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**COMPUTER SCIENCE**

**0478/12**

Paper 1

**October/November 2019**

MARK SCHEME

Maximum Mark: 75

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**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 October/November 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

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This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

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This document consists of **15** printed pages.

**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.

**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.

Question	Answer	Marks															
1	<p><b>One</b> mark for each correct tick</p> <table border="1"><thead><tr><th>Statement</th><th>True (✓)</th><th>False (✓)</th></tr></thead><tbody><tr><td>25 kB is larger than 100 MB</td><td></td><td>✓</td></tr><tr><td>999 MB is larger than 50 GB</td><td></td><td>✓</td></tr><tr><td>3500 kB is smaller than 2 GB</td><td>✓</td><td></td></tr><tr><td>2350 bytes is smaller than 2 kB</td><td></td><td>✓</td></tr></tbody></table>	Statement	True (✓)	False (✓)	25 kB is larger than 100 MB		✓	999 MB is larger than 50 GB		✓	3500 kB is smaller than 2 GB	✓		2350 bytes is smaller than 2 kB		✓	<b>4</b>
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Question	Answer	Marks
2	<p><b>Four</b> from:</p> <ul style="list-style-type: none"> <li>Arithmetic and logic unit (ALU)</li> <li>Memory address register (MAR)</li> <li>Memory data register (MDR) // Memory buffer register (MBR)</li> <li>Accumulator (ACC)</li> <li>Immediate Access Store (IAS)</li> <li>Main memory // RAM</li> <li>Program counter (PC)</li> <li>Current instruction register (CIR)</li> <li>Address bus</li> <li>Data bus</li> <li>Control bus</li> <li>Input device</li> <li>Output device</li> <li>Secondary storage device</li> </ul>	<b>4</b>

Question	Answer	Marks
3(a)	<p><b>One</b> from:</p> <ul style="list-style-type: none"> <li>Continuous data // by description</li> <li>Non-discrete data // by description</li> <li>By example, e.g. data such as a sound wave</li> </ul>	<b>1</b>
3(b)	<p><b>One</b> from:</p> <ul style="list-style-type: none"> <li><u>Discrete</u> data that has only two values</li> <li>By example, e.g. binary data / 1's and 0's</li> </ul>	<b>1</b>

Question	Answer	Marks								
4(a)	52	1								
4(b)	<table border="1"> <tr> <td>1</td> <td>1</td> <td>0</td> <td>1</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> </table>	1	1	0	1	0	0	0	0	1
1	1	0	1	0	0	0	0			
4(c)	It is multiplied by 4	1								

Question	Answer	Marks
5(a)	<p><b>Four</b> from:</p> <ul style="list-style-type: none"> <li>A compression algorithm is used</li> <li>Discards any unnecessary sounds ...</li> <li>... using perceptual musical shaping</li> <li>... such as removing background noise / sounds humans can't hear // or other suitable example</li> <li>Reduces sample size / resolution // by example</li> <li>Reduces sample rate // by example</li> <li>Sound is clipped</li> <li>The data is permanently removed</li> </ul>	4
5(b)(i)	<p><b>One</b> from:</p> <ul style="list-style-type: none"> <li>The file size will be smaller than lossless</li> <li>Requires less storage space</li> <li>Requires less time to transmit</li> </ul>	1
5(b)(ii)	<p><b>One</b> from:</p> <ul style="list-style-type: none"> <li>The quality of the sound will be reduced</li> <li>The original file cannot be restored</li> </ul>	1

