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Markscheme

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Digital Society

Standard level

Paper 1

International Baccalaureate
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1. Diggi the health service robot

(a) (i) Identify **two** output devices that might be included on a service robot.   **[2]**

Answers may include:
- o   Robotic arm.
- o   Wheels (to move).
- o   Screen / monitor.
- o   LED display (face).
- o   Speaker.
- o   Activator/motor system for storage container.
- o   Electronic lock on storage container.

Award [1] for identifying each output device which might be included on a service robot up to [2].

(ii)   Identify **two** sensors that Diggi would use to help it navigate a hospital's corridors.   **[2]**

Answers may include:
- Beacon/RFID reader / sensors for geo fences (or similar) based on scanning locations in hospital.
- Colour sensor / Line following to follow a route on the floor / light sensor.
- QR code / Bar code reader – to read route information from the floor.
- Character recognition – could read the signs in the hospital to locate itself.
- LIDAR / Radar.
- Cameras / Character recognition (could read the signs in the hospital to locate itself).
- Ultrasonic / proximity sensor.

Award [1] for identifying each sensor Diggi would use to help it to navigate through the hospital corridors up to [2].

(iii)   Identify **two** ways in which the developers of Diggi might make the robot seem more human.   **[2]**

Answers may include
- Facial features / expressions that can express various emotions.
- Could communicate with people via text to speech / human like voice.
- Could communicate in text via the display panel.
- Has a 'name' (Diggi).
- Has a head and torso – for example, human shape / two arms and legs.
- Human' movement' – for example, can turn its head / can 'wave' with its arm / walks on two legs.

Award [1] for identifying each way that the developers of Diggi might make the robot seem to human like up to [2].

(b) (i) Diggi's design was based on data gathered by primary and secondary research.

Explain **three** methods of primary data collection that would provide information that could enable Diggi to complete its tasks. **[6]**

Note to examiners: This part (b) question should be marked with ticks.

Answers may include
- Focus groups.
- Would allow small groups of interested users/parties to provide information about how earlier versions/prototypes of Diggi appear and/or function.

- Interviews.
- Would allow interested users/parties to provide detailed information about how prototypes of Diggi appear and/or function.

- Observation.
- Would allow interested users/parties to see how Diggi functions.

- Survey / Questionnaire.
- Ask people what they need from a robot like Diggi.

Award [1] for identifying the method of primary data collection used to inform the design of Diggi and [1] for a development of why this primary data collection type is appropriate up to [2].

Mark as [2] + [2] + [2]

(c) Evaluate the opportunities **and** dilemmas associated with the use of service robots, such as Diggi, in the healthcare sector. **[8]**

Answers may include
Opportunities:
- Does tedious tasks (such as fetching equipment) for the nurses.
- Allows nurses and doctors more time to spend treating patients as it does the fetching and carrying (ethics, change).
- Can keep the patients schedules and files so that no-one is given the wrong medication or medication at the wrong time (systems, ethics).
- Some evidence that robots can provide companionship and alleviate some of the stress of loneliness (ethics, identity).
- Employment – shortage of nurse and support staff, nurse having to do support staff jobs (ethics).
- Could deliver food or medicines to patients who are in isolation / have infectious diseases.

Dilemmas:
- People might feel that their jobs are being taken by the robots / deskilling (ethics). change
- Robots can malfunction and might end up hurting someone (systems, ethics)
- Access to medical records may lead to privacy issues (ethics).
- Ethics of allowing robots to make decisions about patient care – who will be responsible if something goes wrong (ethics, accountability).
- Deskilling of nurses – may lose the ability to correctly order supplies and this will mean if the robot isn't there they will be less effective (change, systems, ethics).
- Some people might feel uncomfortable having a robot in the room (systems). This may relate to a person's age/ culture (identity)
- Security and secureness of the robot if carrying drugs or acting as a terminal to records (systems, ethics).
- If delivering medication – risk of hacking and tampering with medications (systems, ethics).
- Could spread disease and infection while moving between patients if not sanitised properly.
- Nurses (and other hospital staff) might have additional jobs to do as a result of the robot needing to be instructed / maintained / restocked etc.

Keywords: robots, change, identity, systems, ethics, values, accountability, transparency, trust

Please see SL paper 1 part (c) and HL paper 1, Section A part (c) markband on page 17.

2. "Art is dead"

(a) (i)   Identify **two** characteristics of algorithms.   **[2]**

Answers may include:
- A set of rules (that are followed by a computer in problem solving).
- A sequence of step-by-step unambiguous instructions.
- Unambiguous.
- (well dfined) inputs and/or outputs.
- Finite (number of steps).
- Feasible.

Do not accept 'well defined' on its own.

Award [1] for identifying each characteristic of an algorithm up to [2].

