

# Markscheme

**May 2023**

**Information technology  
in a global society**

**Standard 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.

**1. Intelligent Transport Monitoring (Government and Politics / Environment)**

- (a) (i) State **two** file formats that could be used for the images of car number plates. [2]

Answers may include:

- Jpg/jpeg
- Tiff
- PNG
- Bitmap
- Gif

*Award [1] for each file format stated up to [2].*

- (ii) Identify **two** pieces of information, in addition to the location of the vehicle, that could be communicated from a vehicle to the monitoring centre. [2]

Answers may include:

- Speed of travel / stopping (lack of speed)
- Direction of travel
- Rate of acceleration/braking
- Distance travelled
- Registration number / number plate number
- Time of event / time reading taken

*Award [1] for identifying each other piece of information that could be communicated from the vehicle to the monitoring centre up to [2].*

- (iii) The government is considering using the data from the Intelligent Transport Monitoring System (ITMS) to create a model of the traffic patterns in a city.

Identify **two** factors that should be taken into account when developing this model. [2]

Answers may include:

- Quality of the data which is used in the model (GIGO)
- Quantity of the data which is used in the model
- Bias when deciding which data should be used to develop the model.
- Number of variables taken into account
- Sample size / variety (is the data collected at various times of the day and at multiple locations)

*Award [1] for identifying each factor that should be taken into account when developing this model up to [2].*

- (b) (i) The government also wants to use the Intelligent Transport Monitoring System (ITMS) to produce a simulation of traffic patterns.

Explain **one** benefit of producing a simulation of traffic patterns.

[2]

Answers may include:

- enables testing of extreme situations (e.g. congestion due to a big event)
- In order to predict the outcomes in order to prevent problems.
- can easily test outcomes from potentially dangerous situations
- In order to avoid these situations happening.
- obtain results immediately
- rather than waiting for a specific event to happen in reality.
- help in predicting factors that promote a smooth, convenient and time efficient commute
- additional mark for examples of these factors or solutions.
- by using simulations to model the effect of changes to the road network conditions e.g. like the timing to traffic lights, or creating alternative routes.

*Award [1] for identifying a benefit of a simulation and [1] for a development of that benefit up to [2].*

- (ii) Explain **one** advantage of outsourcing the development and operation of the Intelligent Transport Monitoring System (ITMS) to a company in another country.

[2]

Answers may include:

- Not the technical skills within Uganda
- Therefore, it is unlikely the system will be developed to the specifications required
- Existing traffic monitoring systems may exist in other countries.
- Therefore, the Ugandan Government may be able to purchase an existing system and get it modified which will be quicker and cheaper than developing it in house.
- Employment costs might be lower in another country.
- Therefore this would lower the overall cost of the project.
- Government of Uganda will not need to invest the money needed in providing hardware and employing people to run the system in their own country.
- Thereby lowering the cost of the project for the government.

*Award [1] for identifying an advantage of a simulation and [1] for a development of that advantage up to [2].*

- (iii) Explain **one** disadvantage of outsourcing the development and operation of the Intelligent Transport Monitoring System (ITMS) to a company in another country.

**[2]**

Answers may include

- Data protection rules may differ from country to country
- and this might put the data at risk.
- The foreign company may not understand the problem which the Ugandan government is trying to solve
- because it is different from the problems which they experience in their own country.
- Ugandan government may lose control over the project
- and find it difficult to direct the project according to their needs.

*Award **[1]** for identifying a disadvantage of a simulation and **[1]** for a development of that disadvantage up to **[2]**.*

- (c) Discuss whether the advantages for the government of monitoring the movement of vehicles in the Republic of Uganda outweigh the disadvantages.

[8]

Answers may include:

**Advantages**

- Will be able to cut down on crimes e.g., which involve 'get away cars'.
- Allows government to track down cars in an emergency or if there is theft.
- Helps the government maintain safer roads as citizens drive more safely as they know they are being monitored
- Could help government see where the traffic is, and therefore do something to improve the traffic situation
- Could be used to see what time of day the traffic is worst / best.
- Could be used to see where there are regular traffic jams.
- Could be used to identify roads which are not heavily used.
- Could be used to see what types of vehicles use which routes.
- Could be used to see what the speed of vehicles travelling on different roads is (for example to recommend speed bumps or speed cameras).
- Could be used to deploy emergency services or traffic police in the case of an unforeseen event or emergency.
- Extra jobs are created by the implementing the system in various sectors.

