N18/3/ITGSX/HP3/ENG/TZ0/XX/M

Diploma Programme
Programme du diplôme
Programa del Diploma

Markscheme

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Information technology in a global society

Higher level

Paper 3

11 pages

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.

If candidates answer more than the prescribed number of questions:

- In the case of an "identify" question read all answers and mark positively up to the maximum marks. Disregard incorrect answers.

- In the case of a "describe" question, which 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.

- In the case of an "explain" question, which asks for a specified number of explanations *eg* "explain two reasons", mark the **first two** correct answers. This could include two full explanations, one explanation, one partial explanation *etc*.

1. (a) Identify **two** pieces of information that Alicia could send to the cloud. **[2]**

Answers may include:
- child's user ID
- audio recording of speech
- when the child has played with Alicia, for example the time of day / date
- context / topic of current conversation, for example, name, age, relationship
- picture of child for mood/emotion/expression analysis
- video of child asking a question of doing something
- location of the child, such as a town or a city.

Others may be added at the discretion of Team Leaders.

*Award **[1]** for identifying each piece of information that Alicia would send to the cloud up to a maximum of **[2]**.*

(b) Identify **two** ways parents would be able to access data about their child's interactions with Alicia. **[2]**

Answers may include:
- log into website to access cloud account data
- using a mobile app which connects to Alicia and displays information
- connecting to Alicia from a computer (via the Wi-Fi local network or Bluetooth)
- Asking Alicia questions (*eg* when alone with the doll) possibly using password
- by activating a "parent mode" on Alicia using an RFID chip or some other piece of hardware
- by requesting a monthly summary of interactions via email or post which would be created by *MAGS*
- accessing Alicia's history to find information about the child's interactions.

*Award **[1]** for identifying each way parents would be able to access data about the child's interactions with Alicia up to a maximum of **[2]**.*

2. (a) Explain **one** method that could be used to ensure the data stored on Alicia cannot be accessed by unauthorized persons. **[2]**

Answers may include:

- encryption can be applied to the data stored on Alicia and explaining how the encryption process is performed. For example. the use of keys
- data is stored only temporarily on Alicia until it is sent to the cloud, then deleted from the doll where it is more vulnerable
- biometric data (such as fingerprint) could be used to allow/disallow access to the data stored on Alicia
- proprietary protocols could be used:
  - use a different file system which is incompatible with standard devices and will not be viewable easily
- allow Alicia data to be wiped remotely, for example if lost/stolen and no valid connection is made to a network to “refresh” or authenticate the owner within a period of time.

*Award **[1]** for a method that could be used to ensure the data stored on Alicia cannot be accessed by unauthorised persons and **[1]** for a development of that method up to a maximum of **[2]**.*

(b) Mark Danbung has advised the team that Alicia may pause for a few seconds before giving an appropriate response to a child's question. Explain why this might occur. **[4]**

Answers may include:

- the child's questions are digitized into an audio format such as wav, mp3, aif *etc*
- the local Alicia software tries to interpret the speech and does not find a match
- the audio data is sent (along with other contextual data and user ID) using the Wi-Fi router of the home and eventually reaches the *MAGS* server
- the server locates the child's profile in a database and also searches for the audio match in a huge database of the appropriate language *etc*
- a server side process generates an appropriate (probably audio) response and sends it back to the doll to play
- another server side process updates the child's profile with any new information from the request which will be used to update the local software in Alicia
- the doll receives the response from the server and plays it to the child using an in-built speaker if it is an audio response, or using other hardware if it is a gesture, facial expression or body movement *etc*.

Some candidates may take an alternative approach:

- no suitable response is found on Alicia and so it searches for a match on MAGS servers
- the question may be long and complex and therefore takes longer to process and provide a suitable response
- the question may be in a different language which needs translating before it can be matched.
- the child has only started to use the doll and therefore the profile is not as well established and is connecting to the cloud.

