Diploma Programme
Programme du diplôme
Programa del Diploma

Information technology in a global society
Standard level
Paper 1

Tuesday 17 May 2022 (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]**.

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

1. Medical data shared in online apps

Many people use smartwatches to monitor their vital signs and manage their health. Information such as heart rate, blood pressure and body temperature can be obtained from an app* like *yourHealth* on a smartwatch.

Figure 1: The *yourHealth* app and smartwatch

Some users of the smartwatch app are concerned that their privacy might be invaded.

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* app: small specialized program run on mobile devices, the internet, a computer or other electronic device

(a) (i) Define the term *privacy*. [2]

(ii) Identify **two** ways the smartwatch and cellphone (mobile phone) could use to communicate with each other. [2]

The uniform resource locator (URL) for the smartwatch app in **Figure 1** is https://www.yourhealthwatch.com/2020/03/export-data-yourhealth-watch-health-app.html.

(iii) State the domain name. [1]

(iv) State the protocol used in the URL. [1]

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(Question 1 continued)

(b) (i) The team developing the smartwatch app followed the project development life cycle (PDLC).

Explain why end-users should be involved in the development of products such as the smartwatch app. [3]

(ii) Explain why a feasibility study would be used in the development of products such as the smartwatch app. [3]

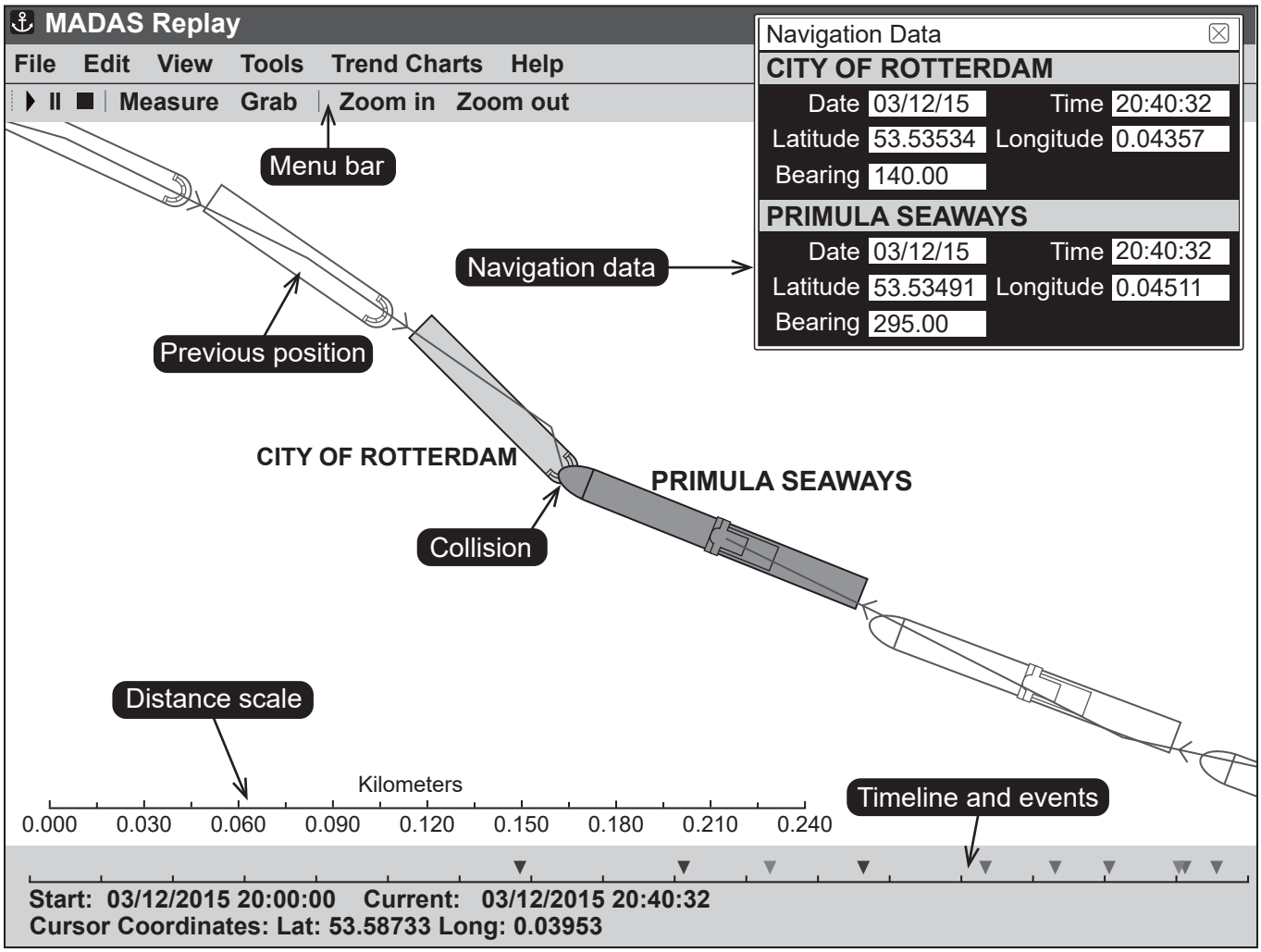
(c) Many people use smartwatches to monitor their vital signs and manage their health.