**Disadvantages**

- May make citizens think the government is spying on them i.e. breakdown of trust.
- Could be used to suppress right to freedom of movement or association i.e. see where people are and who they are near.
- If the data was hacked, criminals would be able to tell when people are not at home and this might lead to increased crime.
- Will cost the citizens money as they need to pay for the system during registration which could lead to problems for the government if citizens refuse to pay this fee.
- May lead to a black economy or ways that the ITMS will be circumvented.
- Cost of the system for the government
- Government would need to employ people to implement, maintain and monitor the new system. This would include training.
- Government would need to roll out an information campaign to inform people about the system which will cost money and require staff.

*Please see generic markband on page 17.*

**2. EyesOnU; (Home and Leisure)**

- (a) (i) State the primary key in the Users table in **Figure 3**. [1]
- UserID

- (ii) State the relationship between the Users table and Images table in **Figure 3**. [1]
- One to many

- (iii) Identify **two** reasons for using a relational database to store this information. [2]

Answers may include:

- Reduces redundant data / redundancy
- Saves storage space
- Reduces errors (caused by repeating data un-necessarily)
- Allows for database to be normalised (avoids anomalies)
- Increases integrity by avoiding update errors (data is updated in one table but not in another when the data is not in a relational database)

*Award [1] for identifying each reason for using a relational database up to [2].*

- (iv) Describe the difference between the internet and the World Wide Web. [2]

Answers may include

- Internet is the physical networks of computers which spans the world
- WWW is the websites / webpages stored on web servers which are viewed in a browser.

*Award [1] for describing each difference between the Internet and the World Wide Web up to [2].*



- (b) The *EyesOnU* facial recognition tool has drawn criticism from privacy campaigners who say that the tool could be used to compromise a user's privacy. *EyesOnU* has stated that their privacy policy will prevent this.

Explain **three** rules that could be included in a privacy policy for *EyesOnU*.

**[6]**

Answers may include:

- Images will only be used for the purpose intended.
- This will mean that users must specify the purpose for which the image is intended when it is uploaded and if they intend to use for other purposes must complete a check box to acknowledge they give their consent for the image to be other uses.
- Images will only be shared with the consent of the subject
- So if another user wishes to use an image they must contact the owner of the image before they can use it (this may include a check box where the subject of the image formally gives permission for it to be used).
- Images will be stored for a limited time only.
- Which means that the images stored on *EyesOnU* will automatically be deleted unless the subject provides permission for it to be kept on the website for longer.
- Details of the image owner will not be shared with third parties.
- If the image owner wishes to share their personal details with third parties (such as age, location, gender etc), they must give additional consent.
- Only relevant information should be collected / stored.
- For example the address of the person need not be stored along with the image as it is not needed for the purpose of searching the pictures.

Award **[1]** for identifying each rule that would be included in a privacy policy for *EyesOnU* and **[1]** for a development of that reason up to **[2]**.

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

- (c) There have been concerns raised about the way people use facial recognition sites like *EyesOnU*.

To what extent is it the responsibility of the website owners **and** the users of *EyesOnU* to ensure that users act ethically?

[8]

Answers may include:

**Responsibility of the users of *EyesOnU***

- *EyesOnU* cannot be held responsible for the actions of every user and appropriate use of the service requires users to act responsibly
- Each user must read the privacy policy and agree to its terms before using the service.
- Each user must only use the site for what it was intended (search for their own photographs).
- Users Should take responsibility for their own behaviour, for example they should not use the site to carry out activities such as spying on other people, stealing another user's identity or tracking another user.

**Responsibility of *EyesOnU***

- Allows users to check to see if their photos are being used on other websites without permission
- *EyesOnU* has a set of terms and conditions and it is a requirement that every user signs this before they can use the service.
- *EyesOnU* does not allow minors to use the service (may require ID check)
- *EyesOnU* uses algorithms that are not harmful to the users. This may include adapting algorithms used that have proved to be harmful.
- Should take appropriate action when users are seen to be acting inappropriately / should be cognizant of the way the service is being used.
- Should provide appropriate duty of care to users, for example, to deal with conflict resolution.
- *EyesOnU* should ensure that the photos that are uploaded to the site are only of the face of the registered user and does not contain any other images of other people or parts of the body.

**Conclusions**

- It is unrealistic for either the users or *EyesOnU* to be the only party who is acting unethically. Both sides must act ethically.
- Users must police their own behaviour so that it is easier for *EyesOnU* to police the behaviour of all users.
- Ethical behaviour, and its promotion, should lead to the development of trust between *EyesOnU* and its users, or between users.
- It could be difficult to verify that users are only uploading their own images and not engaging in wrongful activities

*Please see generic markband on page 17.*

**3. Fake news (Health / Education)**

- (a) (i) State **two** output devices on a smartphone. **[2]**

Answers may include

- Screen.
- Speakers.

