



# Cambridge IGCSE™

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**COMPUTER SCIENCE**

**0478/11**

Paper 1

**October/November 2021**

**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.

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This document consists of **8** 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(a)	– Base-2	1
1(b)	– 9 – 16 – 40 – 161	4

Question	Answer	Marks
2(a)	– Microphone	1
2(b)	– capacitive	1
2(c)	– interrupt	1

Question	Answer	Marks																								
3(a)	<b>One</b> mark per each correct row.	<b>5</b>																								
	<table><tr><th>Statement</th><th>Checksum (✓)</th><th>Check digit (✓)</th><th>Parity check (✓)</th></tr><tr><td>uses an additional bit to create an odd or even number of 1s</td><td></td><td></td><td>✓</td></tr><tr><td>checks for errors on data entry</td><td></td><td>✓</td><td></td></tr><tr><td>compares <b>two</b> calculated values to see if an error has occurred</td><td>✓</td><td>✓</td><td></td></tr><tr><td>will <b>not</b> detect transposition errors</td><td></td><td></td><td>✓</td></tr><tr><td>sends additional values when data is transmitted from one computer to another</td><td>✓</td><td></td><td>(✓)</td></tr></table>		Statement	Checksum (✓)	Check digit (✓)	Parity check (✓)	uses an additional bit to create an odd or even number of 1s			✓	checks for errors on data entry		✓		compares <b>two</b> calculated values to see if an error has occurred	✓	✓		will <b>not</b> detect transposition errors			✓	sends additional values when data is transmitted from one computer to another	✓		(✓)
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	will <b>not</b> detect transposition errors				✓																					
sends additional values when data is transmitted from one computer to another	✓		(✓)																							
3(b)	– ARQ	<b>1</b>																								

Question	Answer	Marks
4(a)	<p><b>Two</b> marks for any <b>two</b> correct workings and <b>one</b> mark for the correct answer.</p> <p>Working:</p> <ul style="list-style-type: none"> <li>– <math>100 \times 50 = 5000</math> bits</li> <li>– <math>5000 \times 8 = 40,000</math> bits</li> <li>– <math>40,000 / 8 = 5,000</math> bytes</li> <li>– <math>5,000 \times 10 = 50,000</math> bytes</li> <li>– <math>50,000 / 1024</math></li> </ul> <p>Answer: 48.83 kB // 49 kB</p> <p><b>NOTE:</b> Alternative correct methods of working can be credited. Answer can be given to any number of dp.</p>	<b>3</b>
4(b)	<p><b>One</b> mark per correct method, <b>two</b> marks per justification.</p> <ul style="list-style-type: none"> <li>– Lossless</li> <li>– Lossy would remove data <b>permanently</b> // lossless would not remove any data <b>permanently</b> // File could be restored to original ...</li> <li>– ... that could affect the quality (lossy) // ... to maintain the quality (lossless)</li> </ul>	<b>3</b>
4(c)	<ul style="list-style-type: none"> <li>– Light</li> <li>– Lens</li> <li>– Charge-coupled</li> <li>– Analogue-to-digital</li> <li>– Pixel</li> </ul>	<b>5</b>

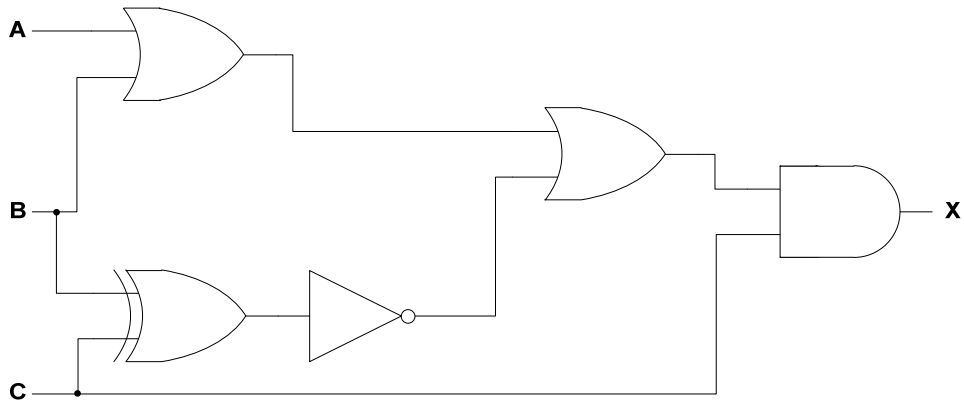
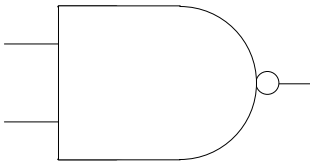
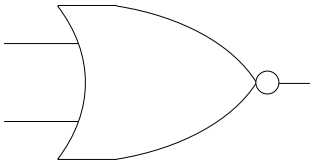
Question	Answer	Marks
5(a)	<p>Any <b>two</b> from:</p> <ul style="list-style-type: none"> <li>– Encryption</li> <li>– Biometric device</li> <li>– Firewall</li> <li>– Anti-spyware</li> <li>– Two-factor authentication // two-step verification</li> </ul>	<b>2</b>
5(b)	<p>Any <b>two</b> from:</p> <ul style="list-style-type: none"> <li>– Interrupt / error-handling</li> <li>– Peripheral management</li> <li>– Providing user interface</li> <li>– Platform for running applications // installing / removing software</li> <li>– Manages security // access rights/levels // user account management</li> <li>– Managing time slicing // multitasking</li> </ul>	<b>2</b>

Question	Answer	Marks																												
6(a)	<p><b>One</b> mark per each correct row.</p> <table><tr><th>Statement</th><th>MAR (✓)</th><th>MDR (✓)</th><th>PC (✓)</th></tr><tr><td>it is a register in the CPU</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>it holds the address of the next instruction to be processed</td><td>(✓)</td><td></td><td>✓</td></tr><tr><td>it holds the address of the data that is about to be fetched from memory</td><td>✓</td><td></td><td>(✓)</td></tr><tr><td>it holds the data that has been fetched from memory</td><td></td><td>✓</td><td></td></tr><tr><td>it receives signals from the control unit</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>it uses the address bus to send an address to another component</td><td>✓</td><td></td><td>✓</td></tr></table>	Statement	MAR (✓)	MDR (✓)	PC (✓)	it is a register in the CPU	✓	✓	✓	it holds the address of the next instruction to be processed	(✓)		✓	it holds the address of the data that is about to be fetched from memory	✓		(✓)	it holds the data that has been fetched from memory		✓		it receives signals from the control unit	✓	✓	✓	it uses the address bus to send an address to another component	✓		✓	6
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it uses the address bus to send an address to another component	✓		✓																											
6(b)	– Arithmetic Logic Unit // ALU	1																												

Question	Answer	Marks
7(a)	<p><b>One</b> mark per correct storage, <b>two</b> marks for justification.</p> <ul style="list-style-type: none"> <li>– Secondary</li> <li>– It is non-volatile storage</li> <li>– It is not directly accessed by the CPU</li> </ul>	<b>3</b>
7(b)	<p>Any <b>four</b> from:</p> <ul style="list-style-type: none"> <li>– Uses flash memory</li> <li>– Data is flashed onto (silicon) chips</li> <li>– Uses NAND/NOR technology // Can use flip-flops</li> <li>– Uses transistors/control gates/floating gates ...</li> <li>– ... to control the flow of electrons</li> <li>– It is a type of EEPROM technology</li> <li>– When data is stored the transistor is converted from 1 to 0 / 0 to 1</li> <li>– Writes (and reads) sequentially</li> </ul>	<b>4</b>

Question	Answer	Marks
8(a)	– High-level	1
8(b)(i)	<b>One</b> mark for the correct translator, <b>two</b> marks for the benefit(s). <ul style="list-style-type: none"> <li>– Interpreter</li> <li>– Easier to debug</li> <li>– ... as errors are immediately reported when detected</li> <li>– Compiler</li> <li>– All errors are reported in a single report</li> <li>– ... meaning they can all be fixed at the same time</li> <li>– No need to recompile code every time a test is run</li> </ul>	3
8(b)(ii)	<b>One</b> mark for the correct translator, <b>two</b> marks for the benefits. <ul style="list-style-type: none"> <li>– Compiler</li> <li>– Creates an executable file</li> <li>– ... so, translator is no longer needed to run it</li> <li>– Source code cannot be stolen // can be provided without the source code</li> </ul>	3

Question	Answer	Marks								
9(a)	<div>One mark per each correct sensor.</div> <table><tr><th>Task</th><th>Sensor</th></tr><tr><td>checking the water is 30 °C</td><td>Temperature</td></tr><tr><td>checking the water acidity level after detergent is added</td><td>pH</td></tr><tr><td>checking the weight of the clothes to make sure that the machine is <b>not</b> overloaded</td><td>Pressure</td></tr></table>	Task	Sensor	checking the water is 30 °C	Temperature	checking the water acidity level after detergent is added	pH	checking the weight of the clothes to make sure that the machine is <b>not</b> overloaded	Pressure	3
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checking the water is 30 °C	Temperature									
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checking the weight of the clothes to make sure that the machine is <b>not</b> overloaded	Pressure									
9(b)	<div><b>Six</b> from:</div> <div><ul style="list-style-type: none"><li>– Sensor sends data to microprocessor</li><li>– Data is converted from analogue to digital (using ADC)</li><li>– Data is compared to stored value (of 30)</li></ul></div> <div>If data is below 30 then a <b>microprocessor sends signal</b> is sent to a heater to heat the water up/add hot water</div> <div><ul style="list-style-type: none"><li>– if data is above 30 then a <b>microprocessor sends signal</b> is sent to turn the heater off to allow the water to cool down/add cold water</li><li>– Actuator used to turn headset on/off // Actuator used to add water</li><li>– If data is 30 then no action is taken</li><li>– It is a continuous process</li></ul></div>	6								

Question	Answer	Marks
10(a)	<p><b>One</b> mark per each correct logic gate with the correct input(s).</p> 	<b>5</b>
10(b)	<p><b>One</b> mark per logic gate name and <b>one</b> mark per correct drawing.</p> <p>– NAND</p>  <p>– NOR</p> 	<b>2</b>

Question	Answer					Marks
10(c)	A	B	C	Working space	X	4
	0	0	0		0	
	0	0	1		0	
	0	1	0		0	
	0	1	1		1	
	1	0	0		0	
	1	0	1		1	
	1	1	0		0	
	1	1	1		1	
	4 marks per 8 correct outputs 3 marks per 6/7 correct outputs 2 marks per 4/5 correct outputs 1 mark per 2/3 correct outputs					

Question	Answer		Marks
11	One mark per each correct term.		<b>5</b>
	<b>Terms</b>	<b>Description</b>	
	<b>HTML</b>	the language used to create a web page	
	<b>Browser</b>	the type of software application used to display a web page	
	<b>IP address</b>	an address given to a computer, by a network, to allow the computer to be uniquely identified	
	<b>Cookie</b>	a text file sent by a web server to collect data about a user's browsing habits	
	<b>Internet Service Provider // ISP</b>	the company that provides a connection to the Internet	





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Maximum Mark: 75

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**Please note the following further points:**

The words in **bold** in the mark scheme are important text that needs to be present, or some notion of it needs to be present. It does not have to be the exact word, but something close to the meaning.

If a word is underlined, this **exact** word must be present.

A single forward slash means this is an alternative word. A double forward slash means that this is an alternative mark point.

Ellipsis (...) on the end of one-mark point and the start of the next means that the candidate **cannot** get the second mark point without being awarded the first one. If a MP has ellipsis at the beginning, but there is no ellipsis on the MP before it, then this is just a follow-on sentence and **can** be awarded **without** the previous mark point.

Question	Answer	Marks																
1(a)	One mark per each correct register. <table border="1"><tr><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td></tr></table>	1	0	1	0	0	1	1	1	1	1	0	1	0	1	1	0	2
1	0	1	0	0	1	1	1											
1	1	0	1	0	1	1	0											
1(b)(i)	Any <b>one</b> from: <ul style="list-style-type: none"><li>– Both addresses can be used to identify a computer/device</li><li>– Both are unique</li><li>– Both can be represented as hexadecimal</li><li>– Both addresses do not change if IP address is static</li></ul>	1																
1(b)(ii)	Any <b>two</b> from: <ul style="list-style-type: none"><li>– An IP address is assigned by the network/router/ISP, A MAC address is assigned by the manufacturer</li><li>– An IP address can be changed (if dynamic), MAC address cannot be changed</li><li>– IP address has 4/8 groups of values, MAC address has 6 groups/pairs of values</li><li>– IP address is 32-bit/128-bit, MAC address is 48-bit</li><li>– IP address does not contain serial number/manufacture number, MAC address does</li><li>– IP(v4) address is denary and MAC address is hexadecimal</li></ul>	2																

Question	Answer	Marks
2(a)	<p>Any <b>three</b> from:</p> <ul style="list-style-type: none"> <li>– Keyboard</li> <li>– Mouse</li> <li>– Microphone</li> <li>– Keypad</li> <li>– Touchscreen</li> <li>– Touchpad</li> </ul>	3

Question	Answer	Marks																												
2(b)	<div>One mark for each correct row.</div> <table><thead><tr><th>Statement</th><th>HDD (✓)</th><th>SSD (✓)</th><th>USB flash memory drive (✓)</th></tr></thead><tbody><tr><td>it has no moving parts</td><td></td><td>✓</td><td>✓</td></tr><tr><td>it is non-volatile</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>it can use NAND gates to store data</td><td></td><td>✓</td><td>✓</td></tr><tr><td>it uses magnetic properties to store data</td><td>✓</td><td></td><td></td></tr><tr><td>it has the smallest physical size</td><td></td><td></td><td>✓</td></tr><tr><td>it has the slowest read/write speeds</td><td>✓</td><td></td><td></td></tr></tbody></table>	Statement	HDD (✓)	SSD (✓)	USB flash memory drive (✓)	it has no moving parts		✓	✓	it is non-volatile	✓	✓	✓	it can use NAND gates to store data		✓	✓	it uses magnetic properties to store data	✓			it has the smallest physical size			✓	it has the slowest read/write speeds	✓			6
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it has the slowest read/write speeds	✓																													
2(c)(i)	<div>Any <b>two</b> from:</div> <div><div>– It cannot be inserted incorrectly</div><div>– Supports different transmission speeds</div><div>– High speed <b>transmission</b></div><div>– <b>Automatically</b> detected (not connected) // automatically downloads drivers</div><div>– Powers the device (for data transfer)</div><div>– Backward compatible</div></div>	2																												
2(c)(ii)	<div>– Serial</div>	1																												

Question	Answer	Marks
3(a)	<p>One mark per each correct term in the correct order.</p> <ul style="list-style-type: none"> <li>– Software</li> <li>– Network</li> <li>– Criteria</li> <li>– Accept // reject</li> <li>– Reject // accept</li> <li>– Hacking</li> </ul>	6

Question	Answer	Marks
3(b)	Any <b>three</b> from: <ul style="list-style-type: none"> <li>– Password</li> <li>– Biometrics (device)</li> <li>– Encryption</li> <li>– Physical methods (e.g. locks)</li> <li>– Two-factor authentication // Two-step verification</li> <li>– Anti-viruses</li> </ul>	<b>3</b>

Question	Answer	Marks
4	Any <b>six</b> from:  Phishing <ul style="list-style-type: none"> <li>– Legitimate looking email sent to user</li> <li>– encourages user to <b>click a link</b> that directs user to a fake website</li> <li>– User encouraged to enter personal details into a fake website // designed to obtain personal details from a user</li> </ul> Pharming <ul style="list-style-type: none"> <li>– Malicious code/malware is downloaded/installed // software downloaded without users' knowledge</li> <li>– ... that <b>re-directs</b> user to fake website (when legitimate URL entered)</li> <li>– User encouraged to enter personal details into a fake website // designed to obtain personal details from a user</li> </ul>	<b>6</b>