(ii)   Identify **two** types of artificial intelligence (AI).   **[2]**
Answers may include:
- strong
- full
- general
- weak
- narrow
- domain-specified / domain specific / subject specific.

Award [1] for identifying each type of artificial intelligence up to [2].

(iii)   Identify **two** image formats that may be used by PIX-ia.   **[2]**

Answers may include:
- gif
- jpeg/jpg
- bmp
- png.

Award [1] for identifying each image format that may be up to [2].

(b) (i)   Explain **one** advantage of using the open-source software development community to develop PIX-ia.   **[2]**

Note to examiners: This part (b) question should be marked with ticks.

Answers may include:
- The community has greater control over the scope of the project.
- Such as the timing, sequencing.

- It allows for the faster evolution / is more agile.
- Because there is less corporate bureaucracy to get in the way.

- Updates / repairs can be made more rapidly than for proprietary software.
- Because there are members of the community who are ready to step in and solve problems.

- Distributed in nature.
- So the community has ownership of the product.

- Lower cost than proprietary software.
- By the use of sweat equity.

- Dataset (copyright free images) could be bigger and more diverse if developed by the open-source community compared to proprietary software.
- As there is a larger developer community.

Note: Answers must focus on the OSS development community and not the software itself.

*Award **[1]** for identifying an advantage of using the open-source community and **[1]** for a development of that advantage up to **[2]**.*

(ii) Suggest **two** ways in which PIX-ia could obtain copyright-free images. **[4]**

Note to examiners: This part (b) question should be marked with ticks.

Answers may include:
- Develop a "sweat equity" scheme.
- This requires the user to contribute a CC image in exchange for access/use.

- Using search filters.
- to search for images tagged under suitable creative commons / copyleft licenses.

- Developing partnerships with open source/creative commons licensed sites like Wikimedia, flickr etc.
- That have an extensive library of images available.

- Having the user community contribute to the database under a CC license.
- In order to build a larger and more diverse dataset to share with other users.

Award [1] for identifying a way that PIX-ia can obtain copyright-free images and [1] for an elaboration up to [2].

Mark as [2] + [2]

(c) Discuss the opportunities **and** dilemmas of using artificial intelligence (AI) to create new artworks.

[8]

Answers may include
Opportunities
- Anyone can 'create' art for themselves at minimal cost (systems, change).
- Speed - multiple cover produced in short space of time (systems).
- Broader selection of images for the cover than artist would have available from anywhere in the world (space)
- Ability to have low-cost experimentation (systems, expression).
- Develop ideas/concepts/combinations that MJ has not been exposed to or considered (expression).
- Potentially up to date with current trends or trends within the music sub-culture (expression).
- Would be cheaper than employing an artist (ethics, change).
- Companies may pay artists to develop content to include in their AI systems.

Dilemmas
- Potential copyright infringement (ethics).
- Determining the ownership of AI-generated art raises complex questions about intellectual property rights, such as whether the credit should go to the programmer, the user, or the AI itself. (ethics, system).
- Graphic designers/artists will lose work as people will now just use the tool (systems, change, ethics).
- Potential ongoing liability in future when someone discovers their image has been used beyond the license agreement (ethics).
- Potential lack of flexibility in development of cover – ability to change individual components/images or placements (systems).
- AI systems do not emulate emotional intelligence and will therefore be unable to produce artwork that may have deeper meaning or hidden messages.
- Potential for humans to become less creative as AI can do much of the work for them.
- Bias in datasets and algorithms could lead to images which are not representative of the population for whom they are made.

Keywords: *artificial intelligence, ownership, change, identity, expression, systems, ethics, values, transparency, trust*

Please see SL paper 1 part (c) and HL paper 1, Section A part (c) markband on page 17.

3. Connecting the unconnected

(a) (i) Identify **two** items of hardware that are needed for a student to connect to the internet at home.

[2]

Answers may include:
- Modem.
- Router.
- Network interface card / wireless card.
- Digital device / computer (laptop / tablet / smart phone / PC etc).

Award [1] for identifying each item of hardware that are needed to connect to the Internet up to [2].

(ii) Identify **two** services provided by an internet service provider (ISP) **other than** access to the World Wide Web. **[2]**

Answers may include:
- Email.
- Chat / texting / online messaging.
- File sharing.
- Cloud storage.
- VOIP / video conferencing.
- SaaS / PaaS / IaaS.
- Customer support services and technical assistance.
- Data security / antivirus / firewall / monitoring for malware and phishing attempts.

Award [1] for identifying each service provided to by an internet service provider (ISP) in addition to access to the World Wide Web up to [2].