*Award **[1]** for stating each output device on a smartphone up to **[2]**.*

- (ii) Identify the steps used in public and private key encryption. **[4]**

Answers may include:

- Private and public keys are generated
- User A has a message to send to User B
- User A gets User B's **public key**
- User A **encrypts** the message,
- using User B's **public key**
- Encrypted message / cypher text is sent to User B
- User B **decrypts** the message,
- using their **private key**.

*Award **[1]** for identifying each step in public and private key encryption up to **[4]**.*

- (b) It has been proposed that the following measures could be introduced to reduce the risk of users spreading false information:
- Limiting the size of the messaging app groups.
  - Limiting the number of times a message can be forwarded.
  - Labelling messages as being forwarded.

Analyse this proposal.

[6]

Answers may include:

**Reasons that support the proposal**

- Limiting the size of the group - fewer people will see a message in a particular group
- Limiting the size of the group - people might be more selective about who they invite to a group they have created
- Limiting the number of times a message can be forwarded - there is a reduced risk of a message 'going viral'.
- Labelling messages as being forwarded - people will be able to see that the message has not been written by the person who forwarded it.

**Reasons that do not support the proposal**

- Limiting size of group - users may simply make several groups to get around the group size limit
- Limiting forwarding – message may still reach a large number of people in groups
- Labelling messages as forwarded – some people could miss this if it is not evident enough
- Labelling messages as forwarded - Could get around forwarding restrictions by retyping the information or by taking a screen shot and sending that.

**Analysis**

- Only slows the dissemination of false information, but does not stop it
- The technical solution to the problem may be less effective than inculcating good behaviour in the users of these messaging apps.
- Users of this messaging service may use other similar services so the problem is displaced rather than resolved.
- Users of the service may find ways to get around the restrictions

Marks	Level descriptor
0	No knowledge or understanding of ITGS issues and concepts. No use of appropriate ITGS terminology.
1–2	A limited response that identifies reasons why the introduction of control will reduce the sharing of false information. Uses little or no appropriate ITGS terminology. No reference is made to the scenario in the stimulus material. The response is theoretical and descriptive. Addresses one of the proposed solutions.
3–4	A description or partial analysis of whether the introduction of controls will reduce the sharing of false information. There is some use of appropriate ITGS terminology in the response and some reference to the scenario in the stimulus material. Addresses one <b>or</b> two of the proposals.
5–6	A balanced analysis of whether the introduction of controls will reduce the sharing of false information. Explicit and relevant references are made to the scenario in the stimulus material. There is appropriate ITGS terminology throughout the response. Addresses two <b>or</b> three of the proposals.

- (c) To what extent is it the responsibility of the individuals within these communities to address the issue of false information being spread on social media?

[8]

Answers may include:

**Individuals can take responsibility for their use of social media by:**

- Individuals should take more responsibility for fact checking information they receive /
- Individuals should try to gather information from a range of sources to determine the veracity of the information rather than to assume everything they receive is true.
- Individuals should be accountable for their own actions such as forwarded information that may be false
- Individuals should not act on the information without considering the implications of their actions.
- Individuals are responsible for their own well being if this is linked to their use of the messaging app.
- Users who are admins of messaging groups have a responsibility to remove users (and messages) who are posting irresponsibly.
- Users can remove themselves from groups which are spreading false information.
- Users should report the fake news to others on the group (or to the social media company or other authorities)

**Individuals are unable to take responsibility for their use of social media because:**

- If the news provider is a monopoly, what else can individuals who want access to news on the internet do?
- As the users may not be able to afford a different internet provider (the app is free), they are effectively trapped / locked in to this service.
- Many of the features of social media platforms, such as no limits on the number of other users a message can be forwarded to built in, and cannot be managed by individuals
- They may not be sufficiently informed to understand the impacts of their actions or inactions.

*Please see generic markband on page 17.*

**4. Jack's fitness business (Business)**

(a) Jack's website has the following URL: <https://www.jacksfitnessservices.com/>

- (i) State the domain name. **[1]**
- jacksfitnessservices.com

Accept www.jacksfitnessservices.com

- (ii) State the protocol. **[1]**
- Https / Hypertext transfer protocol secure

Accept https://

- (iii) Identify **two** reasons why Jack's website would use cookies. **[2]**

Answers may include

- To allow the website's contents to be customised to the user's preferences
- To be able to recognise when the user visits the website again
- To allow for targeting advertising

*Award **[1]** for identifying each reason why cookies may be used on Jack's website up to **[2]**.*

- (iv) Identify **two** reasons why Jack's website would include meta tags. **[2]**

Answers may include

- To make the site more easily searchable / search engine optimisation.
- Provides a description of your site which will be displayed when users search your site.
- Could tell search engines which pages they should or should not index/list in their search engine results (robots meta tag).