Level		Marks
0	*No knowledge or understanding of ITGS issues and concepts. No use of appropriate ITGS terminology.*	0
1	Response with some steps and maybe out of sequence.	1–2
2	Clear and correct sequence, covering input, processing, output/feedback and using ITGS terminology.	3–4

3. Concerns have been expressed about who should be accountable if any harm comes to the child, or if any property is damaged or if any law is broken while the child plays with Alicia.

Discuss whether *MAGS*, the parent or another person or organization should be accountable. **[8]**

Answers may include:

Introductory comments (showing balance)
- it is important to establish levels of responsibility however in real life it may not be so easy to distinguish and should be dealt with on a case-by-case basis
- there are international and national organizations which provide standards that Alicia has already passed (if sold legally)
- the child might self-harm perhaps even without warning, so there may be situations like this in which there really is nobody to blame. Likewise, it could also be a complete accident or an unforeseeable situation.

Arguments for *MAGS* being responsible
- *MAGS* has the responsibility to make sure that any toy they provide for a young child to play with is not harmful
- if Alicia fails to respond to a very basic (*ie* child safety) request from the child, *eg* the child cries for help then perhaps that is due to the product not being adequately tested and prepared to be used in this situation. In such a case *MAGS* may be responsible for their lack of effectiveness in the programming or design of Alicia
- *MAGS* should have carried out an adequate testing phase on Alicia involving many interactions with children and adults. If they did not, perhaps in a rush to market and sell the product, then the unreliability that led to the accident would be their fault
- *MAGS* is responsible for privacy and security of the conversations, so would be responsible if the cloud was hacked and wrong information was sent to the doll and on to the child
- *MAGS* should be responsible for informing parents about the way the doll functions (as a friend for the child rather than a babysitter) and alerting parents to the supervisory role they must play.

Arguments for THE PARENT being responsible
- it was the decision of the parents (whether well informed or not) to buy the doll for their child, knowing that it would have an unpredictable impact, which they may not have monitored closely enough
- the parents presumably left the child and Alicia alone during the incident
- there should be a user agreement which the parents have signed or acknowledged which would state that the parents have at least some responsibility for their child's safety while playing with Alicia.

Arguments for OTHERS being responsible

- the crime or damage may have been initiated by a 3rd person accompanying the child while playing with Alicia and therefore has nothing to do with the actions of the child or the doll – therefore it should be that person who is held responsible (*eg* babysitter)
- there are many international standards set by governments in which the toys are sold. These may not be up-to-date and wide enough to cover the effects for an AI toy which can influence a child's behaviour. In this case, perhaps some blame lies on the government or standards organization of enabling a potentially harmful toy to be sold in their jurisdiction
- if Alicia detects danger to the child but is not able to contact authorities/parents/*etc* due to a failure in network (Bluetooth, Wi-Fi or 3G) connectivity then should the responsibility of the incident rest with *MAGS*? Perhaps the communications provider is more liable because it did not provide the means to carry out the necessary notifications
- *MAGS* could allow parents to opt out of the cloud access and just use the limited functionality of the doll (lessening risks)
  - parents are still ultimately responsible for their children, especially as most children playing with dolls would be very young
  - parents should be aware of their child's play (similar to Internet use) and watch over their play with the doll.

Potential ideas for a conclusion

- Alicia may well be able to record the whole situation (audio and/or video) and this may be able to provide evidence to decide extent of liability
- Alicia's log of past behaviour and interactions with the child will be stored on a server and this can also be used (with permission) to establish whether the incident was foreseeable or not
- there are some very potentially positive possibilities for Alicia to be able to inform authorities / call for help in dangerous situations, but these might depend on the doll's communication capabilities and available networks *etc*. Likewise, the correct usage of Alicia depends on some level of monitoring / supervision by adults as well as by the *MAGS* algorithms.

