



# Cambridge O Level

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**COMPUTER SCIENCE**

**2210/12**

Paper 1

**October/November 2020**

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.

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This document consists of **13** printed pages.

**PUBLISHED****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(a)	Any <b>one</b> from: – Hypertext Mark-up Language – Web authoring language // <b>language</b> used to write/create websites/web pages	<b>1</b>																											
1(b)(i)	– Presentation	<b>1</b>																											
1(b)(ii)	<b>One</b> mark per each nibble:  <table border="1"> <tbody> <tr> <td>43</td> <td>0</td> <td>1</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1</td> <td>1</td> </tr> <tr> <td>B7</td> <td>1</td> <td>0</td> <td>1</td> <td>1</td> <td>0</td> <td>1</td> <td>1</td> <td>1</td> </tr> <tr> <td>F0</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> </tbody> </table>	43	0	1	0	0	0	0	1	1	B7	1	0	1	1	0	1	1	1	F0	1	1	1	1	0	0	0	0	<b>6</b>
43	0	1	0	0	0	0	1	1																					
B7	1	0	1	1	0	1	1	1																					
F0	1	1	1	1	0	0	0	0																					
1(c)(i)	– Input	<b>1</b>																											

Question	Answer	Marks
1(c)(ii)	<p><b>One</b> from:</p> <ul style="list-style-type: none"> <li>– Lossy (compression)</li> </ul> <p>Any <b>three</b> from:</p> <ul style="list-style-type: none"> <li>– A (compression) algorithm is used</li> <li>– Removes redundant/unnecessary data from the file</li> <li>– Removes sounds that cannot be heard by the human ear/background noise</li> <li>– Reduces sample rate</li> <li>– Reduces sample resolution</li> <li>– Data is <b>permanently</b> removed // original file cannot be re-instated</li> <li>– Perceptual music shaping is used</li> </ul> <p>NOTE: If lossless given, marks can be awarded for a correct description of lossless as follow through.</p> <p>Any <b>three</b> from (lossless):</p> <ul style="list-style-type: none"> <li>– A (compression) algorithm is used</li> <li>– Repeating patterns are identified</li> <li>– ... are replaced with a value</li> <li>– ... and indexed</li> <li>– No data is permanently removed // original file can be re-instated</li> <li>– Suitable example of a lossless algorithm</li> </ul>	<b>4</b>
1(c)(iii)	<p>Any <b>two</b> from:</p> <ul style="list-style-type: none"> <li>– Quicker for her to upload</li> <li>– Quicker for users to download</li> <li>– Won't slow website down as much when loading</li> <li>– Takes up less <b>storage</b> space</li> </ul>	<b>2</b>
1(d)(i)	<ul style="list-style-type: none"> <li>– Handshake (layer)</li> <li>– Record (layer)</li> </ul>	<b>2</b>

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
1(d)(ii)	Any <b>six</b> from: <ul style="list-style-type: none"> <li>– <b>Client/browser</b> requests secure <b>connection</b> to server</li> <li>– <b>Client/browser</b> requests the <b>server</b> to identify itself</li> <li>– <b>Server</b> provides a digital certificate</li> <li>– <b>Client/browser</b> validates the certificate</li> <li>– <b>Client/browser</b> send signal <b>back to server</b> (to begin transmission)</li> <li>– Session caching can be used</li> <li>– A session key is generated</li> <li>– Encryption method is agreed // data is encrypted</li> </ul>	<b>6</b>
1(e)(i)	Any <b>three</b> from: <ul style="list-style-type: none"> <li>– Hacking</li> <li>– Denial of service (DoS) attack</li> <li>– Virus</li> <li>– Malware</li> </ul> <p>NOTE: Three different type of malware can be awarded</p>	<b>3</b>
1(e)(ii)	Any <b>four</b> from: <ul style="list-style-type: none"> <li>– Acts as a firewall</li> <li>– Monitor/filters/examines incoming <b>and</b> outgoing traffic</li> <li>– Rules/criteria for traffic can be <b>set</b> // blacklist/whitelist <b>set</b></li> <li>– Blocks any traffic that does not meet criteria ...</li> <li>– ... and can send a warning message <b>to the user</b></li> <li>– Stop the website failing in a DoS attack // DoS attack hits the proxy server and not the webserver</li> </ul>	<b>4</b>