Question	Answer	Marks
5	<b>Eight</b> from: <ul style="list-style-type: none"> <li>– Sensor send data/readings/signal to microprocessor</li> <li>– Data is converted from analogue to digital (using ADC)</li> <li>– Microprocessor compares/checks data to stored values/range of values</li> <li>...</li> <li>– ... If data is greater than 30 / above the range microprocessor sends <b>signal</b> to open window and to turn heater off</li> <li>– ... If data is below 25 the microprocessor sends <b>signal</b> to turn on heater and to close window</li> <li>– ... If data is between 25 and 30 / within the range no action taken</li> <li>– Actuator is used to operate heater/window</li> <li>– <b>Whole</b> process is continuous</li> </ul>	<b>8</b>

Question	Answer	Marks
6(a)	<p>One mark per each correct logic gate, with correct input:</p>	6
6(b)	<ul style="list-style-type: none"> <li>– Row 1</li> <li>– Row 3</li> <li>– Row 4</li> <li>– Row 5</li> </ul>	4

Question	Answer	Marks
7(a)(i)	<p><b>Four</b> from:</p> <ul style="list-style-type: none"> <li>– (Compression) <b>algorithm</b> is used</li> <li>– No data will be removed // original file can be restored</li> <li>– Example of type of algorithm that would be used e.g. RLE</li> <li>– Repeated patterns in the music are identified</li> <li>– ... and indexed</li> </ul> <p>NOTE: If another lossless method is described, marks can be awarded.</p>	4
7(a)(ii)	<p>Any <b>one</b> from:</p> <ul style="list-style-type: none"> <li>– To provide the highest quality of music file (that compression will allow)</li> <li>– The user is able to listen to the original sound file</li> <li>– No loss of quality for the sound file provided</li> </ul>	1
7(a)(iii)	<p>Any <b>one</b> from:</p> <ul style="list-style-type: none"> <li>– Allow for quicker streaming speed</li> <li>– Would not require as much bandwidth (to stream)</li> <li>– Does not need as much RAM</li> <li>– Smoother listening experience // less lag</li> <li>– Will not use as much of data allowance</li> </ul>	1

Question	Answer	Marks
7(a)(iv)	<b>Two</b> from: <ul style="list-style-type: none"> <li>– Streaming speed may be slower</li> <li>– ... and may affect listening experience // buffering may occur</li> <li>– User may need more bandwidth to stream</li> <li>– ... that could be more expensive</li> <li>– It would be a larger file size</li> <li>– ... so may take longer to upload</li> <li>– ... so will take up more storage space ...</li> <li>– ... on webserver</li> </ul>	<b>2</b>
7(b)	Any <b>four</b> from: <ul style="list-style-type: none"> <li>– Browser sends URL to DNS</li> <li>– ... using HTTP/HTTPS</li> <li>– IP address is found on DNS</li> <li>– DNS returns IP address to the browser</li> <li>– Browser sends request to web server/IP address</li> <li>– Web server sends web pages back to browser</li> <li>– Browser <b>interprets/renders</b> the HTML (to display web pages)</li> <li>– Security certificates exchanged</li> </ul>	<b>4</b>
7(c)	<b>Two</b> from: <ul style="list-style-type: none"> <li>– <b>Web server</b> has been flooded with traffic // <b>web server</b> has been sent many requests at once</li> <li>– ... so, server is brought to a halt / crashes</li> </ul>	<b>2</b>

Question	Answer	Marks
8(a)	<ul style="list-style-type: none"> <li>– Odd</li> <li>– Odd</li> <li>– Even</li> <li>– Even</li> </ul>	<b>4</b>
8(b)	Any <b>one</b> from: <ul style="list-style-type: none"> <li>– there is a transposition of bits</li> <li>– it does not check the order of the bits (just the sum of 1s/0s)</li> <li>– even number of bits change</li> <li>– incorrect bits still add up to correct parity</li> </ul>	<b>1</b>
8(c)(i)	<b>Four</b> from: <ul style="list-style-type: none"> <li>– Multiple <b>bits</b> are sent <b>at the same time</b></li> <li>– Uses multiple wires</li> <li>– Data is sent in both directions ...</li> <li>– ... but only one direction <b>at a time</b></li> </ul>	<b>4</b>
8(c)(ii)	Any <b>two</b> from: <ul style="list-style-type: none"> <li>– Bits may arrive skewed</li> <li>– More expensive <b>to setup/manufacture/purchase cable</b></li> <li>– Limited distance</li> <li>– More prone to interference/error</li> </ul>	<b>2</b>





# Cambridge IGCSE™

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**COMPUTER SCIENCE**

**0478/11**

Paper 1

**October/November 2020**

**MARK SCHEME**

Maximum Mark: 75

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<p><b>Published</b></p>
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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.

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This document consists of **11** printed pages.

**PUBLISHED****Generic Marking Principles**

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- 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
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- 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:**

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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:**

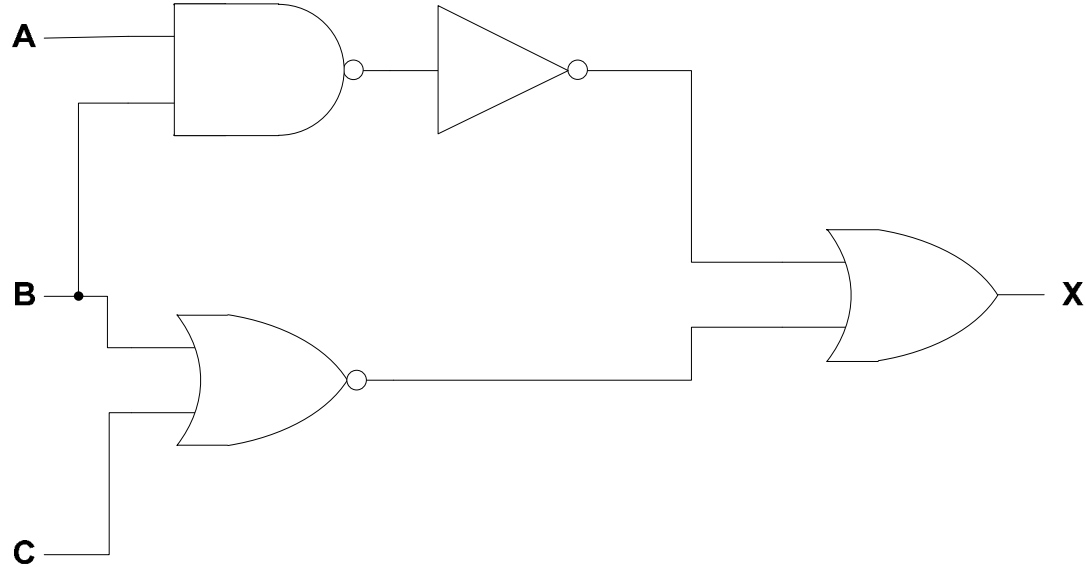
Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Question	Answer	Marks																												
1	<p><b>One</b> mark per each correct row:</p> <table><tr><th>Device</th><th>Input (✓)</th><th>Output (✓)</th><th>Storage (✓)</th></tr><tr><td>Keyboard</td><td>✓</td><td></td><td></td></tr><tr><td>Sensor</td><td>✓</td><td></td><td></td></tr><tr><td>3D Cutter</td><td></td><td>✓</td><td></td></tr><tr><td>2D Scanner</td><td>✓</td><td></td><td></td></tr><tr><td>Microphone</td><td>✓</td><td></td><td></td></tr><tr><td>Hard disk drive (HDD)</td><td></td><td></td><td>✓</td></tr></table>	Device	Input (✓)	Output (✓)	Storage (✓)	Keyboard	✓			Sensor	✓			3D Cutter		✓		2D Scanner	✓			Microphone	✓			Hard disk drive (HDD)			✓	6
Device	Input (✓)	Output (✓)	Storage (✓)																											
Keyboard	✓																													
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2D Scanner	✓																													
Microphone	✓																													
Hard disk drive (HDD)			✓																											

Question	Answer	Marks												
2(a)	<p><b>One</b> mark for each correct binary conversion  <b>One</b> mark for each correct denary conversion</p> <table border="1"> <thead> <tr> <th>Hexadecimal ticket number</th><th>12-bit binary value</th><th>Denary value</th></tr> </thead> <tbody> <tr> <td>028</td><td>0000 0010 1000</td><td>40</td></tr> <tr> <td>1A9</td><td>0001 1010 1001</td><td>425</td></tr> <tr> <td>20C</td><td>0010 0000 1100</td><td>524</td></tr> </tbody> </table>	Hexadecimal ticket number	12-bit binary value	Denary value	028	0000 0010 1000	40	1A9	0001 1010 1001	425	20C	0010 0000 1100	524	6
Hexadecimal ticket number	12-bit binary value	Denary value												
028	0000 0010 1000	40												
1A9	0001 1010 1001	425												
20C	0010 0000 1100	524												

Question	Answer	Marks
2(b)	<b>Seven</b> from: <ul style="list-style-type: none"> <li>– Camera captures code // Laser/light shone on code</li> <li>– Black squares reflect different light to white</li> <li>– Corner squares are used for alignment</li> <li>– Pattern converted to digital data // by example</li> <li>– (Digital) data sent to microprocessor</li> <li>– There is a database of valid QR codes</li> <li>– Data compared to stored values/valid QR codes ...</li> <li>– ... If data matches entry is granted is raised</li> <li>– ... If data matches count is incremented</li> <li>– ... If data does not match, entry is denied</li> </ul>	<b>7</b>

Question	Answer	Marks
3(a)	<ul style="list-style-type: none"> <li>– Handshake</li> <li>– Record</li> </ul>	<b>2</b>
3(b)	<ul style="list-style-type: none"> <li>– Web server</li> <li>– Certificate</li> <li>– Authentic</li> <li>– Browser</li> <li>– Signal</li> </ul>	<b>5</b>
3(c)	Any <b>one</b> from: <ul style="list-style-type: none"> <li>– SSL</li> <li>– HTTPS</li> </ul>	<b>1</b>

Question	Answer	Marks
4(a)	 <p>One mark for each correct gate with correct input</p>	4

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><tr><th>A</th><th>B</th><th>C</th><th>Working space</th><th>X</th></tr><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>0</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>0</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>0</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></table>	A	B	C	Working space	X	0	0	0		1	0	0	1		0	0	1	0		0	0	1	1		0	1	0	0		1	1	0	1		0	1	1	0		1	1	1	1		1	4
A	B	C	Working space	X																																											
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Question	Answer	Marks																														
4(c)	<p><b>One</b> mark for the correct gate and <b>one</b> mark for the correct truth table</p> <p>– AND</p> <table border="1"> <tr><td>A</td><td>B</td><td>X</td></tr> <tr><td>0</td><td>0</td><td><b>0</b></td></tr> <tr><td>0</td><td>1</td><td><b>0</b></td></tr> <tr><td>1</td><td>0</td><td><b>0</b></td></tr> <tr><td>1</td><td>1</td><td><b>1</b></td></tr> </table> <p>– XOR</p> <table border="1"> <tr><td>A</td><td>B</td><td>X</td></tr> <tr><td>0</td><td>0</td><td><b>0</b></td></tr> <tr><td>0</td><td>1</td><td><b>1</b></td></tr> <tr><td>1</td><td>0</td><td><b>1</b></td></tr> <tr><td>1</td><td>1</td><td><b>0</b></td></tr> </table>	A	B	X	0	0	<b>0</b>	0	1	<b>0</b>	1	0	<b>0</b>	1	1	<b>1</b>	A	B	X	0	0	<b>0</b>	0	1	<b>1</b>	1	0	<b>1</b>	1	1	<b>0</b>	<b>4</b>
A	B	X																														
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1	1	<b>0</b>																														

Question	Answer	Marks
5(a)(i)	– <b>Two</b> valid examples of Structure e.g. where text is placed, margins of page	<b>2</b>
5(a)(ii)	– <b>Two</b> valid examples of Presentation e.g. font size, font colour	<b>2</b>
5(b)	– Firewall – Proxy server	<b>2</b>



Question	Answer			Marks															
6(a)(i)	<div><div>– Uses multiple wires</div><div>– Sends multiple bits of data at a time</div></div>			2															
6(a)(ii)	<div><div>– Faster transmission speed</div></div>			1															
6(b)(i)	<div><div>– Control (bus)</div></div>			1															
6(b)(ii)	<div><div>– Accumulator (ACC)</div></div>			1															
6(b)(iii)	<table><tr><th>Statement</th><th>True (✓)</th><th>False (✓)</th></tr><tr><td>Data and instructions are stored in the same memory unit</td><td>✓</td><td></td></tr><tr><td>The control unit manages operations within the CPU</td><td>✓</td><td></td></tr><tr><td>Data and instructions can be fetched into the CPU at the same time</td><td></td><td>✓</td></tr><tr><td>The control unit is responsible for decoding an instruction</td><td>✓</td><td></td></tr></table>			Statement	True (✓)	False (✓)	Data and instructions are stored in the same memory unit	✓		The control unit manages operations within the CPU	✓		Data and instructions can be fetched into the CPU at the same time		✓	The control unit is responsible for decoding an instruction	✓		4
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	The control unit manages operations within the CPU	✓																	
	Data and instructions can be fetched into the CPU at the same time		✓																
The control unit is responsible for decoding an instruction	✓																		

Question	Answer	Marks
7	<p><b>Four</b> from (Max <b>two</b> per format):</p> <p>MIDI</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 // produced by synthesizer</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> <li>– Individual notes can be edited</li> </ul> <p>MP3</p> <ul style="list-style-type: none"> <li>– MP3 is a format for digital audio</li> <li>– MP3 is an actual recording of the sound</li> <li>– MP3 is a (lossy) compression format</li> <li>– Recorded using a microphone</li> </ul>	4

Question	Answer	Marks
8(a)	<p>Any <b>three</b> from:</p> <ul style="list-style-type: none"> <li>– Light emitting diodes (technology)</li> <li>– The <b>display</b> is made up of pixels</li> <li>– ... that are arranged together as a matrix</li> <li>– ... each is formed of three LEDs/filters</li> <li>– Shades of colour are achieved by mixing red, blue and green</li> <li>– The screen can be back-lit/edge-lit</li> </ul> <p>NOTE: Use of liquid crystals with LED technology can also be awarded</p>	3

Question	Answer	Marks
8(b)	Any <b>three</b> from: <ul style="list-style-type: none"> <li>– Energy efficient // low power consumption</li> <li>– Long lasting // longevity</li> <li>– Focussed beam // less light strays from beam</li> <li>– Brighter/vivid colours</li> <li>– High resolution</li> <li>– No flicker</li> <li>– Display is thinner</li> <li>– Mercury free technology // environmentally friendly</li> <li>– Fewer pixel failure</li> <li>– Increased viewing in sunlight</li> </ul>	<b>3</b>
8(c)	– LCD	<b>1</b>

Question	Answer	Marks
9(a)	<ul style="list-style-type: none"> <li>– 1</li> <li>– 0</li> <li>– 0</li> <li>– 0</li> </ul>	<b>4</b>
9(b)	<b>Two</b> from: <ul style="list-style-type: none"> <li>– Checksum</li> <li>– Automatic repeat request // ARQ</li> </ul>	<b>2</b>
9(c)	Any <b>four</b> from: <ul style="list-style-type: none"> <li>– Data is <b>input</b> with check digit</li> <li>– A calculation is performed on the (inputted) data // by example</li> <li>– The calculated digit is compared to a stored value</li> <li>– If it matches, the data entered is correct</li> <li>– If it does not match, the data entered is incorrect</li> </ul>	<b>4</b>



**Cambridge Assessment International Education**  
Cambridge International General Certificate of Secondary Education

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Maximum Mark: 75

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Question	Answer	Marks
1(a)	<p><b>Printer</b></p> <p><b>Statement</b></p> <pre> graph LR     IP[Inkjet printer] --- C[Can print in colour]     IP --- L[Creates output line by line using a print head]     LP[Laser printer] --- C     LP --- D[Uses a charged drum to create the printed item]     LP --- T[Uses powdered toner] </pre> <p><b>One</b> mark for correct lines from inkjet  <b>One</b> mark for correct lines from laser</p>	2
1(b)	<ul style="list-style-type: none"> <li>Laser</li> </ul>	1
1(c)	<p><b>Two</b> from:</p> <ul style="list-style-type: none"> <li>Design is created on the computer / software / CAD</li> <li>Material is loaded to cutter</li> <li>Different types of material can be used</li> <li>Uses lasers to cut material ...</li> <li>... that use infra-red</li> <li>... that produces extreme heat</li> <li>... that is focussed using a special lens</li> <li>Can work on both the x,y and z axis</li> </ul>	2

