Diploma Programme
Programme du diplôme
Programa del Diploma

Markscheme

May 2017

Computer science

Higher level

Paper 3

11 pages

International Baccalaureate
Baccalauréat International
Bachillerato Internacional

This markscheme is **confidential** and for the exclusive use
of examiners in this examination session.

It is the property of the International Baccalaureate and
must **not** be reproduced or distributed to any other person
without the authorization of the IB Global Centre, Cardiff.

The following are the annotations available to use when marking responses.

Annotation	Explanation	Associated shortcut
✔	Good Response/Good Point	(Alt+) 0
✘	Incorrect Point	(Alt+) 1
?	Unclear	
BOD	Benefit of the doubt	
NBOD	No benefit of doubt	
SEEN	Seen	
TV	Too vague	
REP	Repetition	
FT	Follow through	(Alt+) 2
L	(Comp Sci) Language	(Alt+) 3
D	Description	(Alt+) 4
A+	Analysis	(Alt+) 5
REF	Reference	(Alt+) 6
DEV	Development	(Alt+) 7
B+	Balanced argument	
OC	Off course	(Alt+) 8
EVAL	Evaluation	
O	Opinion	
▭	Dynamic, horizontal line that can be expanded	(Alt+) 9
∿	Dynamic, horizontal wavy line that can be expanded	
∿	Dynamic, vertical wavy line that can be expanded	
T	Text box	

You **must** make sure you have looked at all pages. Please put the SEEN annotation on any blank page, to indicate that you have seen it.

General marking instructions

1. Follow the markscheme provided, award only whole marks and mark only in **RED**.

2. Make sure that the question you are about to mark is highlighted in the mark panel on the right-hand side of the screen.

3. Where a mark is awarded, a tick/check (✓) **must** be placed in the text at the **precise point** where it becomes clear that the candidate deserves the mark. **One tick to be shown for each mark awarded.** When marking **Question 4**, use the RM™ Assessor underline tool to underline key parts, and then use the textbox tool to add a comment stating which band the response is in, as well as any supporting explanation.

4. Sometimes, careful consideration is required to decide whether or not to award a mark. In these cases use RM™ Assessor annotations to support your decision. You are encouraged to write comments where it helps clarity, especially for re-marking purposes. Use a text box for these additional comments. It should be remembered that the script may be returned to the candidate.

5. Personal codes/notations are unacceptable.

6. Where an answer to a part question is worth no marks but the candidate has attempted the part question, enter a zero in the mark panel on the right-hand side of the screen. Where an answer to a part question is worth no marks because the candidate has not attempted the part question, enter an "NR" in the mark panel on the right-hand side of the screen.

7. Ensure that you have viewed **every** page including any additional sheets. Please ensure that you stamp "SEEN" on any page that contains no other annotation.

8. A mark should not be awarded where there is contradiction within an answer. Make a comment to this effect using a text box or the "CON" stamp.

Subject details: **Computer science HL paper 3 markscheme**

Mark allocation

Candidates are required to answer **all** questions. Total 30 marks.

General

A markscheme often has more specific points worthy of a mark than the total allows. This is intentional. Do not award more than the maximum marks allowed for that part of a question.

When deciding upon alternative answers by candidates to those given in the markscheme, consider the following points:

- Each statement worth one point has a separate line and the end is signified by means of a semi-colon (;).

- An alternative answer or wording is indicated in the markscheme by a "/"; either wording can be accepted.

- Words in (…) in the markscheme are not necessary to gain the mark.

- If the candidate's answer has the same meaning or can be clearly interpreted as being the same as that in the markscheme then award the mark.

- Mark positively. Give candidates credit for what they have achieved and for what they have got correct, rather than penalizing them for what they have not achieved or what they have got wrong.

- Remember that many candidates are writing in a second language; be forgiving of minor linguistic slips. In this subject effective communication is more important than grammatical accuracy.

- Occasionally, a part of a question may require a calculation whose answer is required for subsequent parts. If an error is made in the first part then it should be penalized. However, if the incorrect answer is used correctly in subsequent parts then **follow through** marks should be awarded. Indicate this with "**FT**".

- Question 4 is marked against markbands. The markbands represent a single holistic criterion applied to the piece of work. Each markband level descriptor corresponds to a number of marks. When assessing with markbands, a "best fit" approach is used, with markers making a judgment about which particular mark to award from the possible range for each level descriptor, according to how well the candidate's work fits that descriptor.

General guidance

Issue	Guidance
Answering more than the quantity of responses prescribed in the 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. *Award up to **[4 max]**.*
    Marks are awarded for:
    What is Boolean logic?
    What is Fuzzy Logic?
    Why would fuzzy logic be appropriate? / Why wouldn't Boolean logic be appropriate?
    What would the use of fuzzy logic achieve?