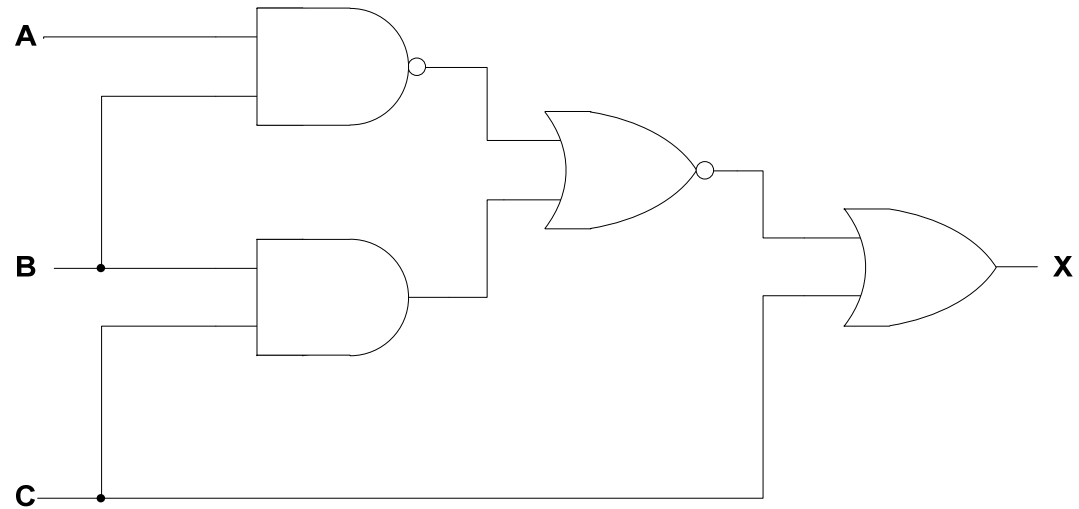
Question	Answer	Marks															
2(a)	<p><b>One</b> mark for each correct row:</p> <table border="1"> <thead> <tr> <th>8-bit binary value</th> <th>Even (✓)</th> <th>Odd (✓)</th> </tr> </thead> <tbody> <tr> <td>11111111</td> <td>✓</td> <td></td> </tr> <tr> <td>01100110</td> <td>✓</td> <td></td> </tr> <tr> <td>01111011</td> <td>✓</td> <td></td> </tr> <tr> <td>10000000</td> <td></td> <td>✓</td> </tr> </tbody> </table>	8-bit binary value	Even (✓)	Odd (✓)	11111111	✓		01100110	✓		01111011	✓		10000000		✓	4
8-bit binary value	Even (✓)	Odd (✓)															
11111111	✓																
01100110	✓																
01111011	✓																
10000000		✓															
2(b)	<p>Any <b>five</b> from:</p> <ul style="list-style-type: none"> <li>– A value is calculated <b>from the data</b></li> <li>– The value is calculated <b>using an algorithm</b> // by example</li> <li>– The value is appended to the data to be transmitted</li> <li>– Value is recalculated after transmission</li> <li>– Values are compared</li> <li>– If the values match the data is correct // if the values do not match the data is incorrect</li> </ul>	5															

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Question	Answer	Marks
3(a)(i)	Any <b>three</b> from: <ul style="list-style-type: none"> <li>– Loss of power/electricity</li> <li>– Spillage of liquids</li> <li>– Flood</li> <li>– Fire</li> <li>– Human error</li> <li>– Hardware failure</li> <li>– Software failure</li> </ul> NOTE: Three different types of human error can be awarded e.g. accidental deletion, not saving data, incorrect shutdown procedure	<b>3</b>
3(a)(ii)	<ul style="list-style-type: none"> <li>– Create a backup</li> </ul>	<b>1</b>
3(b)	Max <b>three</b> from: <ul style="list-style-type: none"> <li>– Solid state drive</li> <li>– Non-volatile</li> <li>– Secondary storage</li> <li>– Flash memory</li> <li>– Has no mechanical/moving parts</li> <li>– Uses transistors</li> <li>– ... and cells that are laid out in a grid</li> <li>– Uses control gates and floating gates</li> <li>– Can be NAND/NOR (technology)</li> <li>– Use EEPROM technology</li> </ul> Max <b>two</b> from: <ul style="list-style-type: none"> <li>– Stores data by flashing it onto the chips</li> <li>– Data stored by controlling the flow of electrons <b>through/using transistors/chips/gates</b></li> <li>– The electric current reaches the control gate and flows through to the floating gate to be stored</li> <li>– When data is stored the transistor is converted from 1 to 0</li> </ul>	<b>4</b>