Question	Answer	Marks								
2(a)	<p><b>One</b> mark for each correct denary value</p> <table><tr><th>Binary</th><th>Denary</th></tr><tr><td>0001001110</td><td>78</td></tr><tr><td>0110110111</td><td>439</td></tr><tr><td>1000000001</td><td>513</td></tr></table>	Binary	Denary	0001001110	78	0110110111	439	1000000001	513	3
Binary	Denary									
0001001110	78									
0110110111	439									
1000000001	513									
2(b)	<p><b>Two</b> from:</p> <ul style="list-style-type: none"><li>• Uses fewer characters // shorter</li><li>• Easier to read / write / understand</li><li>• Less likely to make mistakes // less error prone</li><li>• Easier to debug</li></ul>	2								
2(c)	<p><b>One</b> mark for each correct hexadecimal value in correct order</p> <p>2      B      5</p>	3								



Question	Answer	Marks
3(a)	<b>Three</b> from: <ul style="list-style-type: none"> <li>Malicious software // type of malware</li> <li>Tracks / records keypresses // keylogger</li> <li>Sends data to third party</li> <li>Collected data is analysed to obtain data</li> </ul>	<b>3</b>
3(b)	<b>One</b> mark for identified method, <b>one</b> mark for how it prevents spyware: <p><b>Drop-down boxes // onscreen / virtual keyboard</b></p> <ul style="list-style-type: none"> <li>Means key logger cannot collect data</li> </ul> <p><b>Only requires part of the password</b></p> <ul style="list-style-type: none"> <li>Hacker doesn't get the full password</li> </ul> <p><b>Two-step verification // Two-factor authentication</b></p> <ul style="list-style-type: none"> <li>Extra data is sent to device making it more difficult for hacker to obtain it</li> <li>Data has to be entered into the same system // if attempted from a remote location, it will not be accepted</li> </ul> <p><b>Use a biometric device</b></p> <ul style="list-style-type: none"> <li>The person's biological data (e.g. their fingerprint) is also required</li> </ul>	<b>2</b>
3(c)	<b>Four</b> from: <ul style="list-style-type: none"> <li>Monitors traffic coming into and out of the computer system</li> <li>Checks that the traffic meets any criteria / rules set</li> <li>Blocks any traffic that does not meet the criteria / rules set</li> <li>Allows a set blacklist / whitelist // can block certain IP addresses</li> <li>Can close certain ports</li> </ul>	<b>4</b>
3(d)	<b>Two</b> from: <ul style="list-style-type: none"> <li>Passwords // biometrics</li> <li>Levels of access</li> <li>Proxy servers</li> <li>Physical security methods – e.g. PC's in locked rooms, etc.</li> </ul>	<b>2</b>

Question	Answer	Marks
4(a)	<b>One</b> from: <ul style="list-style-type: none"> <li>• Touch screen</li> <li>• Keyboard</li> <li>• Microphone</li> <li>• Mouse</li> </ul>	<b>1</b>
4(b)	<b>One</b> from: <ul style="list-style-type: none"> <li>• Headphones</li> <li>• Speakers</li> <li>• Printer</li> <li>• Light / LED</li> </ul>	<b>1</b>
4(c)	<b>One</b> from: <ul style="list-style-type: none"> <li>• HDD</li> <li>• SSD</li> <li>• USB drive</li> </ul>	<b>1</b>
4(d)	<b>Four</b> from: <ul style="list-style-type: none"> <li>• QR code is scanned using a <u>camera</u> on a mobile device ...</li> <li>• ... and read / decoded using an application / software</li> <li>• Illuminator shone on code</li> <li>• Squares reflect light differently</li> <li>• Corners of code are used for orientation</li> <li>• Opens document with information // Directs to website with information</li> <li>• QR code can be saved for future reference</li> </ul>	<b>4</b>

Question	Answer	Marks
5(a)	<ul style="list-style-type: none"><li>• Data is sent down a single wire ...</li><li>• ... one bit at a time</li><li>• Data is sent in both directions ...</li><li>• ... but only one direction at a time</li></ul>	<b>4</b>
5(b)	<p><b>One</b> mark for correct byte (Byte) 2 // 01010100</p> <p><b>Three</b> from:</p> <ul style="list-style-type: none"><li>• Added up / counted the 1s / 0s</li><li>• Even parity used // 3 bytes are even</li><li>• Byte 2 uses odd parity // 1 byte is odd</li></ul>	<b>4</b>

Question	Answer	Marks
6(a)(i)	<b>One</b> from: <ul style="list-style-type: none"> <li>• Code will run without the need of an interpreter</li> <li>• (Object) Code is platform independent</li> <li>• Source code not available / cannot be modified</li> </ul>	<b>1</b>
6(a)(ii)	<b>One</b> from: <ul style="list-style-type: none"> <li>• Source code not available / cannot be modified</li> <li>• Comments, etc. not visible</li> <li>• Future changes will require code to be recompiled</li> </ul>	<b>1</b>
6(b)(i)	<b>One</b> from: <ul style="list-style-type: none"> <li>• Protocol is HTTPS</li> <li>• Padlock icon is locked</li> <li>• Can view website certificate</li> </ul>	<b>1</b>
6(b)(ii)	<b>Five</b> from: <ul style="list-style-type: none"> <li>• Browser / client sends request to webserver to request identification</li> <li>• Web server sends its digital / security certificate</li> <li>• Browser authenticates certificate ...</li> <li>• ... if authentic connection, is established</li> <li>• Any data sent is encrypted ...</li> <li>• ... using public and private keys</li> </ul>	<b>5</b>
6(c)	<b>Four</b> from: <ul style="list-style-type: none"> <li>• A type of software licence</li> <li>• Free of charge</li> <li>• Normally distributed without the source code</li> <li>• Can legally share / copy</li> <li>• Cannot legally modify code</li> <li>• Cannot resell</li> </ul>	<b>4</b>

Question	Answer	Marks
6(d)(i)	<b>Two</b> from: <ul style="list-style-type: none"><li>• File size is reduced ...</li><li>• ... so it uses less storage space</li><li>• ... so faster transmission</li><li>• ... so quicker to download</li></ul>	<b>2</b>
6(d)(ii)	<ul style="list-style-type: none"><li>• Lossless</li></ul>	<b>1</b>

Question	Answer	Marks															
7(a)	<table border="1"> <thead> <tr> <th>Input A</th><th>Input B</th><th>Output</th></tr> </thead> <tbody> <tr> <td>0</td><td>0</td><td>0</td></tr> <tr> <td>0</td><td>1</td><td>1</td></tr> <tr> <td>1</td><td>0</td><td>1</td></tr> <tr> <td>1</td><td>1</td><td>1</td></tr> </tbody> </table>	Input A	Input B	Output	0	0	0	0	1	1	1	0	1	1	1	1	1
Input A	Input B	Output															
0	0	0															
0	1	1															
1	0	1															
1	1	1															
7(b)	<ul style="list-style-type: none"> <li>Exclusive OR / XOR / EOR</li> </ul>	1															
7(c)	<p><b>One</b> mark for each correct logic gate with correct inputs</p>	5															
7(d)	<p><b>Two</b> from:</p> <ul style="list-style-type: none"> <li>Can work continuously</li> <li>Avoids human error</li> <li>It could be a dangerous environment and will avoid human risk</li> <li>Detect errors instantly</li> <li>Maintain consistent and correct conditions</li> </ul>	2															

Question	Answer	Marks
8	<b>Six</b> from: <ul style="list-style-type: none"> <li>• PC holds address of the instruction</li> <li>• The address held in PC is sent to MAR ...</li> <li>• ... using address bus</li> <li>• MAR goes to location in memory where instruction is stored</li> <li>• Instruction sent to MDR ...</li> <li>• ... using data bus</li> <li>• Instruction sent to CIR</li> <li>• Control unit sends signals to manage the process ...</li> <li>• ... using the control bus</li> </ul>	<b>6</b>
9(a)	<b>Two</b> from: <ul style="list-style-type: none"> <li>• Layout of the webpage</li> <li>• e.g. where a paragraph is placed</li> <li>• Defined using tags</li> </ul>	<b>2</b>
9(b)	<b>One</b> mark for each correct term in the correct order: <ul style="list-style-type: none"> <li>• browser</li> <li>• IP address</li> <li>• web server</li> <li>• HTML</li> </ul>	<b>4</b>



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**COMPUTER SCIENCE**

**0478/11**

Paper 1

**May/June 2019**

MARK SCHEME

Maximum Mark: 75

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**Published**

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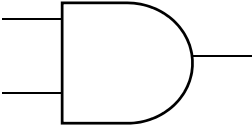
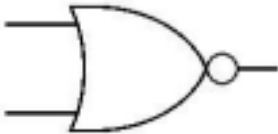
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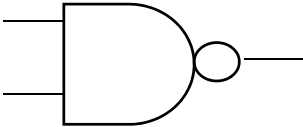
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Question	Answer	Marks																								
1(a)	<div><div>97</div><div><table><tr><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr></table><div><div>1 mark</div><div>1 mark</div></div></div></div> <div><div>5C</div><div><table><tr><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td></tr></table><div><div>1 mark</div><div>1 mark</div></div></div></div> <div><div>E1</div><div><table><tr><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr></table><div><div>1 mark</div><div>1 mark</div></div></div></div>	1	0	0	1	0	1	1	1	0	1	0	1	1	1	0	0	1	1	1	0	0	0	0	1	6
1	0	0	1	0	1	1	1																			
0	1	0	1	1	1	0	0																			
1	1	1	0	0	0	0	1																			
1(b)	<p>Four from:</p> <ul style="list-style-type: none"><li>Media Access Control (address)</li><li>Used to identify a device</li><li>It is a <b>unique</b> (address)</li><li>It is a static address // It does not change</li><li>It is set by the manufacturer</li><li>The first part is the manufacturer ID/number/identifies the manufacturer</li><li>The second part is the serial number/ID</li></ul>	4																								

Question	Answer	Marks
1(c)	<p><b>Two</b> from e.g.:</p> <ul style="list-style-type: none"> <li>• Colour <b>codes</b> // Colour in <b>HTML / CSS</b></li> <li>• Error messages</li> <li>• Locations in memory</li> <li>• Memory dump // debugging</li> <li>• IP address</li> <li>• ASCII // Unicode</li> <li>• Assembly language</li> <li>• URL</li> </ul>	<b>2</b>

Question	Answer	Marks
2(a)	<p>1 mark for correct name, 1 mark for correct gate symbol</p> <p>– AND</p> 	<b>2</b>
2(b)	<p>1 mark for correct name, 1 mark for correct gate symbol</p> <p>– NOR</p> 	<b>2</b>

Question	Answer	Marks
2(c)	<p>1 mark for correct name, 1 mark for correct gate symbol</p> <p>– NAND</p> 	<b>2</b>

Question	Answer	Marks												
3	<p>1 mark for each correct device</p> <table><tr><th>Description of input or output device</th><th>Name of device</th></tr><tr><td>This is an input device that works by shining a light onto the surface of a document. The light source is automatically moved across the document and the reflected light is captured by mirrors and lenses.</td><td>2D Scanner</td></tr><tr><td>This is an input device where a laser or a light source is moved across an object. The width, height and depth of the object are measured to allow a model to be created.</td><td>3D scanner</td></tr><tr><td>This is a large input device that is usually fixed to a wall. A user can calibrate the device to make sure the sensors align with a projected image. The user can use either their finger or a special pen to make selections.</td><td>Interactive whiteboard</td></tr><tr><td>This is an output device that uses many small mirrors to reflect light towards a lens. This will display an image.</td><td>Projector</td></tr><tr><td>This is an output device that creates an object by building layer upon layer of material.</td><td>3D printer</td></tr></table>	Description of input or output device	Name of device	This is an input device that works by shining a light onto the surface of a document. The light source is automatically moved across the document and the reflected light is captured by mirrors and lenses.	2D Scanner	This is an input device where a laser or a light source is moved across an object. The width, height and depth of the object are measured to allow a model to be created.	3D scanner	This is a large input device that is usually fixed to a wall. A user can calibrate the device to make sure the sensors align with a projected image. The user can use either their finger or a special pen to make selections.	Interactive whiteboard	This is an output device that uses many small mirrors to reflect light towards a lens. This will display an image.	Projector	This is an output device that creates an object by building layer upon layer of material.	3D printer	5
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Question	Answer	Marks
4(a)(i)	<p>1 mark for security method, 2 marks for description</p> <p><b>Anti-virus (software) // Anti-malware (software)</b></p> <ul style="list-style-type: none"><li>• Scans the computer system (for viruses)</li><li>• Has a record of known viruses</li><li>• Removes/quarantines any viruses that are found</li><li>• Checks data before it is downloaded</li><li>• ... and stops download if virus found/warns user may contain virus</li></ul> <p><b>Firewall // Proxy server</b></p> <ul style="list-style-type: none"><li>• Monitors traffic coming <b>into and out of</b> the computer system</li><li>• <b>Checks</b> that the traffic meets any criteria/rules set</li><li>• Blocks any traffic that does not meet the criteria/rules set // set blacklist/whitelist</li></ul>	<b>3</b>

Question	Answer	Marks
4(a)(ii)	<p>1 mark for security method, 2 marks for description</p> <p><b>Firewall // proxy server</b></p> <ul style="list-style-type: none"> <li>• Monitors traffic coming into and out of the computer system</li> <li>• Check that the traffic meets any criteria/rules set</li> <li>• Blocks any traffic that does not meet the criteria/rules set // set blacklist/whitelist</li> </ul> <p><b>NOTE: Cannot be awarded if already given in 4(a)(i)</b></p> <p><b>Passwords</b></p> <ul style="list-style-type: none"> <li>• Making a password stronger // by example</li> <li>• Changing it regularly</li> <li>• Lock out after set number of attempts // stops brute force attacks // makes it more difficult to guess</li> </ul> <p><b>Biometrics</b></p> <ul style="list-style-type: none"> <li>• Data needed to enter is unique to individual</li> <li>• ... therefore very difficult to replicate</li> <li>• Lock out after set number of attempts</li> </ul> <p><b>Two-step verification // Two-factor authentication</b></p> <ul style="list-style-type: none"> <li>• Extra data is sent to device, pre-set by user</li> <li>• ... making it more difficult for hacker to obtain it</li> <li>• Data has to be entered into the same system</li> <li>• ... so if attempted from a remote location, it will not be accepted</li> </ul>	<b>3</b>

Question	Answer	Marks
4(a)(iii)	<p>1 mark for security method, 2 marks for description</p> <p><b>Anti-spyware software // Anti-malware (software)</b></p> <ul style="list-style-type: none"> <li>• Scans the computer for spyware</li> <li>• Removes/quarantines any spyware that is found</li> <li>• Can prevent spyware being downloaded</li> </ul> <p><b>NOTE: Anti-malware (software) cannot be awarded if already given in 4(a)(i)</b></p> <p><b>Drop-down boxes // onscreen/virtual keyboard</b></p> <ul style="list-style-type: none"> <li>• Means key logger cannot collect data // key presses cannot be recorded</li> <li>• ... and relay it to third party</li> </ul> <p><b>Two-step verification // Two-factor authentication</b></p> <ul style="list-style-type: none"> <li>• Extra data is sent to device, pre-set by user</li> <li>• ... making it more difficult for hacker to obtain it</li> <li>• Data has to be entered into the same system</li> <li>• ... so if attempted from a remote location, it will not be accepted</li> </ul> <p><b>NOTE: Cannot be awarded if already given in 4(a)(ii)</b></p> <p><b>Firewall // proxy server</b></p> <ul style="list-style-type: none"> <li>• Monitors traffic coming into and out of the computer system</li> <li>• Check that the traffic meets any criteria/rules set</li> <li>• Blocks any traffic that does not meet the criteria/rules set // set blacklist/whitelist</li> </ul> <p><b>NOTE: Cannot be awarded if already given in 4(a)(i) or 4(a)(ii)</b></p>	<b>3</b>
4(b)(i)	<p><b>Three from:</b></p> <ul style="list-style-type: none"> <li>• Human error e.g. accidentally deleting a file</li> <li>• Hardware failure</li> <li>• Physical damage e.g. fire/flood</li> <li>• Power failure // power surge</li> <li>• Misplacing a storage device</li> </ul>	<b>3</b>