(iii) Identify **two** ways in which students could use the internet to collaborate online. **[2]**

Answers may include:
- Collaborative documents – Google Docs/Slides/Sheets/wiki/padlets.
- Social media – posts, groups.
- Sharing resources – shared folders.
- Asynchronous communications – email, SMS/messaging, online forums, discussion platforms, WhatsApp group/chats.
- Synchronous communications – chats, VOIP (voice/video calls), Discord chats/calls, MS Teams chats/calls.

Award [1] for identifying each way that students could use the internet to collaborate online up to [2].

(b) (i) Distinguish between the internet and the World Wide Web. **[2]**

Note to examiners: This part (b) question should be marked with ticks.

Answers may include
- The internet is a worldwide network of networks/ a hardware-based infrastructure / WAN (wide area network) / GAN (global area network) (whereas)
- The www is the collection of webpages, hosted on webservers and accessible via web browsers. It is a subset of the Internet.

Award [1] for identifying a distinguishing characteristic of each of the Internet and the WWW up to a maximum of [2].

(ii) Suggest **two** reasons why some communities have limited access to the internet. **[4]**

Note to examiners: This part (b) question should be marked with ticks.

Answers may include
- Geography of the location / The network was in a region with mountains.
- So faster means of connecting (fiber cables) could not be installed.

- Economic reasons / Not enough paying customers / Fewer people in rural areas / less concentrated population / less customers have the computer infrastructure required.
- Therefore it is not economically viable for the ISPs to put in services.

- Education.
- People lack literacy/digital literacy to use the services.

- Government policies.
- Some communities may not be high priority and governments will not have put the effort into providing access.

- Cultural or religious reasons.
- Some communities may want to limit access to technologies such as the internet / stop or discourage community members from using the technology.

Award [1] for identifying a reason why some communities have limited access to the internet and [1] for a development of that reason up to [2].

Mark as [2] + [2]

(c) Discuss whether it is acceptable for schools to require students to access the internet when completing their homework outside of school. **[8]**

Answers may include
Is acceptable because
- Access to the internet is fast becoming a necessity for teaching and learning and a basic human right (ethics, change).
- Many people have cell phones / mobile phones which can be used to access the internet (systems).
- Public hotspots (library / schools / government buildings) are available to students to do their homework (systems).
- Hotspots in businesses (such as coffee shops / malls / fast food restaurants etc) provide access (systems).
- In countries where there are schemes to provide devices and data (either through the school or other social agencies) (systems).
- The pace of development cannot be at the pace of the slowest, measures need to be introduced to ensure the disadvantaged are not further disadvantaged (ethics, change, space).
- The Internet offers a wealth of research resources, interactive learning opportunities, educational tools, ... ” (system, space, change).

Is not acceptable
- Where Some students do not have access to devices or even electricity to run those devices (ethics, systems, space).
- If schools don't also provide devices and/or data the students who are already disadvantaged may be further disadvantaged (systems, ethics).
- If there is a large gap between students in the school / some students do and some don't have access (systems, ethics).
- Because The exacerbation of the differences between the haves and have nots is contrary to the guiding principles of the web (systems, ethics).
- Where the school cannot put into place measures to protect students from harmful content on the internet whilst they are using it unsupervised (systems, ethics, values).

Note to examiners: Do not credit responses that discuss the opportunities and dilemmas associated with the use of the Internet as a resource in education (this is a much broader and different discussion to that required for this question).

Keywords: networks, internet, hardware, connectivity, teaching, learning, change, spaces, systems, ethics, values, equity

Please see SL paper 1 part (c) and HL paper 1, Section A part (c) markband on page 17.

4. Using social media to help make financial decisions

(a) (i) Identify **two** ways in which financial advice can be provided through social media.   **[2]**

Answers may include:
- Advertisements / promotions eg on a digital news site.
- In platform applications (profit calculators etc).
- Advice on the influencer's blog.
- Videos made by influencers (on TikTok/Youtube etc.).
- News articles on the Internet.
- Sponsored articles on the Internet.
- Posts both genuine and staged on text platforms such as Twitter (X) or Reddit.
- Posts of text and images on platforms such as Facebook or Instagram.
- In platform games.
- In platform simulations.
- Phishing SPAM emails.

Award [1] for identifying way financial advice can be provided by social media up to [2].

(ii) Identify **two** characteristics of cryptocurrency.   **[2]**

Answers may include:
- A digital form of currency.
- Stored on a distributed ledger/blockchain.
- Is a peer-to-peer system/doesn't have a central authority.
- Uses cryptography to secure transactions / more secure / very secure.

- *Award [1] for identifying each characteristic of a cryptocurrency up to [2].*

(iii) Identify **two** reasons why cryptocurrencies have become increasingly popular.   **[2]**

Answers may include:
- More secure (as it is based on a blockchain which is immutable).
- Unregulated by the governments.
- Independent of any particular country's laws.
- Can provide anonymity.
- Fewer fees.
- Price fluctuations in short periods can lead to high profit.
- Can be obtained and used throughout the world.

