

© International Baccalaureate Organization 2024

All rights reserved. No part of this product may be reproduced in any form or by any electronic or mechanical means, including information storage and retrieval systems, without the prior written permission from the IB. Additionally, the license tied with this product prohibits use of any selected files or extracts from this product. Use by third parties, including but not limited to publishers, private teachers, tutoring or study services, preparatory schools, vendors operating curriculum mapping services or teacher resource digital platforms and app developers, whether fee-covered or not, is prohibited and is a criminal offense.

More information on how to request written permission in the form of a license can be obtained from <https://ibo.org/become-an-ib-school/ib-publishing/licensing/applying-for-a-license/>.

© Organisation du Baccalauréat International 2024

Tous droits réservés. Aucune partie de ce produit ne peut être reproduite sous quelque forme ni par quelque moyen que ce soit, électronique ou mécanique, y compris des systèmes de stockage et de récupération d'informations, sans l'autorisation écrite préalable de l'IB. De plus, la licence associée à ce produit interdit toute utilisation de tout fichier ou extrait sélectionné dans ce produit. L'utilisation par des tiers, y compris, sans toutefois s'y limiter, des éditeurs, des professeurs particuliers, des services de tutorat ou d'aide aux études, des établissements de préparation à l'enseignement supérieur, des fournisseurs de services de planification des programmes d'études, des gestionnaires de plateformes pédagogiques en ligne, et des développeurs d'applications, moyennant paiement ou non, est interdite et constitue une infraction pénale.

Pour plus d'informations sur la procédure à suivre pour obtenir une autorisation écrite sous la forme d'une licence, rendez-vous à l'adresse <https://ibo.org/become-an-ib-school/ib-publishing/licensing/applying-for-a-license/>.

© Organización del Bachillerato Internacional, 2024

Todos los derechos reservados. No se podrá reproducir ninguna parte de este producto de ninguna forma ni por ningún medio electrónico o mecánico, incluidos los sistemas de almacenamiento y recuperación de información, sin la previa autorización por escrito del IB. Además, la licencia vinculada a este producto prohíbe el uso de todo archivo o fragmento seleccionado de este producto. El uso por parte de terceros —lo que incluye, a título enunciativo, editoriales, profesores particulares, servicios de apoyo académico o ayuda para el estudio, colegios preparatorios, desarrolladores de aplicaciones y entidades que presten servicios de planificación curricular u ofrezcan recursos para docentes mediante plataformas digitales—, ya sea incluido en tasas o no, está prohibido y constituye un delito.

En este enlace encontrará más información sobre cómo solicitar una autorización por escrito en forma de licencia: <https://ibo.org/become-an-ib-school/ib-publishing/licensing/applying-for-a-license/>.

# Digital society

## Higher level

### Paper 1

6 November 2024

Zone A afternoon | Zone B afternoon | Zone C afternoon

2 hours 15 minutes

---

#### Instructions to candidates

- Do not open this examination paper until instructed to do so.
- Section A: answer two questions.
- Section B: answer one question.
- The maximum mark for this examination paper is **[52 marks]**.

## Section A

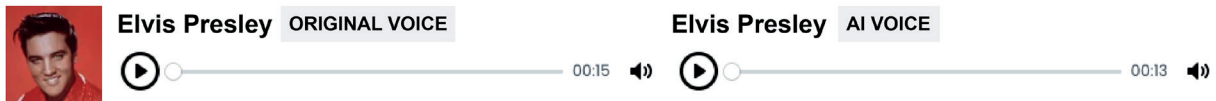
Answer **two** questions from this section. Each question is worth [20 marks].

### 1. Synthetic voices

Respeecher is voice cloning software that can be used to speak like a famous person, such as Elvis Presley (see **Figure 1**). Respeecher was used to clone the voice of actor Mark Hamill for the television series *The Mandalorian*.

**Figure 1: An example of Respeecher**

### Voice cloning Powered by artificial intelligence (AI)



To create the synthetic voice, Respeecher captures recordings of the voice of the famous person and stores them in a database. Respeecher then uses neural networks to create the synthetic voice so it can replace the original voice.

- (a) (i) Identify **two** characteristics of a database. [2]
- (ii) Identify **two** ways in which the integrity of the data in a database can be maintained. [2]
- (iii) Identify **two** characteristics of a neural network. [2]
- (b) (i) Explain **two** reasons why it may be difficult to clone a person's voice. [4]
- (ii) Explain **one** way of verifying that the synthetic voice produced by voice cloning software is that of the famous person. [2]
- (c) Discuss whether it is acceptable for a movie production company to use dialogue generated by voice cloning software from an actor who has not been involved in the production of the movie. [8]

## 2. Experimental earbuds for detecting infections

A Japanese technology company, *Tekunoroji*, has been working on wireless earbuds that can detect possible infections and other conditions (see **Figure 2**).

**Figure 2: An example of earbuds**



*Tekunoroji* earbuds emit a sound that produces unique echoes as it moves through the ear canal. These echoes are captured by a microphone.

