Cambridge Assessment International Education

Cambridge IGCSE™

COMPUTER SCIENCE **0478/12**

Paper 1 **March 2020**

MARK SCHEME

Maximum Mark: 75

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the March 2020 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **14** printed pages.

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Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

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GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

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Question	Answer	Mark
1(a)	**Component** / **Description** Control Bus Program Counter (PC) Memory Data Register (MDR) Accumulator (ACC) Increments to point to the address of the next instruction to be fetched Holds the result of a calculation. It is located within the Arithmetic Logic Unit (ALU) Carries signals to synchronise the fetch-execute cycle Temporary storage between the Central Processing (CPU) and primary memory 1 mark for 1 correct line 2 marks for 2 correct lines 3 marks for 3/4 correct lines	**3**
1(b)	Any **two** from: • Address bus • Data bus	**2**

<table>
<tr><th>Question</th><th>Answer</th><th>Mark</th></tr>
<tr><td>2(a)</td><td>1 mark per each correct row:
<table>
<tr><th rowspan="2">Description</th><th colspan="2">Method</th><th colspan="3">Type</th></tr>
<tr><th>Serial (✓)</th><th>Parallel (✓)</th><th>Simplex (✓)</th><th>Half-duplex (✓)</th><th>Duplex (✓)</th></tr>
<tr><td>Data is sent down a single wire in a single direction only.</td><td>✓</td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>Data is sent down multiple wires in both directions, at the same time.</td><td></td><td>✓</td><td></td><td></td><td>✓</td></tr>
<tr><td>Data is sent down a single wire in both directions, but never at the same time.</td><td>✓</td><td></td><td></td><td>✓</td><td></td></tr>
</table></td><td>3</td></tr>
<tr><td>2(b)(i)</td><td>1 mark for each correct parity bit:
<table>
<tr><th colspan="7">Binary Value</th><th>Parity Bit</th></tr>
<tr><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td></tr>
</table></td><td>3</td></tr>
<tr><td>2(b)(ii)</td><td>Any one from:
• Transposition error // bits are interchanged
• Bits still add up to even number
• Even number of errors has occurred</td><td>1</td></tr>
</table>

Question	Answer	Mark
2(c)(i)	Any **two** from: • Scrambles data • … making it meaningless/unintelligible • Uses an algorithm / key • Data / plain text is changed to cipher text	**2**
2(c)(ii)	Any **one** from: • Increase the length of the key // use more than 128 bits • Uses a more complex encryption algorithm	**1**

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Question	Answer	Mark
2(d)	Any **six** from (max **four** for identification of method only): • Backups • … if data is lost can be replaced • Install antivirus // Anti malware • … **detects/deletes viruses** that could **corrupt/delete** data • Install firewall • … helps prevent hackers gaining access **and** deleting/corrupting data • Password / Biometrics • Two factor authentication // two-step verification • … helps prevent unauthorised access **and** the deletion/corruption of data • Access rights • … helps prevent users accessing data they should not see **and** deleting it • Network/usage policy • … gives users guidance on data use // by example • Surge protection // Uninterrupted power supply (UPS) • … prevents loss of data that has not been saved • … prevents damage to hardware (that stores data) • Physical method // by example • … helps prevent unauthorised access **and** the deletion/corruption of data	**6**

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Question	Answer	Mark
3(a)(i)	Any **one** from: • They are both non-volatile • They are both secondary storage // Both not directly accessed by the CPU • They both have a high capacity of storage • Both have read **and** write abilities	**1**
3(a)(ii)	Any **three** from: • HDD has moving parts but SSD does not • HDD uses magnetic storage whereas SSD uses flash memory • HDD is slower to **access data** than SSD // HDD has greater latency than SSD • HDD will create noise/heat, whereas SSD runs quieter/cooler • HDD has higher power consumption than SSD • HDD have greater longevity/more read-write cycles whereas SDD has lower longevity/limited number of read-write cycles • HDD larger in physical size/heavier than SSD • HDD is normally cheaper for the same capacity of storage as SSD • HDD is available in a larger storage capacity than SSD	**3**
3(b)	Any **one** from: • USB flash memory drive • **External** HDD/SSD • SD Card • CD / DVD / Blu-ray	**1**
3(c)(i)	Any **two** from: • Keyboard • Mouse • Microphone • Touchscreen	**2**
3(c)(ii)	Any **two** from: • Monitor / Screen • Speakers • Headphones • Printer	**2**

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Question	Answer	Mark
3(d)	Any **two** from: • Uses a compression algorithm • Does not **permanently** remove any data • Repeated patterns of notes are identified … • … and are grouped, with an index NOTE: Other possible methods of lossless compression of sound can be credited	**2**
3(e)(i)	Any **two** from: • Stores the notes played and not the sound • Contains instructions/commands for digital instruments // Is recorded / played on a digital instrument e.g. synthesiser • Stores data about notes e.g. pitch byte (Note: Two examples can be awarded) • Can be a compressed format • Can edit **individual notes**	**2**
3(e)(ii)	Any **two** from: • Contains actual **sound** • Contains samples of the sound wave • Contains metadata // by example • Uses lossy compression • Recorded using microphone // Is recorded/played on an MP3 recorder/player	**2**