Question	Answer	Marks
4(b)(ii)	<b>Two</b> from: <ul style="list-style-type: none"> <li>• Back data up</li> <li>• Use surge protection</li> <li>• Keep data in a fireproof / waterproof / protective case</li> <li>• Use verification methods (for deleting files)</li> <li>• Following correct procedure e.g. ejecting offline devices / regularly saving</li> </ul>	<b>2</b>

Question	Answer	Marks
5	<b>Five</b> from: <ul style="list-style-type: none"> <li>• A (compression) algorithm is used</li> <li>• No data is removed in the process // original file can be restored</li> <li>• <b>Repeated</b> words (are identified) // <b>Patterns</b> in the data (are identified)</li> <li>• ... and are indexed/put into a table // by example</li> <li>• ... and are replaced with their index // by example</li> <li>• ... and their positions are stored (in the table) // by example</li> <li>• ... and the number of times the word/pattern appears is stored (in the table) // by example</li> </ul> <p>NOTE: Other valid methods of lossless compression can be awarded marks</p>	<b>5</b>

Question	Answer	Marks
6(a)	<p><b>Four</b> from (max 2 marks per improvement):</p> <ul style="list-style-type: none"> <li>• Make the password require more characters</li> <li>• Makes the password harder to crack/guess</li> <li>• More possible combinations for the password</li>   <li>• Make the password require different types of characters</li> <li>• Makes the password harder to crack/guess</li> <li>• More possible combinations for the password</li>   <li>• Use a biometric device</li> <li>• Hard to fake a person's biological data // data is <b>unique</b></li>   <li>• Two-step verification // Two factor-authentication</li> <li>• Adds an additional level to hack</li> <li>• Have to have the set device for the code to receive it</li> <li>• Drop-down boxes // onscreen keyboard</li> <li>• To prevent passwords being obtained using keylogger</li>   <li>• Request random characters</li> <li>• Won't reveal entire password</li>   <li>• Set number of password attempts</li> <li>• Will lock account if attempting to guess</li> <li>• Will stop brute-force attacks</li> </ul>	<b>4</b>

Question	Answer	Marks
6(b)	<p><b>Four</b> from (max 3 marks for benefits only, without an explanation):</p> <ul style="list-style-type: none"> <li>• More read/write cycles (over its lifetime) // greater longevity ...</li> <li>• ... likely to be a lot of read/write functions each day</li> <li>• Read/write speed is sufficient ...</li> <li>• ... even though it is slower than solid-state</li> <li>• Cheaper <b>per unit of data</b> stored ...</li> <li>• ... better value for the company to purchase</li> <li>• ... so the law company can afford to buy a server with greater storage capacity</li> <li>• No requirement for portability ...</li> <li>• ... as a server, it does not need to be moved</li> <li>• Trusted technology ...</li> <li>• ... it has been traditionally used for many years</li> </ul>	<b>4</b>
6(c)	<ul style="list-style-type: none"> <li>• DVD</li> <li>• CD</li> <li>• Blu-ray</li> </ul>	<b>3</b>

Question	Answer	Marks
7	1 mark for each correct term, in the correct place: <ul style="list-style-type: none"><li>• Syntax</li><li>• High-level language</li><li>• Translator</li><li>• Machine code</li><li>• Assembly</li><li>• Low-level language</li></ul>	6

Question	Answer	Marks
8(a)	<b>Six</b> from: <ul style="list-style-type: none"><li>• SSL is a (security) protocol</li><li>• It encrypts any data that is sent</li><li>• It uses/sends digital certificates ...</li><li>• ... which is sent to the (buyer's/user's) browser // requested by (buyer's/user's) browser</li><li>• ... that contains the gallery's public key</li><li>• ... that can be used to authenticate the gallery</li><li>• Once the certificate is authenticated, the transaction will begin</li></ul>	6

Question	Answer	Marks																					
8(b)	<p>1 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>Firewalls are only available as hardware devices</td><td></td><td>✓</td></tr> <tr> <td>Firewalls allow a user to set rules for network traffic</td><td>✓</td><td></td></tr> <tr> <td>Firewalls will automatically stop all malicious traffic</td><td></td><td>✓</td></tr> <tr> <td>Firewalls only examine traffic entering a network</td><td></td><td>✓</td></tr> <tr> <td>Firewalls encrypt all data that is transmitted around a network</td><td></td><td>✓</td></tr> <tr> <td>Firewalls can be used to block access to certain websites</td><td>✓</td><td></td></tr> </tbody> </table>	Statement	True (✓)	False (✓)	Firewalls are only available as hardware devices		✓	Firewalls allow a user to set rules for network traffic	✓		Firewalls will automatically stop all malicious traffic		✓	Firewalls only examine traffic entering a network		✓	Firewalls encrypt all data that is transmitted around a network		✓	Firewalls can be used to block access to certain websites	✓		6
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8(c)	<p><b>Four</b> from:</p> <ul style="list-style-type: none"> <li>• A set of guidelines</li> <li>• Rules/laws that govern the use of computers / by example</li> <li>• Tell people how to behave when using computers // helps keep users safe when using computers // by example</li> <li>• <b>Art gallery</b> could be subject to plagiarism / intellectual property theft</li> <li>• <b>Art gallery</b> could <b>copyright</b> their work (to make it illegal to steal it)</li> </ul>	4																					



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**COMPUTER SCIENCE**

**0478/11**

Paper 1

**October/November 2018**

MARK SCHEME

Maximum Mark: 75

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<p><b>Published</b></p>
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Question	Answer	Marks										
1(a)	<p>1 mark for each correct line (to a maximum of 3)</p> <table><thead><tr><th>File format</th><th>File type</th></tr></thead><tbody><tr><td><div>.jpeg</div></td><td><div>Text file</div></td></tr><tr><td><div>.mp3</div></td><td><div>Image file</div></td></tr><tr><td><div>.mp4</div></td><td><div>Audio file</div></td></tr><tr><td><div>.txt</div></td><td><div>Video file</div></td></tr></tbody></table>	File format	File type	<div>.jpeg</div>	<div>Text file</div>	<div>.mp3</div>	<div>Image file</div>	<div>.mp4</div>	<div>Audio file</div>	<div>.txt</div>	<div>Video file</div>	3
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<div>.txt</div>	<div>Video file</div>											
1(b)	<p>2 marks for working, 1 mark for correct answer</p> <ul style="list-style-type: none"><li>• 150*100 = 15 000</li><li>• 15 000/1024</li><li>• 14.65kB</li></ul>	3										
1(c)	<p><b>Three</b> from:</p> <ul style="list-style-type: none"><li>• a compression algorithm is used</li><li>• no data is lost in the process</li><li>• repeated words/patterns can be indexed // repeated sections of words/patterns can be indexed // given by example</li><li>• The indexed words/patterns can be replaced with numerical values // given by example</li></ul>	3										

Question	Answer	Marks															
1(d)	<p>1 mark for each correct tick (✓)</p> <table border="1"> <thead> <tr> <th data-bbox="761 248 1061 347">File format</th><th data-bbox="1061 248 1288 347">Lossy (✓)</th><th data-bbox="1288 248 1514 347">Lossless (✓)</th></tr> </thead> <tbody> <tr> <td data-bbox="761 347 1061 413">.jpeg</td><td data-bbox="1061 347 1288 413">✓</td><td data-bbox="1288 347 1514 413"></td></tr> <tr> <td data-bbox="761 413 1061 478">.mp3</td><td data-bbox="1061 413 1288 478">✓</td><td data-bbox="1288 413 1514 478"></td></tr> <tr> <td data-bbox="761 478 1061 544">.mp4</td><td data-bbox="1061 478 1288 544">✓</td><td data-bbox="1288 478 1514 544"></td></tr> <tr> <td data-bbox="761 544 1061 609">.zip</td><td data-bbox="1061 544 1288 609"></td><td data-bbox="1288 544 1514 609">✓</td></tr> </tbody> </table>	File format	Lossy (✓)	Lossless (✓)	.jpeg	✓		.mp3	✓		.mp4	✓		.zip		✓	<b>4</b>
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.zip		✓															

Question	Answer	Marks																					
2(a)	<p>1 mark for each correct line (to a maximum of 5)</p> <table> <thead> <tr> <th data-bbox="320 284 723 323">Binary or hexadecimal</th><th data-bbox="723 284 1077 323"></th><th data-bbox="1077 284 1480 323">Denary</th></tr> </thead> <tbody> <tr> <td data-bbox="320 352 723 456">01001011</td><td data-bbox="723 352 1077 456"></td><td data-bbox="1077 352 1480 456">75</td></tr> <tr> <td data-bbox="320 491 723 595">4E</td><td data-bbox="723 491 1077 595"></td><td data-bbox="1077 491 1480 595">78</td></tr> <tr> <td data-bbox="320 630 723 734">11011010</td><td data-bbox="723 630 1077 734"></td><td data-bbox="1077 630 1480 734">157</td></tr> <tr> <td data-bbox="320 769 723 873">10011101</td><td data-bbox="723 769 1077 873"></td><td data-bbox="1077 769 1480 873">167</td></tr> <tr> <td data-bbox="320 908 723 1011">A7</td><td data-bbox="723 908 1077 1011"></td><td data-bbox="1077 908 1480 1011">25</td></tr> <tr> <td data-bbox="320 1046 723 1150">19</td><td data-bbox="723 1046 1077 1150"></td><td data-bbox="1077 1046 1480 1150">218</td></tr> </tbody> </table>	Binary or hexadecimal		Denary	01001011		75	4E		78	11011010		157	10011101		167	A7		25	19		218	5
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10011101		167																					
A7		25																					
19		218																					
2(b)	<p><b>Two</b> from:</p> <ul style="list-style-type: none"> <li>• It makes the values easier to read/write/understand/debug</li> <li>• It is a shorter way to represent the values</li> </ul>	2																					

Question	Answer	Marks																																													
3(a)	<div><ul style="list-style-type: none"><li>• 4 marks for 8 correct outputs</li><li>• 3 marks for 6 or 7 correct outputs</li><li>• 2 marks for 4 or 5 correct outputs</li><li>• 1 mark for 2 or 3 correct outputs</li></ul></div> <table><tr><th>A</th><th>B</th><th>C</th><th>Working space</th><th>X</th></tr><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>1</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></table>	A	B	C	Working space	X	0	0	0		1	0	0	1		1	0	1	0		1	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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3(b)	<div><p>Three from:</p><ul style="list-style-type: none"><li>• output of AND is 1 if both inputs are 1</li><li>• output of AND is 0 if either or both inputs are 0</li><li>• output of OR is 1 if either input is 1</li><li>• output of OR is 0 if both inputs are 0</li><li>• correct example of AND truth table</li><li>• correct example of OR truth table</li></ul></div>	3																																													

Question	Answer	Marks
4(a)	<b>Four</b> from: Phishing: <ul style="list-style-type: none"> <li>• A legitimate looking email is sent to a user</li> <li>• The email will encourage the user to click a link/open an attachment</li> <li>• The link will redirect a user to a legitimate looking webpage (to steal personal data)</li> </ul> Pharming: <ul style="list-style-type: none"> <li>• A malicious code is installed on a user's hard drive/server</li> <li>• The code will cause a redirection to a legitimate looking webpage (to steal personal data)</li> </ul>	<b>4</b>
4(b)	<b>Two</b> from: <ul style="list-style-type: none"> <li>• Hacking</li> <li>• Cracking</li> <li>• Virus</li> <li>• Denial of service</li> <li>• Malware</li> <li>• Spyware</li> </ul>	<b>2</b>
4(c)	<b>Two</b> from: <ul style="list-style-type: none"> <li>• Firewall</li> <li>• Proxy server</li> <li>• Anti-virus</li> <li>• Anti-malware</li> <li>• Anti-spyware</li> <li>• Username and password</li> </ul>	<b>2</b>

Question	Answer				Marks				
5(a)	1 mark for the correct tick for each storage				5				
						Storage device or media	Primary (✓)	Secondary (✓)	Off-line (✓)
						External HDD			✓
						RAM	✓		
						Internal SSD		✓	
						ROM	✓		
						DVD			✓
5(b)	<b>Four</b> from: <ul style="list-style-type: none"><li>• The disc is rotated/spun</li><li>• Laser beam is used</li><li>• The laser beam makes indentations on the surface of the disc/pits and lands</li><li>• The data is written in a spiral/concentric tracks</li><li>• The pits and lands represent binary values/1s and 0s</li><li>• It is called burning data to the disc</li></ul>				4				
5(c)(i)	Solid state				1				
5(c)(ii)	<b>Two</b> from: <ul style="list-style-type: none"><li>• It has no moving parts so will be durable</li><li>• It is small/compact so it can be easily fit onto the device</li><li>• It is light so it will not be difficult to lift for the drone</li><li>• It can hold the large amount of data needed for the video/film footage</li><li>• Uses less power so drone battery will last longer</li></ul>				2				

Question	Answer	Marks															
6(a)	<p>1 mark for the correct ticks (✓) for each statement</p> <table> <tr> <th>Statement</th><th>3D printer (✓)</th><th>3D cutter (✓)</th></tr> <tr> <td>Outputs a physical 3D product</td><td>✓</td><td>✓</td></tr> <tr> <td>Uses a high powered laser to create the output</td><td></td><td>✓</td></tr> <tr> <td>Creates 3D prototypes</td><td>✓</td><td>✓</td></tr> <tr> <td>Uses layers of material to create the output</td><td>✓</td><td></td></tr> </table>	Statement	3D printer (✓)	3D cutter (✓)	Outputs a physical 3D product	✓	✓	Uses a high powered laser to create the output		✓	Creates 3D prototypes	✓	✓	Uses layers of material to create the output	✓		4
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6(b)	Computer Aided Design/CAD	1															
6(c)	<p><b>Three</b> from:</p> <ul style="list-style-type: none"> <li>• Uses a large number of tiny mirrors</li> <li>• Mirrors are laid out in a grid/matrix</li> <li>• Each mirror creates a pixel in the image</li> <li>• Mirrors can tilt toward or away from light source</li> <li>• The mirrors reflect light toward a (projection) lens</li> <li>• Colour is produced using a colour wheel // Light passes through colour wheel // filters light into red/green/blue</li> <li>• Can be used to display an image on a wall/screen</li> </ul>	3															

Question	Answer	Marks
7(a)	1 mark for each correct answer: <ul style="list-style-type: none"> <li>• uses several/multiple wires</li> <li>• transmits multiple bits at a time</li> </ul>	2
7(b)	Benefit 1 mark for: <ul style="list-style-type: none"> <li>• quicker/faster data transfer</li> </ul> Drawback <b>One</b> from: <ul style="list-style-type: none"> <li>• More chance of data being skewed due to bits being sent simultaneously/out of order // less safe transmission as bits are sent simultaneously/out of order</li> <li>• More expensive as requires more/several/multiple wires</li> <li>• More chance of interference as more/several/multiple wires are used (than can create crosstalk)</li> </ul>	2
7(c)	<b>One</b> from: <ul style="list-style-type: none"> <li>• Used in integrated circuits</li> <li>• Used in RAM</li> <li>• Used in connections to peripheral devices (e.g. printer)</li> </ul>	1

Question	Answer	Marks
8	1 mark for each correct answer, in the given order: <ul style="list-style-type: none"> <li>• browser</li> <li>• webpages</li> <li>• Internet Service Provider (ISP)</li> <li>• Internet</li> <li>• protocol</li> <li>• IP address</li> </ul>	6



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Question	Answer	Marks
9	<b>Five</b> from: <ul style="list-style-type: none"> <li>• The data is sent to the microprocessor</li> <li>• The analogue data is converted to digital (using ADC)</li> <li>• The microprocessor compares the data to a stored value of 5 kg ...               <ul style="list-style-type: none"> <li>– ... If the value is greater than 5 kg ...</li> <li>– ... a counter is added to/incremented</li> </ul> </li> <li>• The process is continuous</li> </ul>	5

Question	Answer	Marks
10	<b>Four</b> from: <ul style="list-style-type: none"> <li>• It performs a number of basic tasks, including controlling hardware/file handling (any other suitable examples)</li> <li>• It allows the user to communicate with the computer using hardware // without it the user would not be able to communicate with the computer using hardware</li> <li>• It provides the user with a user interface // without it the user would not have a user interface to use</li> <li>• PC's are often used to perform many complex tasks at a time ...               <ul style="list-style-type: none"> <li>– ... the OS is needed to handle this multitasking</li> <li>– ... therefore, it provides the ability to handle interrupts</li> </ul> </li> </ul>	4



**Cambridge Assessment International Education**  
Cambridge International General Certificate of Secondary Education

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**COMPUTER SCIENCE**

**0478/11**

Paper 1

**May/June 2018**

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 **12** 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.