Award [1] for identifying each reason why cryptocurrencies have become increasingly popular up to [2].

(b) (i) Explain **two** reasons why the financial advice given by social media influencers may not be reliable.

[4]

Note to examiners: This part (b) question should be marked with ticks.

Answers may include:
- The influencer may not have the qualifications (e.g. degree / diploma in the field) they claim / experience in the field OTHER THAN their experience as an influencer / difficult to verify their qualifications as they could be in another country.
- Which means the information they provide may not be accurate / correct.

- The social media influencer may have links to products / The social media influencer may be endorsed by certain products.
- Which may lead to them having a vested interest in certain products/unbiased view.

- The influencer may not be in the same country as the person they are advising.
- Which means the information they provide may not be accurate / correct /may not apply to the purchaser's situation/may be hard to verify.

- Influencers often aim to entertain and focus on trending topics to attract views and followers.
- which may result in the provision of inaccurate or exaggerated information.

- Influencers only publish their successes and not their losses / don't give the whole picture.
- Which makes people think that they are always making profits / want to follow their advice to become rich.

Award [1] for identifying a reason why the financial advice given by a social media influencer may not be reliable and [1] for a development of that reason up to [2].

Mark as [2] + [2]

(ii) Explain **one** strategy that could be used to verify the accuracy of the financial information provided by a social media influencer. **[2]**

Note to examiners: This part (b) question should be marked with ticks.

Answers may include
- Check the information against other financial sources / by a qualified professional.
- To see how closely it aligns.

- Check to see if the influencer belongs to any industry associations / regulatory bodies.
- To make sure that they are certified to give the advice.

- Check online forums.
- to see if other people have had poor experiences following their advice.

- Some social media companies use fact-checking algorithms to detect inaccurate data.
- This flags some messages for users to alert them to the fact that a message COULD be fake.

- If the influencer has cited sources you can see whether those sources are reliable.
- By seeing if they originate from a person or organisation who is considered credible.

*Award **[1]** for identifying a strategy that could be used to verify the accuracy of the financial information provided by the social media influencer and **[1]** for a development of that strategy up to **[2]**.*

(c) Some governments would like to regulate the content that social media companies post on their sites.

Discuss whether it is the responsibility of the government or social media companies to regulate the financial advice provided on social media. **[8]**

Answers may include:

Is Government responsibility
- Responsibility to keep citizens safe -The regulations provide a form of protection against harmful advice (ethics, expression, power (of influencer)).
- To ensure the finance providers abide by the laws of their country with respect to false advertising, financial trading, hate speech (ethics, power (of influencer), space).
- Responsibility to protect the economy of the country as a whole as misinformation could case market instability (ethics).

Is not a government responsibility
- Social media companies are global and not national and countries have different regulations so it is impossible for a set of regulations to fit every country (ethics, space).
- Different countries and cultures have different values (ethics).
- Social media companies will take advantages of countries where the laws/regulations are more favourable (ethics).
- Governments are not able to adapt as rapidly as social media companies, so they would be constantly playing catch-up (change, ethics).

Is the social media company's responsibility
- They have a duty to their users not to post content that is potentially harmful (ethics).
- To make sure that their platforms do not encourage users to act irresponsibly such as providing incorrect or inappropriate advice (ethics).

Is not the social media company's responsibility
- To interfere with people who wish to use the platform to gain financial information (ethics).
- To act as censors / moral guardians (ethics).

Keywords: *finance, regulation, governments, change, power, systems, ethics, values, accountability, transparency, trust*

Please see SL paper 1 part (c) and HL paper 1, Section A part (c) markband on page 17.

The following markbands should be used with responses to part (c)

SL and HL Paper 1, part (c)	
Marks	**Level descriptor**
0	The work does not reach a standard described by the descriptors below.
1–2	• The response shows limited understanding of the demands of the question. • There is limited relevant knowledge. The response is descriptive and consists mostly of unsupported generalizations. • The response has limited organization or is only a list of items.
3–4	• The response shows some understanding of the demands of the question. • Some relevant knowledge is demonstrated, but this is not always accurate and may not be used appropriately or effectively • The response moves beyond description to include some analysis, but this is not always sustained or effective. • The response is partially organized.
5–6	• The response shows adequate understanding of the demands of the question. • Response demonstrates adequate and effective analysis supported with relevant and accurate knowledge. • The response is adequately organized.
7–8	• The response is focused and demonstrates an in-depth understanding of the demands of the question. • Response demonstrates sustained evaluation and synthesis that is effectively and consistently supported with relevant and accurate knowledge. • The response is well-structured and effectively organised.