Question	Answer	Marks																												
3(c)	<p><b>One</b> mark for each correct row:</p> <table border="1"> <thead> <tr> <th>Statement</th> <th>Blu-ray (✓)</th> <th>CD (✓)</th> <th>DVD (✓)</th> </tr> </thead> <tbody> <tr> <td>A type of optical storage</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>Has the largest storage capacity</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>Can be dual layer</td> <td>✓</td> <td></td> <td>✓</td> </tr> <tr> <td>Read using a red laser</td> <td></td> <td>✓</td> <td>✓</td> </tr> <tr> <td>Has the smallest storage capacity</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>Stores data in a spiral track</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> </tbody> </table>	Statement	Blu-ray (✓)	CD (✓)	DVD (✓)	A type of optical storage	✓	✓	✓	Has the largest storage capacity	✓			Can be dual layer	✓		✓	Read using a red laser		✓	✓	Has the smallest storage capacity		✓		Stores data in a spiral track	✓	✓	✓	6
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Question	Answer	Marks
<p>4(a)</p>	<p><b>One</b> mark for each correct logic gate with correct input:</p> 	<p><b>4</b></p>

Question	Answer	Marks																																													
4(b)	<p> <b>Four</b> marks for 8 correct outputs  <b>Three</b> marks for 6/7 correct outputs  <b>Two</b> marks for 4/5 correct outputs  <b>One</b> mark for 2/3 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>0</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>0</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		0	0	0	1		1	0	1	0		0	0	1	1		1	1	0	0		0	1	0	1		1	1	1	0		1	1	1	1		1	4
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Question	Answer	Marks																		
5(a)	<p><b>One</b> mark for each correct row:</p> <table border="1"> <thead> <tr> <th>Statement</th> <th>True (✓)</th> <th>False (✓)</th> </tr> </thead> <tbody> <tr> <td>It is a flat panel display</td> <td>✓</td> <td></td> </tr> <tr> <td>It creates images using red, green and blue diodes</td> <td>✓</td> <td></td> </tr> <tr> <td>It is not very energy efficient and gives off heat</td> <td></td> <td>✓</td> </tr> <tr> <td>It is also used in mobile devices such as smartphones and tablets</td> <td>✓</td> <td></td> </tr> <tr> <td>It is a front-lit display</td> <td></td> <td>✓</td> </tr> </tbody> </table>	Statement	True (✓)	False (✓)	It is a flat panel display	✓		It creates images using red, green and blue diodes	✓		It is not very energy efficient and gives off heat		✓	It is also used in mobile devices such as smartphones and tablets	✓		It is a front-lit display		✓	<b>5</b>
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5(b)	<p><b>One</b> mark for each correct term in the correct place:</p> <ul style="list-style-type: none"> <li>– Control</li> <li>– Unique</li> <li>– Identify</li> <li>– Protocol</li> <li>– Dynamic</li> </ul>	<b>5</b>																		

Question	Answer	Marks
5(c)	Any <b>four</b> from: <ul style="list-style-type: none"><li>– Allows user to view web pages</li><li>– Renders HTML</li><li>– Allows user to bookmark/favourite web pages</li><li>– Provides navigation features</li><li>– Allows (multiple) tabs</li><li>– <b>Stores</b> cookies</li><li>– Records history of pages visited</li><li>– Has a homepage</li><li>– Runs active script</li><li>– Allows <b>files</b> to be downloaded from <b>website/internet</b></li><li>– Sends a request to the <b>IP address/web server</b> (to obtain the contents of a web page)</li><li>– Sends URL to DNS</li><li>– <b>Manages</b> HTTP/HTTPS protocol</li></ul>	<b>4</b>