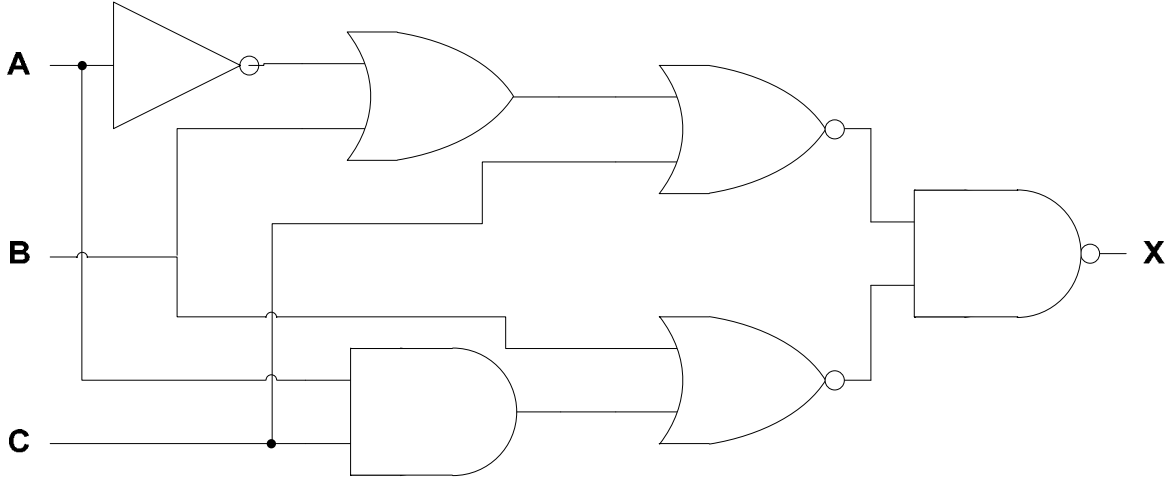
Question	Answer	Marks
1	<p>1 mark for each correct answer, in the given order:</p> <ul style="list-style-type: none"> <li>– analogue</li> <li>– digital</li> <li>– denary</li> <li>– 10</li> <li>– binary</li> <li>– 2</li> </ul>	<b>6</b>

Question	Answer	Marks
2	<p>1 mark for each correct conversion:</p> <ul style="list-style-type: none"> <li>– 42</li> <li>– 257</li> <li>– 542</li> </ul>	<b>3</b>

Question	Answer	Marks
3	<p>1 mark for correct register, 3 marks for reason:</p> <ul style="list-style-type: none"> <li>– Register C</li> </ul> <p>Any <b>three</b> from:</p> <ul style="list-style-type: none"> <li>– Count the number of 1/0 bits (in each byte/register)</li> <li>– Two bytes/registers have an odd number of 1/0 bits // Two use odd parity</li> <li>– Odd parity must be the parity used</li> <li>– One byte/register has an even number of 1/0 bits // One uses even parity</li> <li>– One with an even number of one bits/even parity is incorrect // Register C should have odd parity</li> </ul>	<b>4</b>

Question	Answer	Marks
4(a)	1 mark for each correct answer:  Lossy (compression) Lossless (compression)	<b>2</b>
4(b)	1 mark for correct compression, 3 marks for description:  – Lossless (compression)  Any <b>three</b> from: – The file can be restored/decompressed to the exact same state it was before compression/ to original – (It is a computer program so) no data can be lost // Lossy would remove data – Will not run correctly (with any other compression) – (Lossless) will give repeating words/sections of word a value// RLE is used // Other valid examples of methods of lossless compression – Value is recorded in an index	<b>4</b>

Question	Answer	Marks														
5	<p>1 mark for each correct line, up to a maximum of 5 marks:</p> <table><thead><tr><th>Component</th><th>Description</th></tr></thead><tbody><tr><td>Immediate access store (IAS)</td><td>Holds data and instructions when they are loaded from main memory and are waiting to be processed.</td></tr><tr><td>Register</td><td>Holds data temporarily that is currently being used in a calculation.</td></tr><tr><td>Control unit (CU)</td><td>Holds data or instructions temporarily when they are being processed.</td></tr><tr><td>Accumulator (ACC)</td><td>Manages the flow of data and interaction between the components of the processor.</td></tr><tr><td>Arithmetic logic unit (ALU)</td><td>Carries out the calculations on data.</td></tr><tr><td>Bus</td><td>Pathway for transmitting data and instructions.</td></tr></tbody></table>	Component	Description	Immediate access store (IAS)	Holds data and instructions when they are loaded from main memory and are waiting to be processed.	Register	Holds data temporarily that is currently being used in a calculation.	Control unit (CU)	Holds data or instructions temporarily when they are being processed.	Accumulator (ACC)	Manages the flow of data and interaction between the components of the processor.	Arithmetic logic unit (ALU)	Carries out the calculations on data.	Bus	Pathway for transmitting data and instructions.	5
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Bus	Pathway for transmitting data and instructions.															

Question	Answer	Marks
6(a)	<p data-bbox="342 217 1261 248">1 mark for each correct logic gate (with the correct direction of input(s))</p>  <pre data-bbox="360 288 1523 767">graph LR; A((A)) --- NOT1[NOT]; A --- OR1[OR]; B((B)) --- OR2[OR]; B --- AND2[AND]; C((C)) --- AND2; NOT1 --- OR1; OR1 --- OR3[OR]; OR2 --- AND3[AND]; AND2 --- AND3; AND3 --- X((X))</pre>	<b>6</b>



Question	Answer	Marks																																													
6(b)	<p>4 marks for 8 correct outputs 3 marks for 6 or 7 correct outputs 2 marks for 4 or 5 correct outputs 1 mark for 2 or 3 correct outputs</p> <table><tr><th>A</th><th>B</th><th>C</th><th>Working space</th><th>X</th></tr><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>1</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></table>	A	B	C	Working space	X	0	0	0		1	0	0	1		1	0	1	0		1	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
7	<p>Compiler</p> <p>Any <b>three</b> from:</p> <ul style="list-style-type: none"> <li>– Translates high-level language into <b>machine code/low level language</b></li> <li>– Translates (the source code) all in one go/all at once</li> <li>– Produces an executable file</li> <li>– Produces an error report</li> </ul> <p>Interpreter</p> <p>Any <b>three</b> from:</p> <ul style="list-style-type: none"> <li>– Translates high-level language into <b>machine code/low level language</b></li> <li>– Translates (the source code) line by line/statement by statement</li> <li>– Stops if it finds an error</li> <li>– Will only continue when error is fixed</li> </ul>	6

Question	Answer	Marks
8(a)	<p>Any <b>four</b> from:</p> <ul style="list-style-type: none"> <li>– Shines light / (red) laser at barcode</li> <li>– Light is called an illuminator</li> <li>– Light is reflected back // White lines reflect light // Black lines reflect less light/absorbs light</li> <li>– Sensors / photoelectric cells detect the light</li> <li>– Different reflections / bars will give different binary values / digital values // pattern converted to digital values</li> <li>– A microprocessor interprets the data</li> </ul>	4
8(b)	<p>Any <b>three</b> from:</p> <ul style="list-style-type: none"> <li>– barcode identifies a (unique) product</li> <li>– barcode can be used to look up product (in a database)</li> <li>– data about stock levels can be stored on a system</li> <li>– stock can be automatically deducted from the system</li> <li>– can check stock is below a certain level // check stock level</li> <li>– automatic re-order // Alerts when stock is low</li> <li>– automatically update new stock level</li> <li>– to locate if an item of stock is available in another location</li> </ul>	3

Question	Answer	Marks
8(c)	<p>Any <b>four</b> from:</p> <ul style="list-style-type: none"> <li>– (Infrared) rays are sent across screen (from the edges)</li> <li>– Has sensors around edge // Sensors capture beams</li> <li>– (Infrared) rays form a grid across the screen</li> <li>– (Infrared) ray is broken (by a finger blocking a beam)</li> <li>– <b>Calculation</b> is made (on where beam is broken) to locate the 'touch' // Co-ordinates are used to locate the touch</li> </ul>	4
8(d)	<p>Secondary Storage – any <b>two</b> from:</p> <ul style="list-style-type: none"> <li>– Not directly accessed by the CPU</li> <li>– Non-volatile storage</li> <li>– Secondary is internal to the computer/device</li> <li>– An example of secondary storage would be HDD/SSD</li> </ul> <p>Off-line storage – any <b>two</b> from:</p> <ul style="list-style-type: none"> <li>– Non-volatile storage</li> <li>– Off-line storage is storage that is removable from a computer/device // not internal // portable</li> <li>– An example of off-line storage would be CD/DVD/USB stick/SD card/magnetic tape/ external HDD/SSD</li> </ul>	4

Question	Answer	Marks
9	<p>Any <b>six</b> from:</p> <ul style="list-style-type: none"> <li>– Suitable biometric device, such as fingerprint scanner/retina/eye/iris scanner/face recognition/voice recognition/palm scanner // description of use e.g. use fingerprint on device</li> <li>– Sensor (in biometric device) captures/takes data/readings (of user)</li> <li>– Data/readings are converted from analogue to <b>digital</b> (using ADC)</li> <li>– Data/reading sent to the microprocessor</li> <li>– Data/readings compared to stored values/data ...</li> <li>– ... if data/readings <b>match</b> user can enter</li> <li>– ... if data/readings <b>do not match</b> user is declined entry // user asked to try again ...</li> <li>– ... alert may be sent to security // alarm may sound</li> </ul>	6

Question	Answer	Marks
10(a)	Any <b>four</b> from: <ul style="list-style-type: none"> <li>– Structure <b>and</b> presentation are defined using (mark-up) tags</li> <li>– Structure <b>and</b> presentation dictate the appearance of the website</li> <li>– Structure is used for layout</li> <li>– Example of structure</li> <li>– Presentation is used for formatting / style</li> <li>– Example of formatting</li> <li>– Separate file / CSS can be used for presentation content</li> </ul>	<b>4</b>
10(b)(i)	1 mark for each correct part <ul style="list-style-type: none"> <li>– domain (name)</li> <li>– file name/webpage name</li> </ul>	<b>2</b>
10(b)(ii)	Any <b>two</b> from: <ul style="list-style-type: none"> <li>– Hypertext Transfer Protocol Secure // it is the access protocol // It is a protocol</li> <li>– It means the website uses SSL/TLS</li> <li>– It means data sent (to and from the webserver) is encrypted</li> </ul>	<b>2</b>
10(c)	Any <b>two</b> from e.g. : <ul style="list-style-type: none"> <li>– To store items that a customer has added to an online shopping basket</li> <li>– To store a customer's credit card details</li> <li>– To store log-in details</li> <li>– To track what product a customer browses // Track music preferences</li> <li>– Targeted advertising // making recommendations</li> <li>– Personalises/customises the experience</li> <li>– Shows who are new and returning customers</li> <li>– To speed up log-in times</li> <li>– To speed up/allow single click purchases</li> <li>– Improves the experience</li> </ul>	<b>2</b>

Question	Answer	Marks
10(d)	<p>Any <b>four</b> from:</p> <ul style="list-style-type: none"><li>– Prevents direct access to the <b>webserver</b> // Sits between <b>user</b> and <b>webserver</b></li><li>– If an attack is launched it hits the proxy server instead // can be used to help prevent DDOS // help prevent hacking of <b>webserver</b></li><li>– Used to direct invalid traffic away from the webserver</li><li>– Traffic is examined by the proxy server // Filters traffic</li><li>– If traffic is valid the data from the webserver will be obtained by the user</li><li>– If traffic is invalid the request to obtain data is declined</li><li>– Can block requests from certain IP addresses</li></ul>	<b>4</b>



**Cambridge Assessment International Education**  
Cambridge International General Certificate of Secondary Education

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**COMPUTER SCIENCE**

**0478/11**

Paper 1

**October/November 2017**

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.

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This document consists of **10** printed pages.

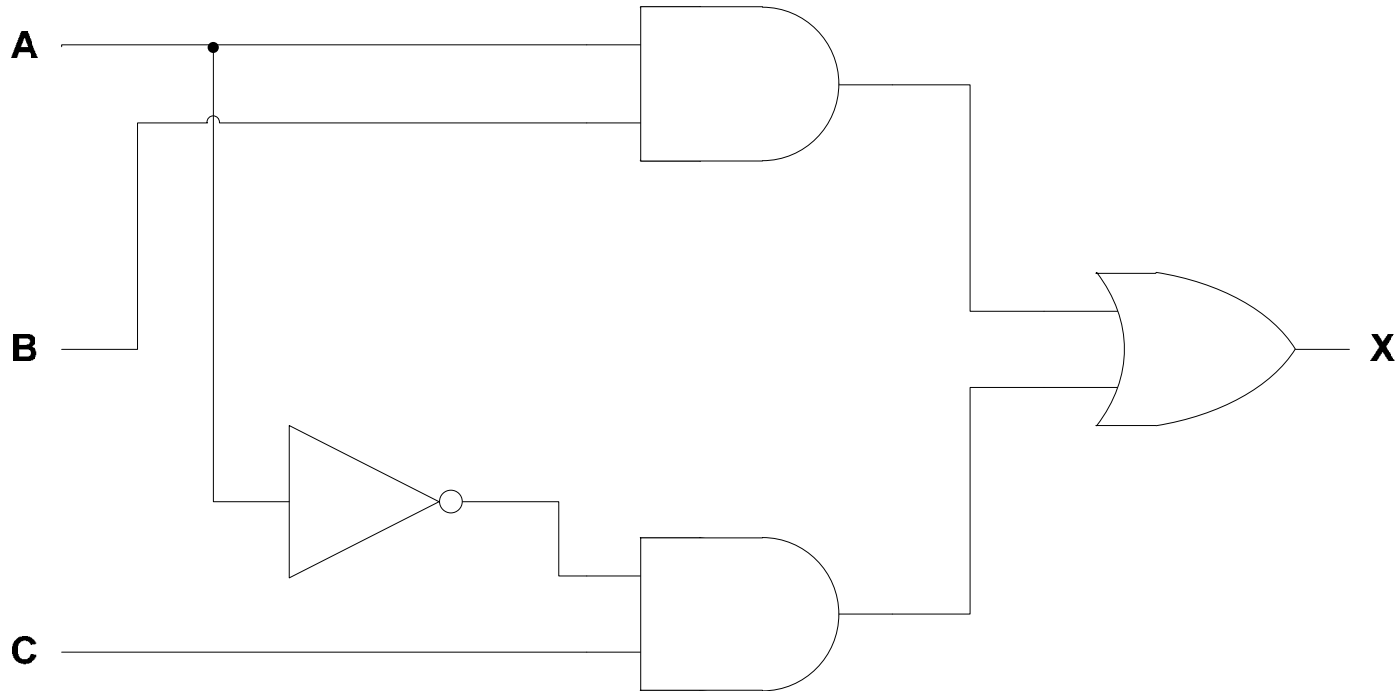
Question	Answer	Marks												
1(a)	Output	1												
1(b)	1 mark for each correct conversion <div><div>E</div><div>0</div><div>4</div><table><tr><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td></tr></table></div>	1	1	1	0	0	0	0	0	0	1	0	0	3
1	1	1	0	0	0	0	0	0	1	0	0			
1(c)	Any <b>one</b> from: <ul style="list-style-type: none"><li>– Hexadecimal codes can fit in a smaller display rather than a full text based message</li><li>– Smaller amount of memory needed to store the hex error messages than text based</li></ul>	1												
1(d)	1 mark for correct sensor, 1 mark for corresponding use Possible examples could include: <ul style="list-style-type: none"><li>– Temperature (sensor)</li><li>– To monitor the temperature of the water</li><li>– Pressure (sensor)</li><li>– To monitor the level of water in the washing machine</li><li>– Motion (sensor)</li><li>– To monitor whether the drum is still in motion</li><li>– pH (sensor)</li><li>– To monitor the level of water hardness/detergent present in the water</li></ul>	6												

