Diploma Programme
Programme du diplôme
Programa del Diploma

Information technology in a global society
Standard level
Paper 1

18 May 2023

Zone A afternoon | **Zone B** afternoon | **Zone C** afternoon

1 hour 30 minutes

Instructions to candidates

- Do not open this examination paper until instructed to do so.
- Answer two questions. Each question is worth **[20 marks]**.
- The maximum mark for this examination paper is **[40 marks]**.

2223 – 5512

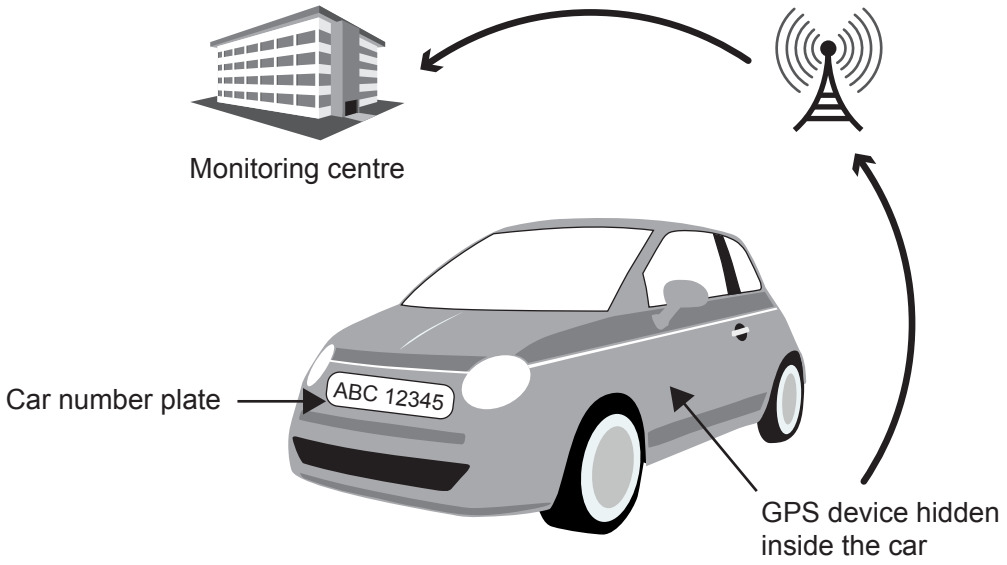
8 pages

Answer **two** questions. Each question is worth [20 marks].

1. Intelligent transport monitoring

The government of the Republic of Uganda has required all motor vehicles to be fitted with a global positioning system (GPS) device. The government has adopted this strategy to reduce crimes that often involve the use of motor vehicles. **Figure 1** shows that a GPS device can be hidden inside a car.

Figure 1: How the transport monitoring system works



The GPS device within the vehicle will communicate with a monitoring centre to send the data from the car using mobile/cellphone technology. If the device is disconnected from the vehicle, an alert will be sent to the monitoring centre.

In addition to the information captured by the GPS device, there are roadside cameras that capture images of the number plates of passing cars.

This initiative is called the Intelligent Transport Monitoring System (ITMS).

However, civil liberty groups in the Republic of Uganda have raised concerns about the Intelligent Transport Monitoring System.

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

(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]

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(Question 1 continued)

(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]

The Ugandan government is outsourcing the development of the Intelligent Transport Monitoring System (ITMS) to a technology company in another country. This company will also develop and operate the software that monitors vehicles in the system (ITMS).

(ii) Explain **one** advantage of outsourcing the development and operation of the Intelligent Transport Monitoring System (ITMS) to a company in another country. [2]

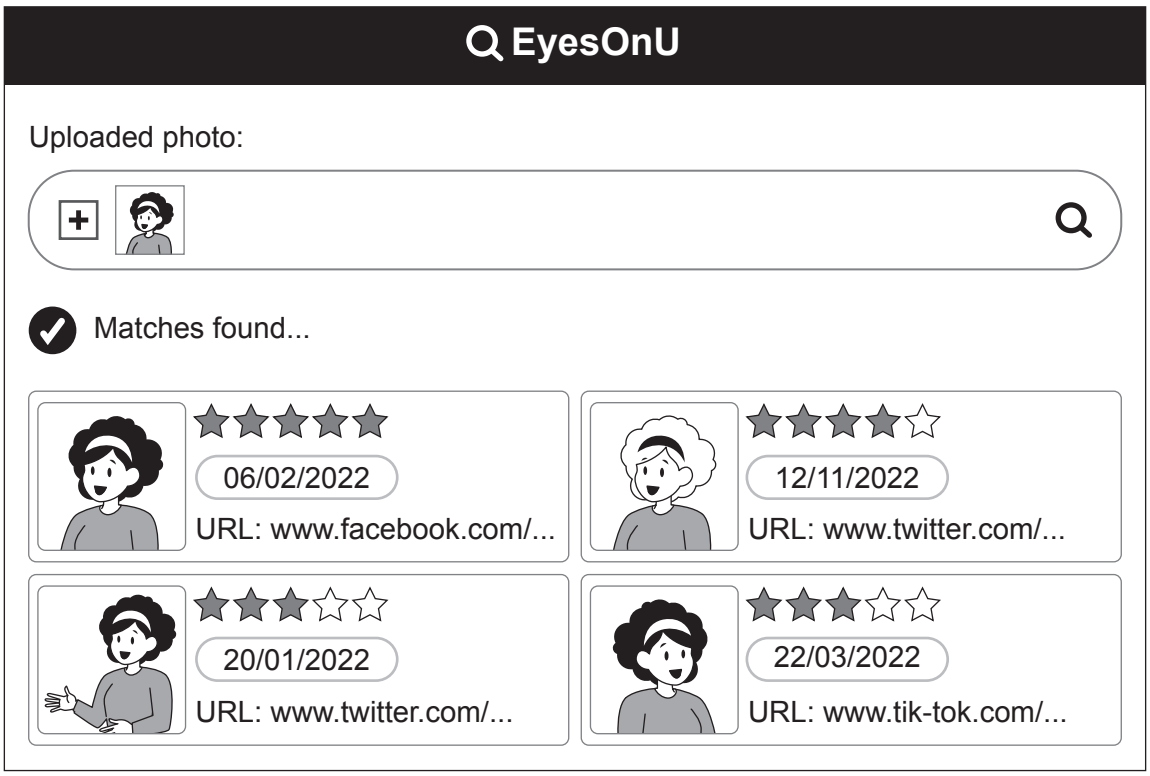
(iii) Explain **one** disadvantage of outsourcing the development and operation of the Intelligent Transport Monitoring System (ITMS) to a company in another country. [2]