To what extent should an individual use a smartwatch to manage their health? [8]

2. Investigation of ocean disasters

A system called the Marine Accident Data Analysis Suite (MADAS) uses data collected from marine accidents to create a simulation to help understand what has happened (see **Figure 2**).

Figure 2: An example of a MADAS simulation



Cruise ships are required to carry a voyage data recorder (VDR), which uses sensors to monitor the conditions in the ship at all times. The data from the sensors is collected and input into a relational database (see **Figure 3**) that is a part of the MADAS system (see **Figure 4**).

Figure 3: Part of the relational database in the MADAS system

Accident
Accident_ID
Ship_ID
Date
Location
More fields

Ship
Ship_ID
Year_Built
Country_of_Reg
Length
More fields

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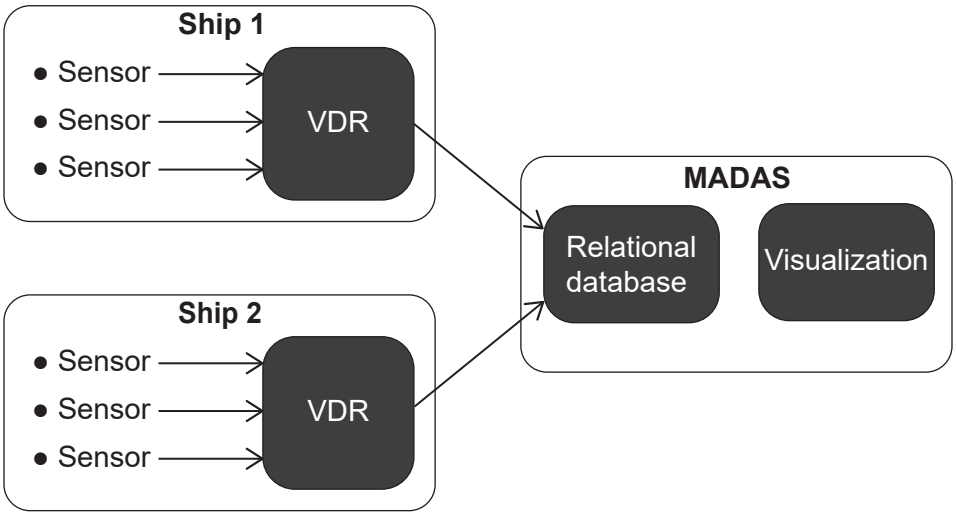
(Question 2 continued)

Figure 4: The MADAS system



(a) The voyage data recorder (VDR) records weather conditions during a voyage.

(i) Identify **two** sensors that may be used to detect data about the weather conditions. [2]

(ii) State the primary key in the Ship table in **Figure 3**. [1]

(iii) State the relationship between the Ship table and Accident table in **Figure 3**. [1]

(iv) Outline **one** advantage of using a relational database rather than a flat-file database. [2]

(b) (i) Distinguish between data validation **and** data verification. [2]

(ii) The MADAS system uses data visualization.

Explain why data visualization is used by the MADAS system. [4]

(c) To what extent can the use of simulations like the MADAS system help prevent future accidents? [8]

3. Schools told not to use cloud computing software applications

Schools in the German state of Hesse will no longer be able to use cloud computing services and software applications, such as G Suite and Office 365, due to new data protection rules. This has led to the risk of schools' data being accessed by governments from other countries.

In contrast, many schools in other parts of the world use cloud computing services and software applications. These applications allow students to access software that was previously only installed on their computers.

(a) (i) Identify **two** types of cloud computing software applications that students might use at school. [2]

(ii) If the schools in Hesse can no longer use cloud computing software applications, they will need to store their data on a local file server and access it through a local area network (LAN).

Identify **two** ways in which data could be secured if the school stored it locally. [2]

(iii) The change from cloud computing software applications may require the school to change the type of licence they need to purchase.

Identify **two** types of licence that the school could purchase to allow them to install and run software applications on their local area network (LAN). [2]

(b) The European Union's (EU) General Data Protection Regulation (GDPR) governs data protection and privacy in the EU. Its regulations give users certain rights in terms of their data.

Explain **three** principles that should be included in data protection regulations such as GDPR. [6]

(c) A new school has opened in Switzerland and its IT Manager is considering two options:

Option 1: Using a local client–server network.

Option 2: Using a cloud-based service.

Evaluate the implications of these two options for the IT Manager. [8]

4. China's social credit scheme

The Chinese government is proposing a social credit scheme that will reward its citizens with points for what it considers to be good behaviour. This can be done by monitoring citizens' social media connections, purchasing history and location data.

CCTV cameras are widely used in China and there are concerns that facial recognition technology is already being utilized by the government to detect "good" and "bad" behaviours of its citizens. The facial recognition system requires high-resolution images.

(a) (i) Define the term *resolution*. [2]

(ii) Identify **two** types of image file. [2]

(iii) Distinguish between authentication **and** authorization. [2]

(b) (i) Other governments are considering setting up similar systems that will use facial recognition to gather information about the behaviour of its citizens.

Explain why the development of a requirements specification is important in the development of a new facial recognition system. [3]

(ii) Explain why using high-resolution images could be a challenge to the implementation of a facial recognition system. [3]

(c) Discuss the advantages **and** disadvantages of a government using a facial recognition system to monitor the behaviour of its citizens. [8]

References:

Figure 2. With permission from the International Union of Marine Insurance. Source adapted.