Question	Answer	Marks
5(c)(i)	<p><b>Four from:</b></p> <ul style="list-style-type: none"> <li>Musical Instrument Digital Interface file</li> <li>Stores a set of commands / instructions for how the sound should be played</li> <li>Does not store the actual sounds</li> <li>Data in the file has been recorded using digital instruments</li> <li>Specifies pitch of the note // specifies the note to be played</li> <li>Specifies when each note plays and stops playing // Specifies key on/off</li> <li>Specifies duration of the note</li> <li>Specifies volume of the note</li> <li>Specifies the tempo</li> <li>Specifies the type of instrument</li> </ul>	<b>4</b>
5(c)(ii)	<p><b>Four from:</b></p> <ul style="list-style-type: none"> <li>It uses a single wire ...</li> <li>... therefore, it is cheaper to manufacture / buy / install</li> <li>... therefore, less likely to have interference // no crosstalk</li> <li>... therefore, can be used over longer distances</li> <li>Data is sent a bit at a time ...</li> <li>... therefore, less chance of data being skewed // data is received in order</li> <li>Transmission can be synchronised ...</li> <li>... can reduce rate of errors</li> </ul>	<b>4</b>

Question	Answer			Marks																					
6	<p><b>One</b> mark for each correct tick</p> <table border="1"> <thead> <tr> <th>Statement</th> <th>Resistive (✓)</th> <th>Capacitive (✓)</th> </tr> </thead> <tbody> <tr> <td>This touch screen has multi-touch capabilities</td> <td></td> <td>✓</td> </tr> <tr> <td>This touch screen cannot be used whilst wearing gloves</td> <td></td> <td>✓</td> </tr> <tr> <td>This touch screen is made up of two layers with a small space in between</td> <td>✓</td> <td></td> </tr> <tr> <td>This touch screen uses the electrical properties of the human body</td> <td></td> <td>✓</td> </tr> <tr> <td>This touch screen is normally cheaper to manufacture</td> <td>✓</td> <td></td> </tr> <tr> <td>This touch screen has a quicker response time</td> <td></td> <td>✓</td> </tr> </tbody> </table>			Statement	Resistive (✓)	Capacitive (✓)	This touch screen has multi-touch capabilities		✓	This touch screen cannot be used whilst wearing gloves		✓	This touch screen is made up of two layers with a small space in between	✓		This touch screen uses the electrical properties of the human body		✓	This touch screen is normally cheaper to manufacture	✓		This touch screen has a quicker response time		✓	<b>6</b>
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Question	Answer	Marks
7(a)	<p><b>Four</b> from:</p> <ul style="list-style-type: none"> <li>Membrane / matrix / circuit board present at base of keys</li> <li>A key is pressed that presses a switch</li> <li>When a key is pressed it completes a circuit // changes the current in a circuit</li> <li>The location of the keypress is calculated</li> <li>An index of characters is searched to find the corresponding keypress</li> <li>Each character has an ASCII / Unicode value</li> <li>The ASCII / Unicode value has a binary value</li> <li>Keypress generates an interrupt</li> <li>Each character / keypress is added to a buffer to wait to be processed</li> <li>The binary can then be processed by the CPU to action the key press</li> </ul>	<b>4</b>
7(b)	<p><b>Three</b> from:</p> <ul style="list-style-type: none"> <li>Display a web page</li> <li>Sends a request to the web server</li> <li>Receives data from web server</li> <li>Translates HTML files</li> <li>Processes client-side script, e.g. JavaScript</li> <li>Store favourites</li> <li>Store history</li> <li>Navigation forward and backward</li> <li>Check security</li> <li>Store / access cookies</li> <li>Find specific text within a web page</li> <li>Downloading file from the web</li> <li>Allows a homepage</li> <li>Allows multiple tabs / web pages to be opened</li> <li>Stores data in its cache</li> </ul>	<b>3</b>

Question	Answer	Marks
7(c)	<p><b>Three</b> from:</p> <p>Hypertext Transfer Protocol Secure // It is a protocol ...            ... that is a set of rules/standards            Secure version of <u>HTTP</u>            Secure website // secures data            Uses TLS / SSL            Uses encryption</p>	<b>3</b>

Question	Answer	Marks
8(a)	<p><math>X = 1</math> if (A is 1 XOR C is 1) OR (B is 1 NAND C is NOT 1)  <math>X = (A \text{ XOR } C) \text{ OR } (B \text{ NAND NOTC})</math></p> <p><b>One</b> mark for each bullet:            (A XOR C)            OR            (B NAND NOTC)</p>	<b>3</b>