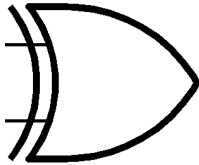
Question	Answer	Marks										
2	<p>1 mark for each correct file format e.g.</p> <table><tr><th>File type</th><th>File format</th></tr><tr><td>Pictures</td><td>.JPEG</td></tr><tr><td>Text</td><td>.doc, .txt, .rtf, .docx, .odt .pdf</td></tr><tr><td>Sound</td><td>.mp3, .wav, .aif, .flac, .mid</td></tr><tr><td>Video</td><td>.mp4, .flv, .wmv</td></tr></table>	File type	File format	Pictures	.JPEG	Text	.doc, .txt, .rtf, .docx, .odt .pdf	Sound	.mp3, .wav, .aif, .flac, .mid	Video	.mp4, .flv, .wmv	3
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Question	Answer	Marks
3(a)	<ul style="list-style-type: none"> <li>– Part 1 (access) protocol</li> <li>– Part 2 domain (name)</li> <li>– Part 3 filename</li> </ul>	3
3(b)	<p><b>Four</b> from:</p> <ul style="list-style-type: none"> <li>– IP address is used to identify a device (on the Internet / network)</li> <li>– IP address is allocated by the network/ ISP</li> <li>– Can be used in place of URL</li> <li>– IP addresses can be IPv4 or IPv6</li> <li>– IP address can be static ...</li> <li>– ... meaning it doesn't change each time it is connected to the Internet</li> <li>– IP address can be dynamic ....</li> <li>– ... meaning that it can change each time a device is connected to the Internet</li> <li>– Any valid example (e.g. xxx.xxx.xxx.xxx or xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx)</li> </ul>	4



Question	Answer	Marks														
4	<p>1 mark for each correct line up to a total of 5 marks</p> <table><thead><tr><th>Component</th><th>Description</th></tr></thead><tbody><tr><td>Arithmetic Logic Unit (ALU)</td><td>Used to connect together the internal components of the CPU.</td></tr><tr><td>Buses</td><td>Used to carry out calculations on data.</td></tr><tr><td>Control Unit (CU)</td><td>Used to temporarily hold data and instructions during processing.</td></tr><tr><td>Immediate Access Store (IAS)</td><td>Used to allow interaction with the computer.</td></tr><tr><td>Input/Output</td><td>Used to hold data and instructions before they are processed.</td></tr><tr><td>Registers</td><td>Used to manage the flow of data through the CPU.</td></tr></tbody></table>	Component	Description	Arithmetic Logic Unit (ALU)	Used to connect together the internal components of the CPU.	Buses	Used to carry out calculations on data.	Control Unit (CU)	Used to temporarily hold data and instructions during processing.	Immediate Access Store (IAS)	Used to allow interaction with the computer.	Input/Output	Used to hold data and instructions before they are processed.	Registers	Used to manage the flow of data through the CPU.	5
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Question	Answer	Marks
5(a)	<p data-bbox="331 215 768 247">1 mark for each correct logic gate</p>  <pre data-bbox="353 271 1747 965">graph LR; A --- AND1[AND]; B --- AND1; B --- NOT[NOT]; NOT --- AND2[AND]; C --- AND2; AND1 --- OR[OR]; AND2 --- OR; OR --- X</pre>	4

Question	Answer	Marks
5(b)	<p>1 mark for correct logic gate symbol:</p>  <p>Any <b>four</b> from:</p> <ul style="list-style-type: none"> <li>– similar to an OR gate</li> <li>– It has (at least) two inputs</li> <li>– Output will be high/1 if both inputs are different</li> <li>– Output will be high/1 if either input is high</li> <li>– Output will be low/0 if both inputs are high</li> <li>– Output will be low/0 if both inputs are low</li> </ul>	5

Question	Answer	Marks
6	<p>Any <b>six</b> from:</p> <p>2D</p> <ul style="list-style-type: none"> <li>– (Scanner) shines a light onto the surface of a document // Light moves across document</li> <li>– Reflected light is captured</li> <li>– Uses mirrors and lenses</li> <li>– Captured image is converted into a digital file</li> <li>– Produces a 2D digital image</li> </ul> <p>3D</p> <ul style="list-style-type: none"> <li>– Scanners shines a laser (or light) over the surface of a 3D object</li> <li>– Records measurements of the geometry/dimensions of the object</li> <li>– Measurements are converted to digital file</li> <li>– Produces a 3D digital model</li> </ul>	6

Question	Answer	Marks																					
7	<p>1 mark for each correct tick</p> <table> <tr> <th>Statement</th><th>true (✓)</th><th>false (✓)</th></tr> <tr> <td>Firewalls can monitor incoming and outgoing traffic.</td><td>✓</td><td></td></tr> <tr> <td>Firewalls operate by checking traffic against a set of rules.</td><td>✓</td><td></td></tr> <tr> <td>Firewalls cannot block access to a certain website.</td><td></td><td>✓</td></tr> <tr> <td>Firewalls can be software and hardware.</td><td>✓</td><td></td></tr> <tr> <td>Firewalls can act as intermediary servers.</td><td></td><td>✓</td></tr> <tr> <td>Firewalls can block unauthorised traffic.</td><td>✓</td><td></td></tr> </table>	Statement	true (✓)	false (✓)	Firewalls can monitor incoming and outgoing traffic.	✓		Firewalls operate by checking traffic against a set of rules.	✓		Firewalls cannot block access to a certain website.		✓	Firewalls can be software and hardware.	✓		Firewalls can act as intermediary servers.		✓	Firewalls can block unauthorised traffic.	✓		6
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Question	Answer	Marks
8(a)	<p>Any <b>three</b> from:</p> <ul style="list-style-type: none"> <li>– Human error (e.g. deleting/overwriting data)</li> <li>– Physical damage</li> <li>– Power failure/surge</li> <li>– Hardware failure</li> <li>– Software crashing</li> </ul>	3
8(b)	<p>Any <b>three</b> from:</p> <ul style="list-style-type: none"> <li>– Online shopping // Online payment systems // Online booking</li> <li>– Email</li> <li>– Cloud based storage</li> <li>– Intranet/extranet</li> <li>– VPN</li> <li>– VoIP // video conferencing</li> <li>– Instant messaging (IM) // social networking // online gaming</li> </ul>	3

Question	Answer	Marks
8(c)	<p>1 mark for identifying, 1 mark for description</p> <ul style="list-style-type: none"> <li>– Strong password</li> <li>– To make it difficult to hack an account</li>   <li>– Biometric device</li> <li>– To use data that is difficult to fake as a password</li>   <li>– TLS // Encryption</li> <li>– To make data meaningless if intercepted</li> <li>– To encrypt data that is exchanged (TLS only)</li> <li>– More secure than SSL (TLS only)</li>   <li>– Anti-spyware (software)</li> <li>– To find and remove any spyware that is installed on a computer</li> <li>– To help stop key loggers recording key presses</li>   <li>– Firewall</li> <li>– To help prevent unauthorised access to an account</li> <li>– Blocks any requests that do not meet/match the criteria</li>   <li>– Authentication (card reader at home)/mobile security code app/two-step verification</li> <li>– To add another level of identification of the user</li>   <li>– Use of drop-down boxes (or equivalent)</li> <li>– So key loggers cannot record the key presses</li>   <li>– Proxy server</li> <li>– To divert an attack away from the main system</li> </ul>	<b>6</b>

Question	Answer	Marks
9(a)	<p>Any <b>four</b> from:</p> <ul style="list-style-type: none"> <li>– (Red) laser is used</li> <li>– (Laser beams) shines onto surface of the disk</li> <li>– It is rotated (at a constant speed) to be read</li> <li>– Surface is covered in a track (that spirals from the centre)</li> <li>– Data is represented on the surface using pits and lands</li> <li>– Pits and lands represent binary values</li> <li>– Pits reflect light back differently (to the area in between/land)</li> <li>– Optical device can determine the binary value from the light reflection</li> </ul>	<b>4</b>
9(b)	<p>1 mark for calculation, 1 mark for correct answer:</p> <ul style="list-style-type: none"> <li>– <math>1000 \times 16</math></li> <li>– <math>16000/8</math></li> <li>– Answer is <b>2000</b> bytes</li> </ul>	<b>2</b>
9(c)	<p><b>Four</b> from: (Max 2 for either primary or secondary)</p> <ul style="list-style-type: none"> <li>– Primary RAM and ROM</li> <li>– Secondary HDD and SSD</li> <li>– Primary is directly accessible by CPU</li> <li>– Secondary is not directly accessible by CPU</li> <li>– Primary is internal to computer</li> <li>– Secondary can be internal <b>or</b> external to the computer</li> <li>– Primary stores boot up instructions <b>and</b> can hold data whilst being processed</li> <li>– Secondary stores files/software</li> <li>– Primary has faster access speed</li> <li>– Secondary has a slower access speed</li> <li>– Primary has both volatile <b>and</b> non-volatile</li> <li>– Secondary is non-volatile</li> </ul>	<b>4</b>

Question	Answer			Marks
10	1 mark for each correct tick			<b>6</b>
	<b>Statement</b>	<b>true (✓)</b>	<b>false (✓)</b>	
	Assembly language uses mnemonic codes.	✓		
	Assembly language programs do not need a translator to be executed.		✓	
	Assembly language is a low-level programming language.	✓		
	Assembly language is specific to the computer hardware.	✓		
	Assembly language is machine code.		✓	
	Assembly language is often used to create drivers for hardware.	✓		



**Cambridge International Examinations**  
Cambridge International General Certificate of Secondary Education

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**COMPUTER SCIENCE**

**0478/11**

Paper 1

**May/June 2017**

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.

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This document consists of **8** printed pages.



Question	Answer	Marks
1(a)	1 mark for <b>any</b> two correct values, 2 marks for all 4 correct values. 29FC	<b>2</b>
1(b)	<b>Two</b> from: <ul style="list-style-type: none"> <li>Easier/quicker to understand/read</li> <li>Easier to debug/identify errors</li> <li>Fewer digits are used / shorter // takes up less space on screen // more can be shown on screen / page</li> </ul>	<b>2</b>
1(c)	<b>Two</b> from: <ul style="list-style-type: none"> <li>Notations for colour in HTML // HTML colour (codes)</li> <li>Error messages</li> <li>MAC address // IP address</li> <li>Locations in memory</li> <li>Memory dump</li> </ul>	<b>2</b>

Question	Answer	Marks
2(a)	<b>Two</b> from: <ul style="list-style-type: none"> <li>Closer to human language // closer to English</li> <li>Independent of a particular type of computer/device/platform // portable language</li> <li>A language such as Python, Java, Pascal, etc. (any suitable example)</li> </ul>	<b>2</b>
2(b)	<b>One</b> from: <ul style="list-style-type: none"> <li>Compiler</li> <li>Interpreter</li> </ul>	<b>1</b>
2(c)	Must relate to answer given in 2b. No follow through for incorrect answer in part 2b.  <b>Compiler – Three</b> from: <ul style="list-style-type: none"> <li>Translates the whole program as a complete unit / at once</li> <li>Creates an executable file / object code</li> <li>A report / list of errors in the code is created</li> <li>Optimises the source code (to run efficiently)</li> </ul> <b>Interpreter – Three</b> from: <ul style="list-style-type: none"> <li>Translates a program one line of code at a time</li> <li>Machine code is directly executed // The interpreter is used each time the program / code is executed</li> <li>Will identify an error as soon as it finds one in a line of code</li> </ul>	<b>3</b>

Question	Answer	Marks															
3	<p>1 mark per correct tick</p> <table> <tr> <th>Statement</th><th>true (✓)</th><th>false (✓)</th></tr> <tr> <td>47KB is larger than 10MB.</td><td></td><td>✓</td></tr> <tr> <td>250bytes is smaller than 0.5MB.</td><td>✓</td><td></td></tr> <tr> <td>50GB is larger than 100MB.</td><td>✓</td><td></td></tr> <tr> <td>1TB is smaller than 4GB.</td><td></td><td>✓</td></tr> </table>	Statement	true (✓)	false (✓)	47KB is larger than 10MB.		✓	250bytes is smaller than 0.5MB.	✓		50GB is larger than 100MB.	✓		1TB is smaller than 4GB.		✓	4
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4	<p>1 mark per correct tick</p> <table> <tr> <th>Statement</th><th>True</th><th>False</th></tr> <tr> <td>Data is transmitted in one direction only, one bit at a time.</td><td></td><td>✓</td></tr> <tr> <td>Data is transmitted in both directions, multiple bits at a time.</td><td></td><td>✓</td></tr> <tr> <td>Data is transmitted in one direction only, multiple bits at a time.</td><td></td><td>✓</td></tr> <tr> <td>Data is transmitted in both directions, but only one direction at a time. Data is transmitted one bit at a time.</td><td>✓</td><td></td></tr> <tr> <td>Data is transmitted in both directions, but only one direction at a time. Data is transmitted multiple bits at a time.</td><td></td><td>✓</td></tr> </table>	Statement	True	False	Data is transmitted in one direction only, one bit at a time.		✓	Data is transmitted in both directions, multiple bits at a time.		✓	Data is transmitted in one direction only, multiple bits at a time.		✓	Data is transmitted in both directions, but only one direction at a time. Data is transmitted one bit at a time.	✓		Data is transmitted in both directions, but only one direction at a time. Data is transmitted multiple bits at a time.		✓	5
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Question	Answer	Marks												
5(a)	<p>1 mark per correct tick</p> <table border="1"> <thead> <tr> <th>Received byte</th><th>corrupted during transmission (✓)</th><th>not corrupted during transmission (✓)</th></tr> </thead> <tbody> <tr> <td>10110100</td><td>✓</td><td></td></tr> <tr> <td>01101101</td><td></td><td>✓</td></tr> <tr> <td>10000001</td><td>✓</td><td></td></tr> </tbody> </table>	Received byte	corrupted during transmission (✓)	not corrupted during transmission (✓)	10110100	✓		01101101		✓	10000001	✓		3
Received byte	corrupted during transmission (✓)	not corrupted during transmission (✓)												
10110100	✓													
01101101		✓												
10000001	✓													
5(b)	<p><b>Four</b> from:</p> <ul style="list-style-type: none"> <li>• Uses acknowledgement and time out</li> <li>• Check performed on received data // error is detected by e.g. parity check, check sum</li> <li>• If error detected, request sent to resend data // negative acknowledgment is used</li> <li>• If no acknowledgement is sent that data is received // positive acknowledgment is used</li> <li>• Data is resent / Resend request repeated, till data is resent correctly ...</li> <li>• ... or request times out // limit is reached</li> </ul>	4												

Question	Answer	Marks
6	<p>1 mark for correct bus name and up to 2 further marks for appropriate purpose.</p> <p><b>Address (bus)</b> <b>Two</b> from:</p> <ul style="list-style-type: none"> <li>• Carries / transports an address / location ...</li> <li>• ... of the next item to be fetched</li> <li>• Data travels one way (unidirectional)</li> </ul> <p><b>Data (bus)</b> <b>Two</b> from:</p> <ul style="list-style-type: none"> <li>• Carries / transports data / example of data ...</li> <li>• ... that is currently being processed // that will be / has been processed</li> <li>• Data can travel in both directions (bidirectional)</li> </ul> <p><b>Control (bus)</b> <b>Two</b> from:</p> <ul style="list-style-type: none"> <li>• Carries / transports signals</li> <li>• Control / directs the actions of the CPU / processor</li> <li>• Can be either Unidirectional or Bidirectional</li> </ul>	6

