
- Will reassure customers that the company is following a recognised framework.
- Provides transparency to stakeholders of ethical use.

Reasons why The ACM Code of Ethics or ACTIVE ethics is not appropriate:

- People may not agree on which approach to base their ethical standard. Each approach has a different emphasis.
- Decision makers may not agree on the interpretation of the ethics. They may not all agree to the same set of human and civil rights.
- Decision makers may not agree on what constitutes the common good. They may not even agree on what is a good and what is a harm.
- The different approaches may give different outcomes, so how would they choose which one to use?
- How would a system be put in place to evaluate and reflect on the actions taken and learn from them?
- The student may apply a number of these ethics and how they would or would not be appropriate.
- The statements are very general, e.g., “avoid harm” in the ACM documentation.

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"> • No knowledge or understanding of the relevant ITGS issues and concepts. • No ITGS terminology.
Basic 1–2 marks	<ul style="list-style-type: none"> • Shows only a little ITGS knowledge. • Makes at least one argument. • May not have any comparison/conclusion.
Adequate 3–4 marks	<ul style="list-style-type: none"> • Shows a little more ITGS knowledge but still weak. • Has more arguments, (at least two) and possibly from different stakeholders. • Has a conclusion or judgments which are probably not backed by much reasoning.
Competent 5–6 marks	<ul style="list-style-type: none"> • Shows good ITGS knowledge and detail. • Has more arguments and they are balanced (+ and –) and for different stakeholders. • Conclusion/judgments are supported by the arguments and is well thought out.
Proficient 7–8 marks	<ul style="list-style-type: none"> • Shows very good ITGS knowledge. • Arguments are very balanced and detailed. • Conclusion is based completely on the arguments.

4. Discuss whether the benefits to *South-East Asia Coffee Shops (SEACS)* of introducing the facial recognition application outweigh the potential privacy, anonymity, consent and surveillance concerns.

[12]

Opportunities for *SEACS* may include:

- Accuracy of customer recognition can give the benefits of a more customized service by the staff.
- Staff turnover or part-time staff will no longer impact on the ability to provide a customized service.
- Recognizing and identifying existing customers can speed up the time to take orders and reduce waiting time in the queue.
- Reduces loyalty card fraud, users can not borrow friends' cards to gain discounts
- The ease of use and seamless integration with the POS could encourage customer loyalty.
- The customer loyalty scheme will be easily administered/automated bringing benefits to the coffee shop which include:
 - administration of promotions and perks for customers
 - analysis of orders – can help with menu options, stock decisions.
 - Improvement of security – facial recognition could be extended to be used as a security feature for the coffee shop, by linking with a security system and using the same cameras.
- Facial recognition could be extended to be used by the owners to monitor staff attendance, which could be taken on entering and leaving the premises.

Issues caused by privacy, anonymity, consent and surveillance may include:

- *SEACS* will need to develop (write, implement and share) policies to protect customers' privacy.
- *SEACS* may be taken to court for breach of privacy if policies do not meet government requirements.
- *SEACS* may be liable for breach of privacy if staff do not follow the guidelines when operating the POS.
- *SEACS* will need to develop the facial recognition system so that privacy is not breached. This may include:
 - clear signage and information about the FR system, before entering the coffee shop/while in the coffee shop
 - the ability to opt out at any time and for staff to be able to update the database accordingly
 - an opportunity for customers to not have their images stored
 - an ability for customers to authenticate the consent, eg, a signature.
 - Customers may choose not to use the coffee shop for fear of surveillance.
 - Customers may choose not to use the coffee shop if they do not trust *SEACS* to keep the data secure and used only for the original purpose.
- *SEACS* will need to make sure that the security of their system does not get breached and unauthorized users do not have access to the customer database including their personal details.
- Hackers could potentially use the FR data to replicate people's faces and use this to access other systems (privacy linked with identify theft).
- If customers request anonymity but still wish to be a member of the loyalty scheme, they may have to run both the original card-based system as well as the FR one.

HL paper 3 question 4 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 1–3 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, conclusions or future strategies. • No reference is made to the information in the case study or independent research in the response. • The response may be no more than a list.
Adequate 4–6 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, judgments or future strategies that are no more than unsubstantiated statements. The analysis underpinning them may also be partial or unbalanced. • Implicit references are made to the information in the case study or independent research in the response.
Competent 7–9 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 information in the case study or independent research are made at places in the response.
Proficient 10–12 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, judgments or future strategies that are well supported and underpinned by a balanced analysis. • Explicit references are made appropriately to the information in the case study and independent research throughout the response.