Question	Answer	Marks																																													
8(b)	<p><b>Four</b> marks for 8 correct outputs  <b>Three</b> marks for 6 or 7 correct outputs  <b>Two</b> marks for 4 or 5 correct outputs  <b>One</b> mark for 2 or 3 correct outputs</p> <table border="1"> <thead> <tr> <th>A</th> <th>B</th> <th>C</th> <th>Working space</th> <th>X</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> <td></td> <td>1</td> </tr> <tr> <td>0</td> <td>0</td> <td>1</td> <td></td> <td>1</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td></td> <td>0</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> <td></td> <td>1</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td></td> <td>1</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> <td></td> <td>1</td> </tr> <tr> <td>1</td> <td>1</td> <td>0</td> <td></td> <td>1</td> </tr> <tr> <td>1</td> <td>1</td> <td>1</td> <td></td> <td>1</td> </tr> </tbody> </table>	A	B	C	Working space	X	0	0	0		1	0	0	1		1	0	1	0		0	0	1	1		1	1	0	0		1	1	0	1		1	1	1	0		1	1	1	1		1	<b>4</b>
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9(b)	Parallel data transmission	<b>1</b>																		

Question	Answer	Marks
9(c)	<p><b>Four</b> from (maximum two marks per benefit):</p> <p>It is a universal standard ... ... so it is likely to be compatible with the computer</p> <p>It can only be inserted one way ... ... so there is less chance of connecting a device incorrectly</p> <p>It is a high-speed connection ... ... so data will be transmitted quicker</p> <p>It uses serial transmission ... ... so it is cheaper to manufacture/buy ... less chance of skewing / errors</p> <p>It doesn't require a (wireless) network ... ... therefore, can be used if a network is down</p> <p>It is backwards compatible ... ... so no additional technology is needed</p> <p>It can power the device ... ... therefore no separate source of power is needed</p> <p>Drivers are automatically downloaded // device is automatically identified ... ... so no need to find them online / install them manually</p>	<b>4</b>

Question	Answer	Marks
10(a)	<p><b>Four</b> from:</p> <ul style="list-style-type: none"> <li>Validation method</li> <li>Used to check data entry</li> <li>Digit is calculated from data // by example</li> <li>Digit is appended / added to data</li> <li>Digit is recalculated when data has been input</li> <li>Digits are compared</li> <li>If digits are different, error is detected // If digits match, no error is detected</li> </ul>	<b>4</b>
10(b)	<p><b>Six</b> from (maximum three marks per security method):</p> <ul style="list-style-type: none"> <li>Firewall ...</li> <li>... Monitors the traffic</li> <li>... <b>Blocks</b> any traffic that doesn't meet the <b>criteria / rules</b></li>   <li>(Strong) password // biometric ...</li> <li>... Data cannot be accessed without the use of the password / bio data</li> <li>... Prevent brute force attacks</li>   <li>Encryption ...</li> <li>... Data will be scrambled</li> <li>... <b>Key</b> is required to decrypt the data</li> <li>... If data is stolen it will be meaningless</li>   <li>Physical security methods ...</li> <li>... The physical security will need to be overcome</li> <li>... This can help deter theft of the data</li>   <li>Antispyware ...</li> <li>... will remove any spyware from system</li> <li>... will prevent data being relayed to a third party</li> </ul>	<b>6</b>

Question	Answer	Marks
11(a)	<b>RAM</b> To store the data / instructions / parts of OS that are currently in use <b>ROM</b> To store the firmware / bootup instructions / BIOS <b>SSD</b> To store files / software // by example	<b>3</b>
11(b)	<b>Two</b> from: It is more durable // it has no moving parts It has a faster read / write / access speed It is more compact / light weight / smaller / portable It uses less energy // battery will last longer It is quieter Not affected by magnetic forces It runs at a cooler temperature Less latency // takes less time to warm up	<b>2</b>