Question	Answer	Marks
7	<p>1 mark for correct line till 5 marks given.</p>	5

Question	Answer	Marks
8	<ul style="list-style-type: none"> <li>• Secondary</li> <li>• HDD/SSD</li> <li>• SSD/HDD</li> <li>• Primary</li> <li>• ROM/RAM</li> <li>• RAM/ROM</li> </ul>	6

Question	Answer	Marks
9	<p>1 mark for appropriate device name and 1 further mark for appropriate purpose.</p> <p><b>Input devices</b>  <b>Two</b> from:</p> <ul style="list-style-type: none"> <li>• <b>Keypad / Keyboard</b> ...</li> <li>• ... e.g. to allow customer to input the quantity of an item</li> <li>• <b>Touchscreen</b> ...</li> <li>• ... e.g. to allow a customer to select a payment method</li> <li>• <b>Barcode scanner / Barcode reader</b> ...</li> <li>• ... e.g. to allow a customer to scan in their shopping</li> <li>• <b>Card reader // Cash deposit / intake</b> ...</li> <li>• ... e.g. to allow a customer to pay for their shopping</li> <li>• <b>Weighing scales</b> ...</li> <li>• ... e.g. to allow a customer to weigh fresh produce</li> </ul> <p><b>Output devices</b>  <b>One</b> from:</p> <ul style="list-style-type: none"> <li>• <b>Display / Touchscreen</b> ...</li> <li>• ... e.g. to allow a customer to see the running total of their shopping</li> <li>• <b>Speaker</b> ...</li> <li>• ... e.g. to give audio instructions to a customer about how to use the self-checkout</li> <li>• <b>Printer</b> ...</li> <li>• ... e.g. to print a receipt for the customer</li> </ul>	<b>6</b>

Question	Answer	Marks															
10(a)	<p>1 mark for four correct outputs only</p> <table border="1"> <thead> <tr> <th>A</th><th>B</th><th>Output</th></tr> </thead> <tbody> <tr> <td>0</td><td>0</td><td><b>1</b></td></tr> <tr> <td>0</td><td>1</td><td><b>0</b></td></tr> <tr> <td>1</td><td>0</td><td><b>0</b></td></tr> <tr> <td>1</td><td>1</td><td><b>0</b></td></tr> </tbody> </table>	A	B	Output	0	0	<b>1</b>	0	1	<b>0</b>	1	0	<b>0</b>	1	1	<b>0</b>	<b>1</b>
A	B	Output															
0	0	<b>1</b>															
0	1	<b>0</b>															
1	0	<b>0</b>															
1	1	<b>0</b>															
10(b)	<p>1 mark for each correct section of the statement</p> <ul style="list-style-type: none"> <li>• (A AND B)</li> <li>• AND</li> <li>• (C OR NOT B)</li> </ul>	<b>3</b>															

Question	Answer	Marks
11	<p><b>Three</b> from e.g. :</p> <ul style="list-style-type: none"> <li>• (Provides an) interface</li> <li>• Loads / opens / installs / closes software</li> <li>• Manages the hardware // manages peripherals // spooling</li> <li>• Manages the transfer of programs into and out of memory</li> <li>• Divides processing time // processor management</li> <li>• Manages file handling</li> <li>• Manages error handling // manages interrupts</li> <li>• Manages security software</li> <li>• Manages utility software</li> <li>• Manages user accounts</li> <li>• Multitasking</li> <li>• Multiprogramming // time slicing</li> <li>• Batch processing</li> </ul>	<b>3</b>

Question	Answer	Marks
12(a)	<p>1 mark for appropriate sensor and 1 further mark for appropriate use.</p> <p><b>Two</b> from:</p> <ul style="list-style-type: none"> <li>• <b>Gas (sensor)</b> ...</li> <li>• ... e.g. to measure the levels of oxygen/carbon dioxide / nitrogen in the factory to make sure they are not too high / low</li> <li>• <b>Temperature (sensor)</b> ...</li> <li>• ... e.g. to measure the temperature of the chemicals to make sure it is not too high/low</li> <li>• <b>Motion / Infra-red (sensor)</b> ...</li> <li>• ... e.g. to detect any persons in an unauthorised area of the factory</li> <li>• <b>Pressure (sensor)</b> ...</li> <li>• ... e.g. to measure the pressure of chemicals flowing through pipes to check that level are not too high / low</li> <li>• <b>pH (sensor)</b> ...</li> <li>• ... to measure the pH to make sure the acidity / alkalinity of the chemicals is correct</li> <li>• <b>Light (sensor)</b> ...</li> <li>• ... to measure the level of light to make sure it remains at a constant level for the chemical process</li> </ul>	<b>4</b>
12(b)	<p><b>Five</b> from:</p> <ul style="list-style-type: none"> <li>• Sensors send signals to microprocessor</li> <li>• Analogue signals are <u>converted to digital</u> (using ADC)</li> <li>• Microprocessor compares value to stored value ...</li> <li>• ... If out of range / matches stored values ...</li> <li>• ... signal sent to alert workers (e.g. sound alarm)</li> <li>• ... microprocessor send signal to cause an action to occur e.g. cool a process down, heat a process up, add a chemical</li> <li>• ... no action taken</li> <li>• Output/record readings</li> <li>• Monitoring is continuous</li> </ul>	<b>5</b>

Question	Answer	Marks
13(a)	<b>Two</b> from: <ul style="list-style-type: none"><li>• Smaller file to transmit</li><li>• The file is transmitted quicker</li><li>• Uses / requires less bandwidth</li></ul>	<b>2</b>
13(b)(i)	<ul style="list-style-type: none"><li>• Lossless (compression) ...</li><li>• ... It is important the code must be (exactly) the same as the original file</li><li>• ... If it does not match the original file it will not work</li></ul>	<b>3</b>
13(b)(ii)	<ul style="list-style-type: none"><li>• Lossy (compression) ...</li><li>• ... It would make the file smaller than lossless compression / the file would stream faster than lossless compression</li><li>• ... The quality of the video can be reduced but it can still be viewed</li></ul>	<b>3</b>



**Cambridge International Examinations**  
Cambridge International General Certificate of Secondary Education

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**COMPUTER SCIENCE**

**0478/11**

Paper 1

**October/November 2016**

MARK SCHEME

Maximum Mark: 75

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**Published**

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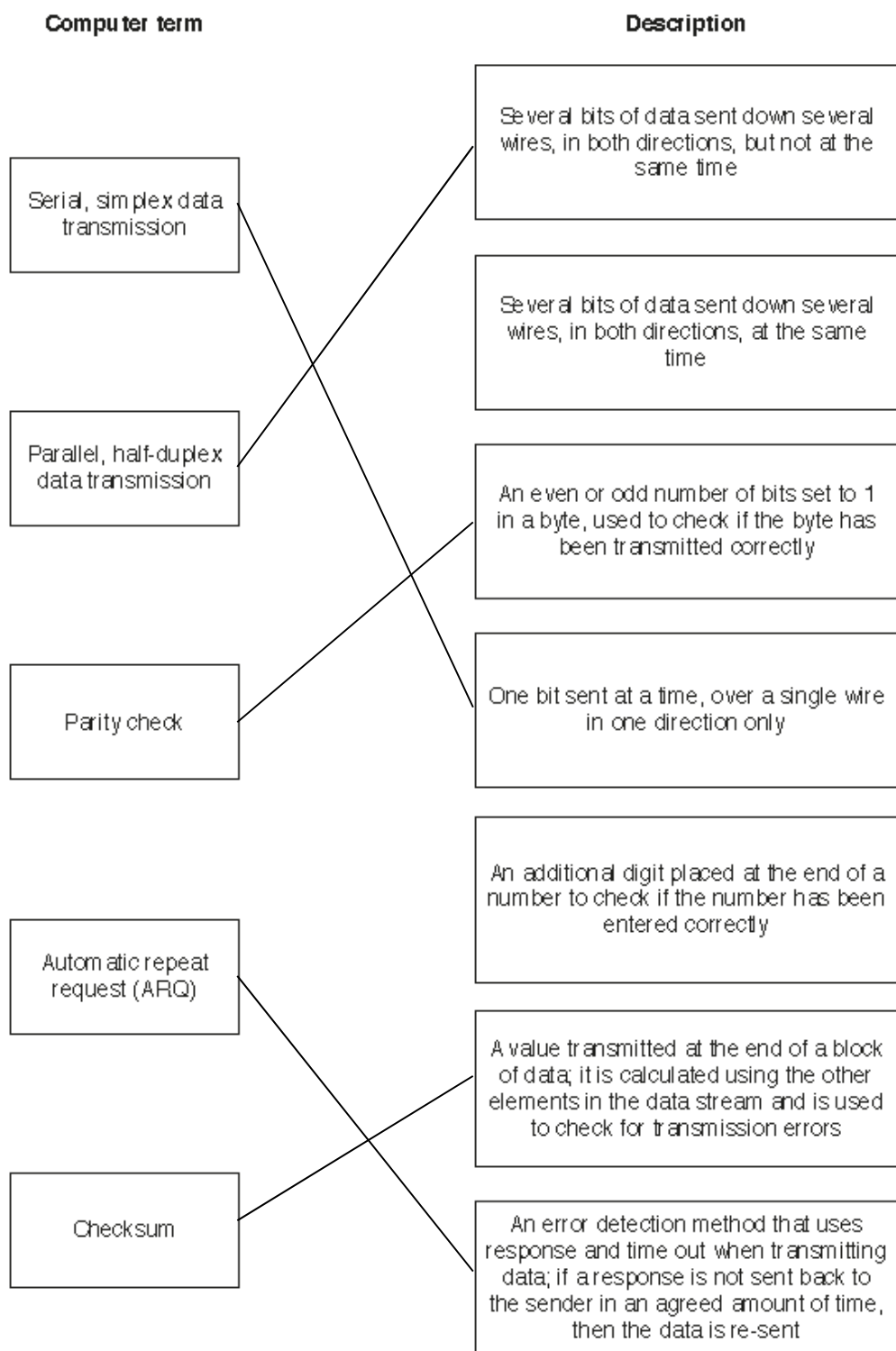
This document consists of **9** printed pages.



<b>Page 2</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
	<b>Cambridge IGCSE – October/November 2016</b>	<b>0478</b>	<b>11</b>

- 1** In any order:
- Fetch
  - Decode
  - Execute
- [3]
- 
- 2**
- Hacking
  - Virus
  - Cookies
  - Cracking
  - Pharming
- [5]

3



[5]

<b>Page 4</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
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**4 (a)** Any **two** from:

- Easy to make a mistake
- Can be slow if not trained
- Dirt/food can get into keys

[2]

**(b)** Any **two** with identification and explanation from:

- Fewer typing errors may be made ...
- ... because one button is pressed to order an item
- Speed up the time to enter an order ...
- ... because fewer buttons are pressed to complete the order
- May require less training ...
- ... because it is easier to identify an order item from its image rather than typing it
- Can stop dirt/food damage ...
- ... normally has a protective layer // because there are no keys for dirt/food to get into

[4]

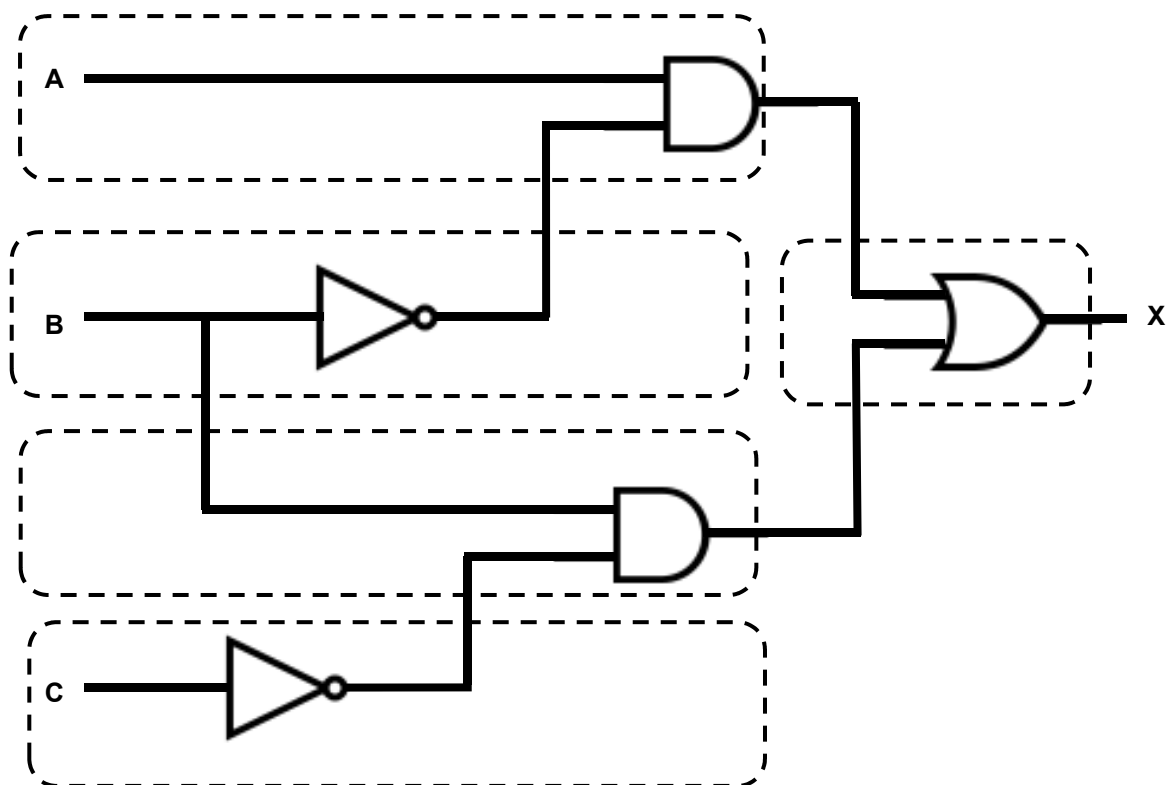
**(c)** 1 mark for security measure, 1 mark for description.

Any **two** from:

- Encryption
- If the data is accessed or stolen it will be meaningless
  
- Biometric device
- Can help prevents unauthorised access to the system (only award once)
  
- Firewall
- Can alert to show unauthorised access attempt on the system
- Can help prevent unauthorised access to the system (only award once)
- Can help protect against viruses and malware entering the system
  
- Anti-spyware
- Can stop the keys being logged that, when analysed, would reveal the password to the data

[4]

5 (a) 1 mark per correct section.