*Award **[1]** for identifying each reason why Jack's website would include meta tags up to **[2]**.*

- (b) Jack keeps the records of his financial transactions with clients in a spreadsheet.

Explain **three** advantages for Jack of keeping financial transactions with clients in a spreadsheet rather than in a database.

**[6]**

Answers may include:

- Spreadsheets functions and formulas can be used to calculate various values within a spreadsheet.
- Database formulas can only be used in queries and reports, mostly to aggregate the data.
- Spreadsheets allow data to be visualised in charts/graphs
- Databases usually cannot provide graphs or can only provide graphs on limited sets of data.
- Spreadsheets provide models / spreadsheets can be used to ask 'what if' questions
- Databases only work with data store in the database table so it is more difficult to use them to predict the future / with predictive data / to ask 'what if' questions.
- In a spreadsheet, stored data can be formatted as currency, text, dates etc. Within the spreadsheet table so that the raw data is more readable for a novice
- In a database, only raw data is stored and formatting is only provided by database reports. This makes it less 'readable' to a novice.
- Spreadsheet is more appropriate for the amount and type of data which Jack is likely going to have to deal with as a person with their own business.
- It is unlikely he would want to spend the time or effort on creating a customised database (or learning how to use one) or the money to pay someone else to do it.

*Award **[1]** for identifying each advantage of Jack keeping financial transactions with clients in a spreadsheet rather than in a database up to **[2]**.*

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

- (c) Jack's business has recently suffered because he can't always visit his clients in their homes. He is considering changing to personal training via a video-streaming platform.

Evaluate the advantages **and** disadvantages for Jack if he offers personal training via a video-streaming platform instead of travelling to visit his clients in person.

[8]

Answers may include

**Advantages of offering video streaming**

- No need for Jack to travel - provides environmental advantages
- Could have more classes in the day as saves time by not having to unpack, pack up and travel between clients.
- Could have bigger classes and therefore increase the number of clients in a day
- Avoids having groups of people in the same space (health issue)
- The streamed class could be made available for 24 hours which would attract extra students who cannot fit in with the class schedule
- Less cost to Jack for car travel between houses
- Advantages of working from home
- Could attract new clients from a wider area

**Disadvantages of offering video streaming**

- People may miss the 'personal touch' and no longer wish to train with Jack
- Technical issues could interfere with Jack's ability to give a class / quality of the class
- Jack may not be able to instruct as well without being able to be physically present in the room when people are exercising
- In the case of an emergency (pulled muscle, sprained ankle etc.) Jack would not be physically present to assist.
- He may lose clients who are not experienced with using online video streaming
- He may lose clients who do not have the equipment needed to use online video streaming
- He may lose clients who do not have the exercise equipment at home which Jack would have provided.
- It is harder to get to know clients, encourage them to workout and therefore maintain a client base
- Might lose clients to other, free, video content available online. As this free content might be seen as 'just as good' as Jack's video content.

*Please see generic markband on page 17.*



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

<b>Marks</b>	<b>Level descriptor</b>
<b>No marks</b>	<ul style="list-style-type: none"> <li>• A response with no knowledge or understanding of the relevant ITGS issues and concepts.</li> <li>• A response that includes no appropriate ITGS terminology.</li> </ul>
<b>Basic 1–2 marks</b>	<ul style="list-style-type: none"> <li>• A response with minimal knowledge and understanding of the relevant ITGS issues and concepts.</li> <li>• A response that includes minimal use of appropriate ITGS terminology.</li> <li>• A response that has no evidence of judgments, conclusions or future strategies.</li> <li>• The response may be no more than a list.</li> </ul>
<b>Adequate 3–4 marks</b>	<ul style="list-style-type: none"> <li>• A descriptive response with limited knowledge and/or understanding of the relevant ITGS issues and/or concepts.</li> <li>• A response that includes limited use of appropriate ITGS terminology.</li> <li>• 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.</li> </ul>
<b>Competent 5–6 marks</b>	<ul style="list-style-type: none"> <li>• A response with knowledge and understanding of the relevant ITGS issues and/or concepts.</li> <li>• A response that uses ITGS terminology appropriately in places.</li> <li>• A response that includes conclusions and/or judgments that have limited support and are underpinned by a balanced analysis.</li> </ul>
<b>Proficient 7–8 marks</b>	<ul style="list-style-type: none"> <li>• A response with a detailed knowledge and understanding of the relevant ITGS issues and/or concepts.</li> <li>• A response that uses ITGS terminology appropriately throughout.</li> <li>• A response that includes conclusions, judgments or future strategies that are well supported and underpinned by a balanced analysis.</li> </ul>