The captured echoes are sent to an app in a connected smartphone. They are then uploaded to a database. Neural networks then use algorithms to generate a profile of the wearer's inner ear, which includes changes in temperature and levels of moisture in the ear canal that may suggest the wearer has a condition in the ear.

The earbuds can be used to diagnose three different conditions: earwax blockage, ruptured ear drums, and inflammation of the middle ear caused by colds or sore throats.

- (a) (i) Identify **two** sensors needed for the earbuds to collect data. [2]
- (ii) Identify **two** ways in which data can be shared between the earbuds and the app. [2]
- (iii) Identify **two** characteristics of an algorithm. [2]
- (b) Explain **three** concerns about the algorithms used in the earbuds. [6]
- (c) Evaluate the impacts that wearable devices may have when used for medical diagnostics and care. [8]

### 3. Smart glasses help police track criminals

Police departments are considering equipping police officers with smart glasses. The police believe these smart glasses can help monitor human behaviour and support law enforcement.

The smart glasses include software that can scan a person's face. The software can then search the police database and provide information about that person (see **Figure 3**).

**Figure 3: An example of smart glasses**



Civil liberty groups have concerns about the possible misuse of these smart glasses. They are concerned that the smart glasses may be used as a form of surveillance.

- (a) (i) Identify **two** appropriate uses of smart glasses in policing. [2]
- (ii) Identify the steps in the process by which facial recognition software can help the police identify a person. [4]
- (b) Data about citizens is captured by the smart glasses and is added to the police database.  
To ensure this data is not misused, policies are required for data collection, data storage and any data sharing.
  - (i) Explain **one** policy that is required for the ethical **collection** of citizens' data. [2]
  - (ii) Explain **one** policy that is required for the ethical **storage** of citizens' data. [2]
  - (iii) Explain **one** policy that is required for the ethical **sharing** of citizens' data. [2]
- (c) Discuss the advantages **and** disadvantages of using smart glasses that can recognize faces in law enforcement. [8]

## Section B

Answer **one** question from this section. Each question is worth [12 marks].

### 4. Exoskeletons

Globally, life expectancies have risen from 66.8 years in 2000 to 73.4 years in 2019.

This has resulted in a global challenge to help elderly people maintain their independence and prevent them from falling as their muscles become weaker.

One intervention that could address this problem is a smart exoskeleton.

Scientists are researching how to make exoskeletons more affordable, lighter in weight, and easier to control (see **Figure 4**). They are also integrating artificial intelligence (AI) so that the exoskeletons can predict human behaviour.

**Figure 4: An exoskeleton for an elderly person**



It is claimed that this intervention will significantly increase the quality of life for elderly people.

Evaluate this claim.

[12]

## 5. Internet voting

A global challenge is to ensure that all citizens are represented in elections.

India is considering an intervention that will use internet voting for elections. The aim of this intervention is to increase voter participation, which has not exceeded 70% in any national election since 1952.

Voters will be able to use internet-connected digital devices to vote from any location (see **Figure 5**). If a voter does not have such a device, they can go to a public facility, such as a library, to use an internet-connected device to vote.

**Figure 5: Voting using a mobile device**



It is claimed that this intervention will increase voter participation.

To what extent do you agree with this claim?

[12]

**Disclaimer:**

Content used in IB assessments is taken from authentic, third-party sources. The views expressed within them belong to their individual authors and/or publishers and do not necessarily reflect the views of the IB.

**References:**

- Figure 1** With permission from Respeecher.
- Figure 2** yunava1, n.d. *Wireless earphone in the girl's ear – stock photo*. [image online] Available at: <https://www.gettyimages.co.uk/detail/photo/wireless-earphone-in-the-girls-ear-royalty-free-image/1314954738> [Accessed 6 July 2023]. Source adapted.
- Figure 3** Drazen\_, n.d. *Mature man working remotely on laptop from café – stock photo*. [image online] Available at: <https://www.gettyimages.co.uk/detail/photo/mature-man-working-remotely-on-laptop-from-cafe-royalty-free-image/1387520816?phrase=man+in+cafe> [Accessed 23 May 2023]. Source adapted.
- CocoSan, n.d., *People enjoying coffee in modern unrecognizable café – stock photo*. [image online] Available at: <https://www.gettyimages.co.uk/detail/photo/people-enjoying-coffee-in-modern-unrecognizable-royalty-free-image/1407730635> [Accessed 23 May 2023]. Source adapted.
- Figure 4** gorodenkoff, n.d. *Modern Hospital Physical Therapy: Patient with Injury Walks on Treadmill Wearing Advanced Robotic Exoskeleton Legs – stock photo*. [image online] Available at: <https://www.gettyimages.co.uk/detail/photo/modern-hospital-physical-therapy-patient-with-royalty-free-image/1335020215> [Accessed 6 July 2023]. Source adapted.
- Figure 5** CarmenMurillo, n.d. *Hand holding smart phone with online voting concept on screen - stock photo*. [image online] Available at: <https://www.gettyimages.co.uk/detail/photo/hand-holding-smart-phone-with-online-voting-concept-royalty-free-image/537356658> [Accessed 6 July 2023]. Source adapted.