(c) Discuss whether the advantages for the government of monitoring the movement of vehicles in the Republic of Uganda outweigh the disadvantages. [8]

2. EyesOnU

EyesOnU is a facial recognition website that allows people to upload a picture of a person and find matching images on the World Wide Web. Each image found is given a rating based on how similar it is to the uploaded picture (see **Figure 2**).

Figure 2: Example of a search on the *EyesOnU* website



EyesOnU is marketed as an online tool that allows a user to see if somebody else has used an image that includes them without their permission.

EyesOnU aims to encourage its users to behave ethically.

EyesOnU stores the data in a relational database (see **Figure 3**).

Figure 3: Part of the *EyesOnU* relational database

Users
UserID
FirstName
Surname
DateOfBirth
…

Images
ImageID
UserID
DateAndTime
…

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(Question 2 continued)

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

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

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

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

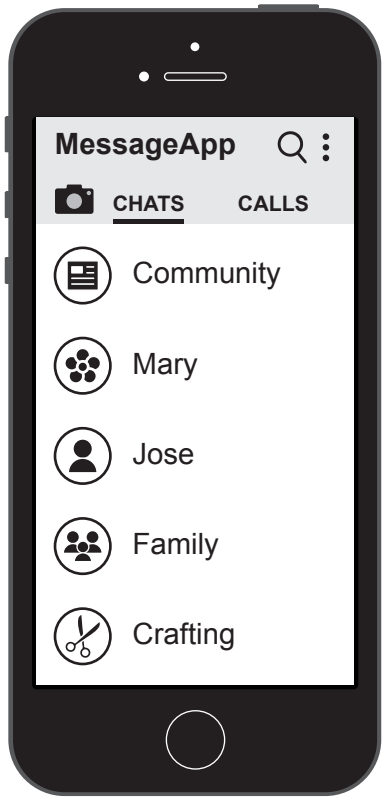
(c) There have been concerns raised about the way people use facial recognition sites like *EyesOnU*.

To what extent is it the responsibility of the website owners **and** the users of *EyesOnU* to ensure that users act ethically? [8]

3. Fake news

In 2021, 96 % of Brazilians with access to a smartphone used free internet messaging apps as their only method of communication and obtaining news (see **Figure 4**).

Figure 4: An example of a smartphone with a free messaging app



However, these messaging apps are leading to the spread of false information. This is because messages are often forwarded many times, especially when users are using messaging groups that allow messages to be shared between several people. These forwarded messages may not have been written by a member of the group. Being able to check whether the information in the messages is true can be very difficult.

One of the issues that has arisen as a result of false information being spread by such groups is that people in communities far from large towns are refusing medical treatment (such as vaccinations against preventable diseases).

The messaging app company has said that, because the messages on its platform are encrypted, there is nothing it can do to remove messages containing false information (see **Figure 5**).

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(Question 3 continued)

Figure 5: An example of a message spreading false information

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

(ii) Identify the steps used in public and private key encryption. [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 messaging app groups.
- Limiting the number of times a message can be forwarded.
- Labelling messages as being forwarded.

Analyse this proposal. [6]

(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]

4. Jack's fitness business

Jack Chevremont is a personal trainer in Massachusetts, USA. For the last few years he has been providing fitness sessions for clients at home. Jack has grown his business based on personal recommendations.

Jack is considering expanding his business. He has been advised to develop a website to advertise to prospective clients. This website would also allow clients to book their fitness sessions online.

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

(i) State the domain name. [1]

(ii) State the protocol. [1]

One of Jack's clients has advised him to use cookies and meta tags.

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

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

(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]

References:

Figure 1 Anon, n.d. [Vector image of car]. [online] Available at: https://publicdomainvectors.org/en/free-clipart/Green-car-vector-image/10093.html [Accessed 7 March 2022]. Public domain.

Anon, n.d. [Vector image of a building]. [online] Available at: https://publicdomainvectors.org/en/free-clipart/Building-3D-graphics/70653.html [Accessed 7 March 2022]. Public domain.

Figure 5 Mike, 2017. *Brown T-rex statue*. [online] Available at: https://www.pexels.com/photo/brown-t-rex-statue-410856/ [Accessed 7 March 2022]. Source adapted.