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<table>
<tr><th>Question</th><th>Answer</th><th>Mark</th></tr>
<tr><td>4</td><td>
<table>
<tr><th>Statement</th><th>Assembler (✓)</th><th>Compiler (✓)</th><th>Interpreter (✓)</th></tr>
<tr><td>Translates low-level language to machine code</td><td>✓</td><td></td><td></td></tr>
<tr><td>Translates high-level language to machine code</td><td></td><td>(✓)</td><td>✓</td></tr>
<tr><td>Produces error messages</td><td>(✓)</td><td>✓</td><td>✓</td></tr>
<tr><td>Translates high-level language one line at a time</td><td></td><td></td><td>✓</td></tr>
<tr><td>Produces an executable file</td><td>(✓)</td><td>✓</td><td></td></tr>
</table>
1 mark per each correct row:

NOTE: tick shown in brackets (✓) is optional</td><td>5</td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Mark</th></tr>
<tr><td>5(a)</td><td>Any two from:
• Computer consist of transistors / logic circuits
• … that can only store/process data in two states / as high-low / on-off / 1 and 0</td><td>2</td></tr>
<tr><td>5(b)</td><td>1 mark per each correct 8-bit binary value:
<table>
<tr><th>Denary Value</th><th>8-bit binary register</th></tr>
<tr><td>129</td><td>10000001</td></tr>
<tr><td>56</td><td>00111000</td></tr>
</table></td><td>2</td></tr>
</table>

Question	Answer	Mark
5(c)	1 mark per each correct conversion: 0 0 1 1 | 1 0 1 0 | 1 0 0 1 1 mark 1 mark 1 mark	**3**
5(d)	Any **two** from: • Represent colours in HTML // HTML colour **codes** • MAC address • Assembly Language • Error messages • IP address • ASCII values • URL • Memory dump • Memory locations	**2**

Question	Answer	Mark
6(a)		4

A	B	C	Working space	X
0	0	0		**0**
0	0	1		**0**
0	1	0		**0**
0	1	1		**1**
1	0	0		**1**
1	0	1		**1**
1	1	0		**0**
1	1	1		**1**

4 marks for 8 correct outputs
3 marks for 6/7 correct outputs
2 marks for 4/5 correct outputs
1 mark for 2/3 correct outputs

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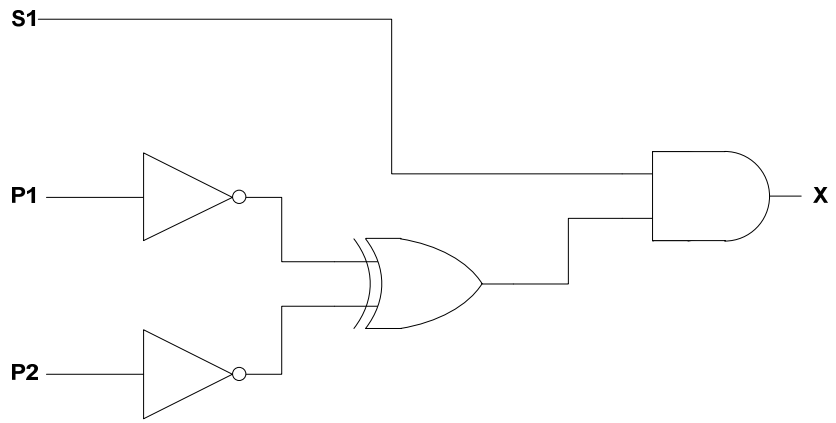
Question	Answer	Mark
6(b)	1 mark for each correct logic gate:  NOTE: Can also award 4 marks to a circuit that shows X = (P1 XOR P2) AND (S1)	**4**

Question	Answer	Mark
7	Any **seven** from: • Uses light sensor **and** Infrared / Motion / Pressure sensor • Sensors send data to the microprocessor • Data is converted from analogue to digital (using ADC) • Microprocessor compares both values to stored values • If motion value is out of range/in range, light value is checked // If light value is **<= 10**, motion value is checked • If light value is **<= 10** lights are turned on // If motion value is out of range/in range lights are turned on … • … by sending a signal to actuator • Lights remain on for set period (and then turn off) // If motion is in range/out of range or light is > 10 then signal sent to turn lights off • Process repeats / is continuous	**7**

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Question	Answer	Mark
8(a)	Any **five** from: • **Sends** the URL of the website • … to a DNS to find the IP address • Connects to the webserver (using the IP address) … • … using HTTP / HTTPS • Renders/Translates the HTML • Runs active/client-side scripts built into webpages • **Manages** SSL/TLS certificate process • Stores/retrieves cookies	**5**
8(b)	Any **three** from: • **Webserver** is sent multiple requests // Requests flood the **webserver** … • … at the **same** time • **Webserver** crashes / runs slow • Designed to prevent access to e.g. a website // Stops legitimate requests being processed/serviced	**3**
8(c)(i)	• A **law/legislation** that requires permission to use intellectual property / other people's work	**1**
8(c)(ii)	Any **one** from: • To claim other's work as your own • To use other people's work without consent / acknowledgement • Theft of intellectual property	**1**

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