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

Marks	***Level descriptor***
No marks	• *No knowledge or understanding of the relevant ITGS issues and concepts.* • *No ITGS terminology.*
Basic ***1–2 marks***	• *Shows only a little ITGS knowledge.* • *Makes at least one argument.* • *May not have any comparison/conclusion.*
Adequate ***3–4 marks***	• *Shows a little more ITGS knowledge but still weak.* • *Has more arguments, (at least two) and possibly from different stakeholders.* • *Has a conclusion or judgments which are probably not backed by much reasoning.*
Competent ***5–6 marks***	• *Shows good ITGS knowledge and detail.* • *Has more arguments and they are balanced (+ and –) and for different stakeholders.* • *Conclusion/judgments are supported by the arguments and is well thought out.*
Proficient ***7–8 marks***	• *Shows very good ITGS knowledge.* • *Arguments are very balanced and detailed.* • *Conclusion is based completely on the arguments.*

4. Artificial intelligence (AI) toys such as Alicia are becoming more sophisticated and human-like. With reference to your independent research, to what extent is it acceptable for AI toys to replace the friendships of other children? **[12]**

Answers may include:

Pros

- might be useful in situations where the child has no access to other children to form friendships with (*eg* lives in a remote area)
- could be used in circumstances in which a child is psychologically or physically unfit to mix with other children and the doll could provide surrogate friendship
- children do not always have healthy relationships and the doll could be programmed to give each individual child the support and learning that he or she specifically needs, rather than leaving that to chance with human friendships
- children of certain ages (toddlers) usually develop imaginary friends anyway who talk to them and give them "advice", and take the blame for their actions. An AI toy may be able to provide that function, but in a more discerning way – *eg* it could be like an imaginary friend who provides good advice and informs parents of potential bad behavior.

Cons

- it would not be good for the child if it stopped the child from making other human friends because human interaction is required to develop social competence in children [possibility to refer to research here – many studies available]
- if a child relates to an AI personality he/she could be learning relationship skills which are not quite human and make the child less able to relate to real human children in the future
- an AI doll might not be as creative in playing with a child as another child would be. It might not be able to encourage the child to be imaginative because imagination is something which comes naturally to humans but can be very difficult for machines
- too much interaction with a toy such as Alicia may develop an unrealistic view of the world for the child (*eg* that all people will always be patiently waiting to carry out the child's instructions or help)
- if the AI toy is programmed to inform the parents on a regular basis of the conversation then this could be lead to insecurity in the child. Parents might not use this information sensitively and could confront the child with evidence of their actions in the form of recorded conversations with the doll. This could lead the child to believe he/she had been betrayed.

Possible conclusion ideas:

Alicia might be better used to augment and support a child's friendships with other children.
The doll could take on the role of a friend and counsellor.

Whether we like it or not, AI will be forming a larger and larger part of the child's future life. Therefore, it might be better to allow the child to have exposure to an AI toy at an early age and also develop in him/her an awareness that this is not human but has some human characteristics and abilities.

HL paper 3 question 4 markband

Marks	*Level descriptor*
No marks	• *A response with no knowledge or understanding of the relevant ITGS issues and concepts.* • *A response that includes no appropriate ITGS terminology.*
Basic ***1–3 marks***	• *A response with minimal knowledge and understanding of the relevant ITGS issues and concepts.* • *A response that includes minimal use of appropriate ITGS terminology.* • *A response that has no evidence of judgments, conclusions or future strategies.* • *No reference is made to the information in the case study or independent research in the response.* • *The response may be no more than a list.*
Adequate ***4–6 marks***	• *A descriptive response with limited knowledge and/or understanding of the relevant ITGS issues and/or concepts.* • *A response that includes limited use of appropriate ITGS terminology.* • *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.* • *Implicit references are made to the information in the case study or independent research in the response.*
Competent ***7–9 marks***	• *A response with knowledge and understanding of the relevant ITGS issues and/or concepts.* • *A response that uses ITGS terminology appropriately in places.* • *A response that includes conclusions and/or judgments that have limited support and are underpinned by a balanced analysis.* • *Explicit references to the information in the case study or independent research are made at places in the response.*
Proficient ***10–12 marks***	• *A response with a detailed knowledge and understanding of the relevant ITGS issues and/or concepts.* • *A response that uses ITGS terminology appropriately throughout.* • *A response that includes conclusions, judgments or future strategies that are well supported and underpinned by a balanced analysis.* • *Explicit references are made appropriately to the information in the case study and independent research throughout the response.*