    Boolean logic requires precise inputs/1s and 0s;
    Fuzzy logic operates with partial truths/imprecise data/values between 0 and 1/probabilities;
    Precise data may not always be available (or might lead to a wrong diagnosis)/imprecise data might (more) accurately reflect the condition/situation (allow an example);
    Fuzzy logic (through these partial truths/etc.) can give a definite answer/course of action/higher truth/more accurate diagnosis/ranked by probabilities (NOT just statistics);   **[4]**

2. *Award up to **[4 max]**.*
    Marks are awarded for:
    Identifying the use of RFID;
    *Outlining the role of NFC **[2 marks]**;*
    *Describing the beneficial consequences up to **[2]** marks;*

    RFID tags can be used to identify the patient;
    NFC enabled sensors/transducers/wearables can record patient data (allow example);
    Which can be transmitted to a nearby NFC reader/smartphone;
    Which can alert the patient (for whatever reason *eg* take medicine);
    And/or transmit this data (via the WAN) to the doctor/hospital (***Note:*** *given in* **Case Study**),
    thereby eliminating/reducing the need for the patient to be in a hospital because the hospital/doctor can be alerted in the case of an emergency/can monitor the patient's health;   **[4]**

    Note: *for the last mark point it must be clear that the data is being used in some way.*

3. (a) *Award up to **[4 max]**.*
__Marks are awarded as follows:__
The importance
- *The meaning of interoperability **[1 mark]**;*
- *Why it is important in this scenario **[1 mark]**;*

The issues
- *Award **[1 mark]** for each issue that is outlined up to **[2 max]**;*
- *Award **[1 mark]** for identifying 2 issues if no issue has been outlined;*

The importance – **[2 max]**:
EHR systems require data to be transferable between different systems/used on different platforms/systems (hardware and software) to be compatible;
So that the data is accessible in different areas or countries/health care systems are compatible / so patients can be treated wherever they are/so data can be (easily) analysed/accessed in any centre/country **OR** allow an example that demonstrates the importance;

The issues – **[2 max]**:
Systems will use different hardware/OS/software/languages/formats so they will have to change to a common format;
Changing systems will be expensive/time consuming;
If a new system is introduced staff will have to undergo re-training;
Databases might be different so data would have to be stored in a common format/put in a common place (cloud);
Translation systems would have to be put in place so that all data is understandable;
There might be problems in getting the different parties to agree on a particular standard; **[4]**

(b) *Award up to **[6 max]**.*
__Marks are awarded as follows:__
*Award up to **[2]** marks for each advantage and each disadvantage that is clearly discussed up to 3 issues (3x2). Award **[1]** mark for only identifying/outlining an issue. To gain 5 or 6 marks at least 1 advantage and 1 disadvantage must be addressed. Accept one answer from each of the following categories.*

Advantages for the patients
Patients can be treated more effectively + good reason, *eg* as their past history can be seen including any medication/allergies they might have by any health worker with legitimate access;
Doctors/nurses/ambulance etc. can get quick access to patient details;
Should save time in deciding appropriate treatment;

Advantage for the administrators
Prospective donors can be located more easily as there will be a larger pool of potential donors;

Advantage for researchers
Having a large database of patients with the whole range of characteristics / ailments will greatly help in epistemological studies / bioinformatics;

Disadvantages for the patients
There will be privacy issues, as the medical data will now not be restricted to local health centres but made available potentially across countries. More chance of data being misused / hacked + consequence;
Combining current systems into one interoperable system may result in errors / misunderstandings as not all systems are the same. This could lead to dangerous problems due to wrong diagnosis;

Disadvantages for the administrators / doctors
Putting the system in place is expensive in terms of money and time.
Costs of systems / re-training;
This might take money from other parts of the health budget; **[6]**

4. *Award up to* **[12 max]**.

Technologies to be considered, but not limited to:
Telemedicine, Tele surgery, 3D bioprinters, Robotics, Augmented Reality, Wearables/NFC, (Expert Systems), DDSS/CDSS;

Discussion should include (with technical details):
The way in which EHR, imaging in diagnosis and improved fuzzy logic based systems can increase reliability of expert systems, which could improve doctors' diagnoses/change the way they work;
The interpretation of images that are more complex/informative means that staff may need retraining or be replaced by technical experts. Technical retraining may be required for doctors and surgeons to use read and interpret the technology;
An explanation of augmented reality and its effect on surgery;
An explanation of robotic surgery and the reduced need for expert surgeons – surgeon skills will be different/less manual;
Conclusion may predict the change of doctors and surgeon's jobs and whether there will be a reduction in numbers and change in conditions;

Note: *We need to limit this to the use of technology about which we already know / which is already in development and not to consider any speculations about what might happen in the future.*

Note: *The candidate should focus on changes that would impact upon the doctors rather than patients.*

Marks	Level descriptor
No marks	• No knowledge or understanding of the relevant issues. • No use of appropriate terminology.
Basic 1–3 marks	• Minimal knowledge and understanding of the relevant issues or concepts. • Minimal use of appropriate terminology. • The answer may be little more than a list. • No reference is made to the information in the case study or independent research.
Adequate 4–6 marks	• A descriptive response with limited knowledge and/or understanding of the relevant issues or concepts. • A limited use of appropriate terminology. • There is limited evidence of analysis. • There is evidence that limited research has been undertaken.
Competent 7–9 marks	• A response with knowledge and understanding of the relevant issues and/or concepts. • A response that uses terminology appropriately in places. • There is some evidence of analysis. • There is evidence that research has been undertaken.
Proficient 10–12 marks	• A response with a detailed knowledge and clear understanding of the relevant issues and/or concepts. • A response that uses terminology appropriately throughout. • There is competent and balanced analysis. • Conclusions are drawn that are linked to the analysis. • There is clear evidence that extensive research has been undertaken.

[12]

Total: [30]