[5]

(b) 4 marks for 8 correct values  
 3 marks for 6 correct values  
 2 marks for 4 correct values  
 1 mark for 2 correct values

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

[4]

Page 6	Mark Scheme	Syllabus	Paper
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(c) Register Z [1]

(d) (i) (byte) 5 [1]

(ii) (column) 4 [1]

(iii) corrected byte is: **1 0 0 1 1 1 1 1** [1]

(iv) that gives the value: **1 5 9**  
(follow through applies) [1]

(v) Any **two** from:

- The byte would be transmitted without having 5 consecutive 1's
- The fault condition would not be recognised [2]

**6** Any **two** from:

High level language

- easier/faster to write code as uses English-like statements
- easier to modify as uses English-like statements
- easier to debug as uses English-like statements
- portable language code

Any **two** from:

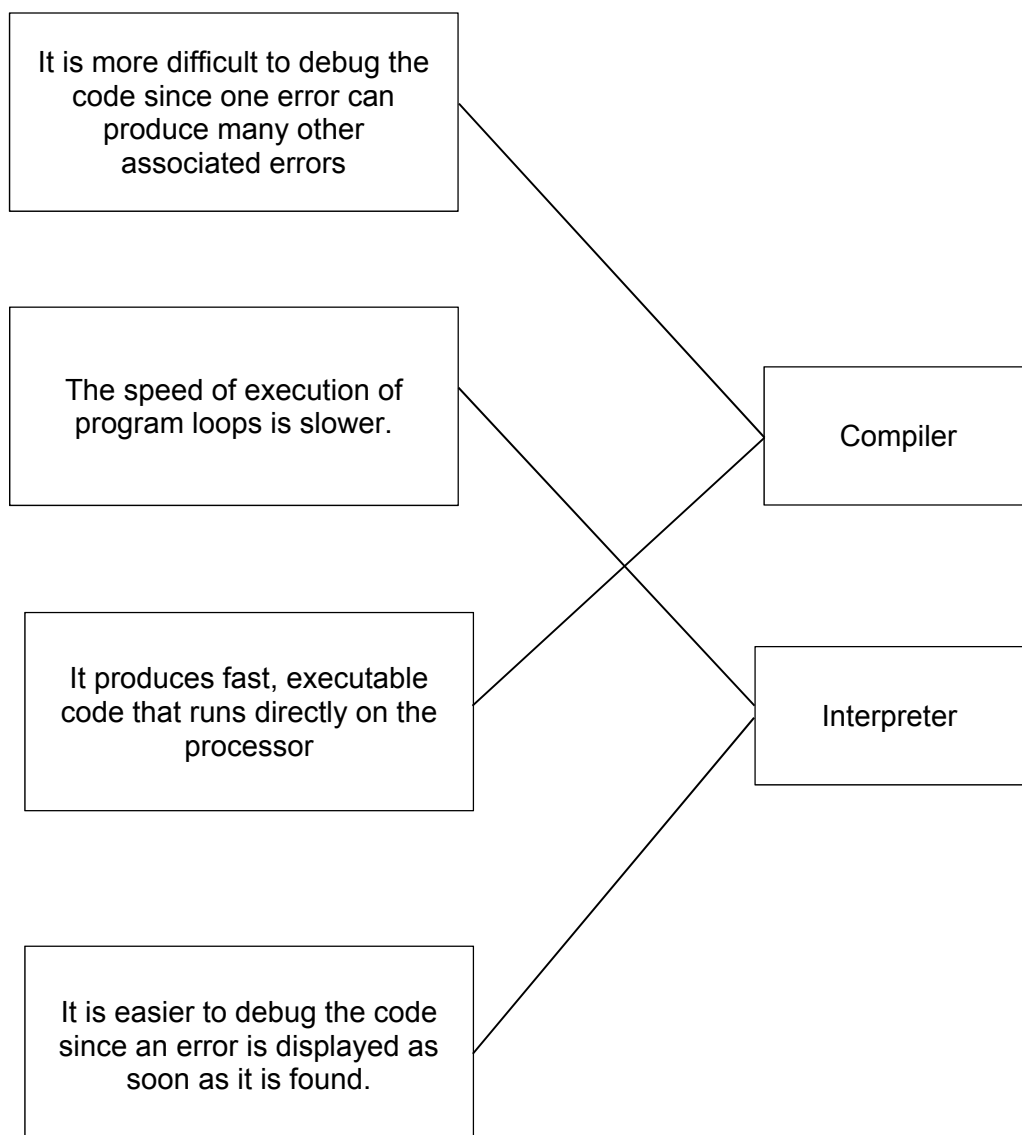
Low level language

- can work directly on memory locations
- can be executed faster
- translated program requires less memory [4]

**7** Any **four** from:

- reaches maximum brightness quickly
- colours are vivid
- good colour definition/contrast can be achieved
- screens can be thinner/thin
- more reliable as LED's are long lasting
- consume very little/less energy [4]

8



[4]

Page 8	Mark Scheme	Syllabus	Paper
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9 Any **six** from:

- infrared / motion / pressure (sensor) // sensor detects movement/pressure
- signals/data sent (continuously) to microprocessor
- converted from analogue to digital (using ADC)
- microprocessor compares value with those stored in memory
- if sensor value does not match the stored value(s) ...
- ... signal sent to switch on the light
- ... signal sent to keep the light on
- ... light remains on for a period of time (30 seconds)
- if sensor value matches the stored value(s) ...
- ... light will remain off
- ... will turn off after period of time (30 seconds)
- works in a continues loop

[6]

10 (a) (i) 2 marks for 3 correct binary conversions, 1 mark for 2 correct binary conversions

[2]

0	0	0	1	1	0	1	0	1	1	1	1
---	---	---	---	---	---	---	---	---	---	---	---

(ii) 1 mark for each correct hex value converted

**1 A F**

[3]

(b) 2 marks for working + 1 mark for correct answer

Working

- $1200 \times 8 = 9600$  (bytes)
- $9600/1024$  or  $9600/1000$

Answer

- 9.4 or 9.6 kilobytes

[3]

(c) Any **one** from:

MAC address

- Media Access Control (address)
- unique number that identifies a device (connected to the Internet)
- address is made up of manufacturer id + serial number of device
- address is allocated by the manufacturer

Any **one** from:

IP address

- Internet Protocol (address)
- location/address of a device on the Internet
- address is unique for given Internet session
- address is supplied when a device connects to the Internet
- address is allocated by the network

[2]

<b>Page 9</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
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- (d) – record (layer)  
– handshake (layer) [2]

**11** Any **six** from:

- Help stop the misuse of computers
- The use of computers needs to be governed
- Help keep users safer when using computers
- Provides rules for using computers
- Help stop intellectual property theft
- Helps prevent the misuse of personal information
- Reference to laws (relevant example)
- Reference to security issues (relevant example)

NOTE: Answer must refer to the importance of ethics and be more than a description of ethics. [6]





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**COMPUTER SCIENCE**

**0478/11**

Paper 1

**May/June 2016**

MARK SCHEME

Maximum Mark: 75

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**Published**

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<b>Page 2</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
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**1** 1 mark for each correct column

<b>Software feature</b>	<b>Free</b>	<b>Freeware</b>	<b>Shareware</b>
Software source code can be freely accessed and modified as required	✓		
All the features of the full version of the software are not made available; the full version needs to be purchased first			✓
The original software is subject to all of the copyright laws		✓	✓
It is possible to distribute modified versions or copies of the software to friends and family	✓		

(1 mark) (1 mark) (1 mark)

[3]

**2 (a) media access control**

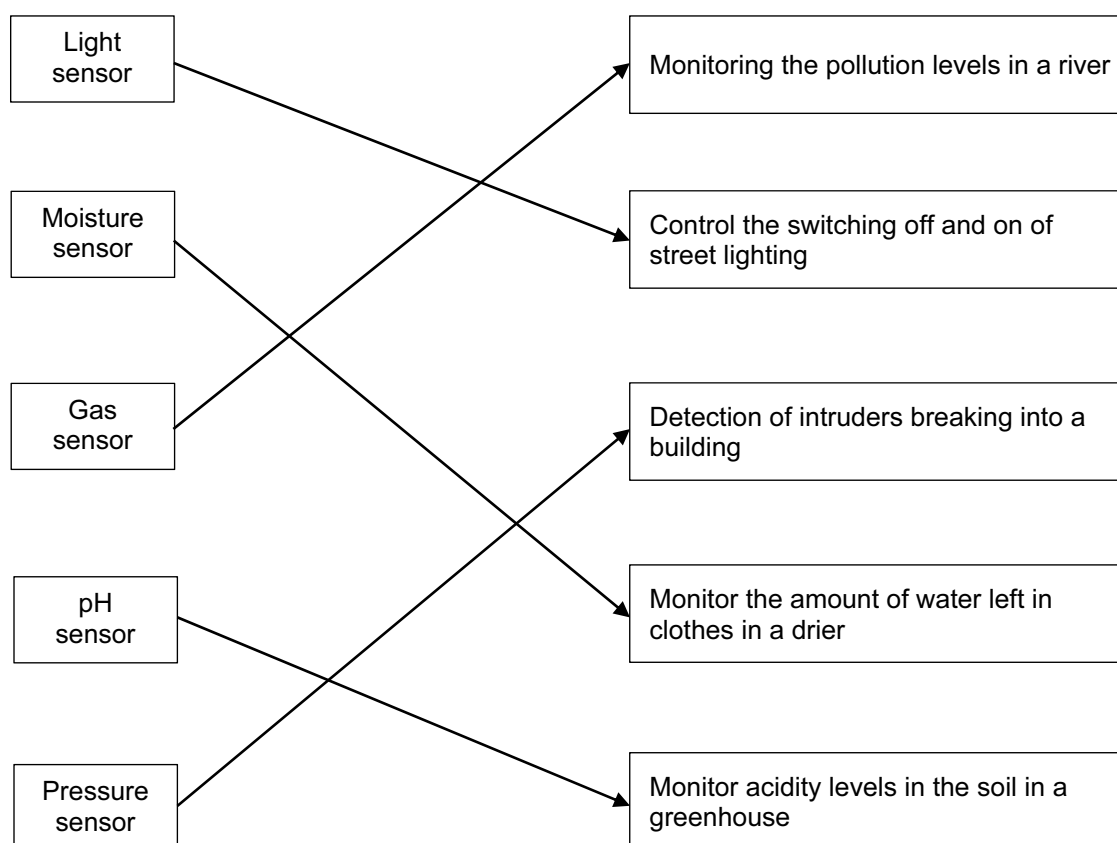
[1]

**(b)** Any **three** from:

- hardware/physical address
- unique address/number associated (with network card in) a device/computer
- usually 48/64 bits (12/16 hex digits)
- first 6/8 digits = manufacturer code/ID of device (NIC)
- last 6/8 digits = serial number of device (NIC)

[3]

**3 (a)**



4/5 matches – 4 marks  
 3 matches – 3 marks  
 2 matches – 2 marks  
 1 match – 1 mark

[4]

**(b)** Any **four** from:

- sensor(s) sends signal/data to microprocessor
- signal/data converted to digital (using an ADC)
- microprocessor compares signal/data with pre-set/stored value
- if sensor(s) signal/data indicates the presence of a person / the door needs to be opened / a match is found / door is closed ...
- ... microprocessor sends a signal to an actuator ...
- ... to operate/drive a motor to open the door

[4]

Page 4	Mark Scheme	Syllabus	Paper
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4 (a) (i) serial [1]

(ii) Any **three** from:

- automatically detects the hardware/installs drivers
- plug only goes in one way/can't connect incorrectly
- supports different data transmission speeds/a range of data transmission speeds
- has become the industry standard/universally used
- backwards compatible (with earlier versions of USB ports)

[3]

(iii) interrupt

[1]

(b) 1 mark each use of printer, max 1 mark per printer.

- inkjet printer
- (small quantities of) documents
  - photographs

- 3D printer
- (physical) prototype (from CAD)
  - (physical) model (from a blueprint)

[2]

(c) 1 mark for naming printer + 1 mark for description + 1 mark for application

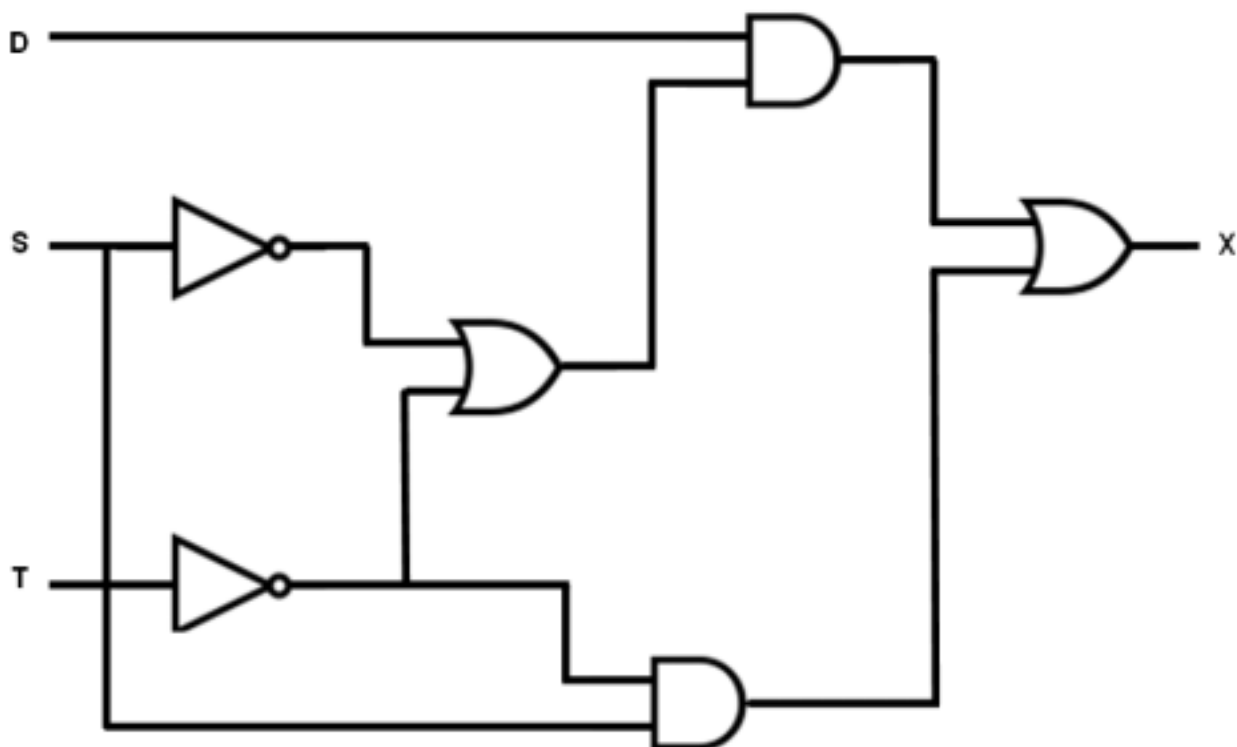
Laser printer

- uses toner/powder ink
- uses (positive and negative) charged drums // rotating drum
- uses static charge
- no moving head
- faster at printing
- high volume output/high speed
- producing flyers/leaflets/magazines

[3]

*This is an example, other types of printers can be credited.*

5 (a) 1 mark for each correct gate, with correct source of input(s)



[6]

(b)

D	S	T	Working Space	X
0	0	0		0
0	0	1		0
0	1	0		1
0	1	1		0
1	0	0		1
1	0	1		1
1	1	0		1
1	1	1		0

4 marks for 8 correct X bits

3 marks for 6 correct X bits

2 marks for 4 correct X bits

1 mark for 2 correct X bits

[4]

Page 6	Mark Scheme	Syllabus	Paper
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6 (a) Any **one** from:

- protocol ends in “s”
- use of https

[1]

(b) Any **three** from:

- requests web server to identify itself/view the (SSL) certificate
- receives a copy of the (SSL) certificate, sent from the webserver
- checks if SSL certificate is authentic/trustworthy
- sends signal back to webserver that the certificate is authentic/trustworthy
- starts to transmit data once connection is established as secure
- if website is not secure browser will display an open padlock/warning message

[3]

7 (a) 1 mark for each correct binary value

3	0	0	1	1
---	---	---	---	---

5	0	1	0	1
---	---	---	---	---

[2]

(b)

0	0	0	1	→	1	} 1 mark
1	0	0	1	→	9	
0	1	0	0	→	4	
1	1	1	0	→	E	} 1 mark

[2]

Page 7	Mark Scheme	Syllabus	Paper
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8 (a) (i) Any **two** from:

- to protect against key logging software/spyware
- can stop key presses being recorded
- can stop key presses being relayed
- drop down boxes cannot be recorded as key presses
- drop down boxes can be placed in different location on the screen each time (to overcome screen capture issues)

[2]

(ii) Any **one** from:

- hacker never finds all characters on the first hack
- makes it more difficult for hackers to find the order of the characters
- hacker needs to hack the system several times to gain the whole password
- shoulder surfing will not give person full password

[1]

(b) Any **two** from:

- fingerprint scanner
- face recognition software
- retina scanner/iris scanner
- voice recognition software

[2]

9 (a) 1 mark for correct check digit and 1 mark for showing the calculation

$$(4 \times 1) + (2 \times 2) + (4 \times 3) + (1 \times 4) + (5 \times 5) + (0 \times 6) + (8 \times 7)$$

$$= 4 + 4 + 12 + 4 + 25 + 0 + 56 = 105$$

$$105/11 = 9 \text{ remainder } 6$$

check digit is: **6**

1 mark for any correct line of working

[2]

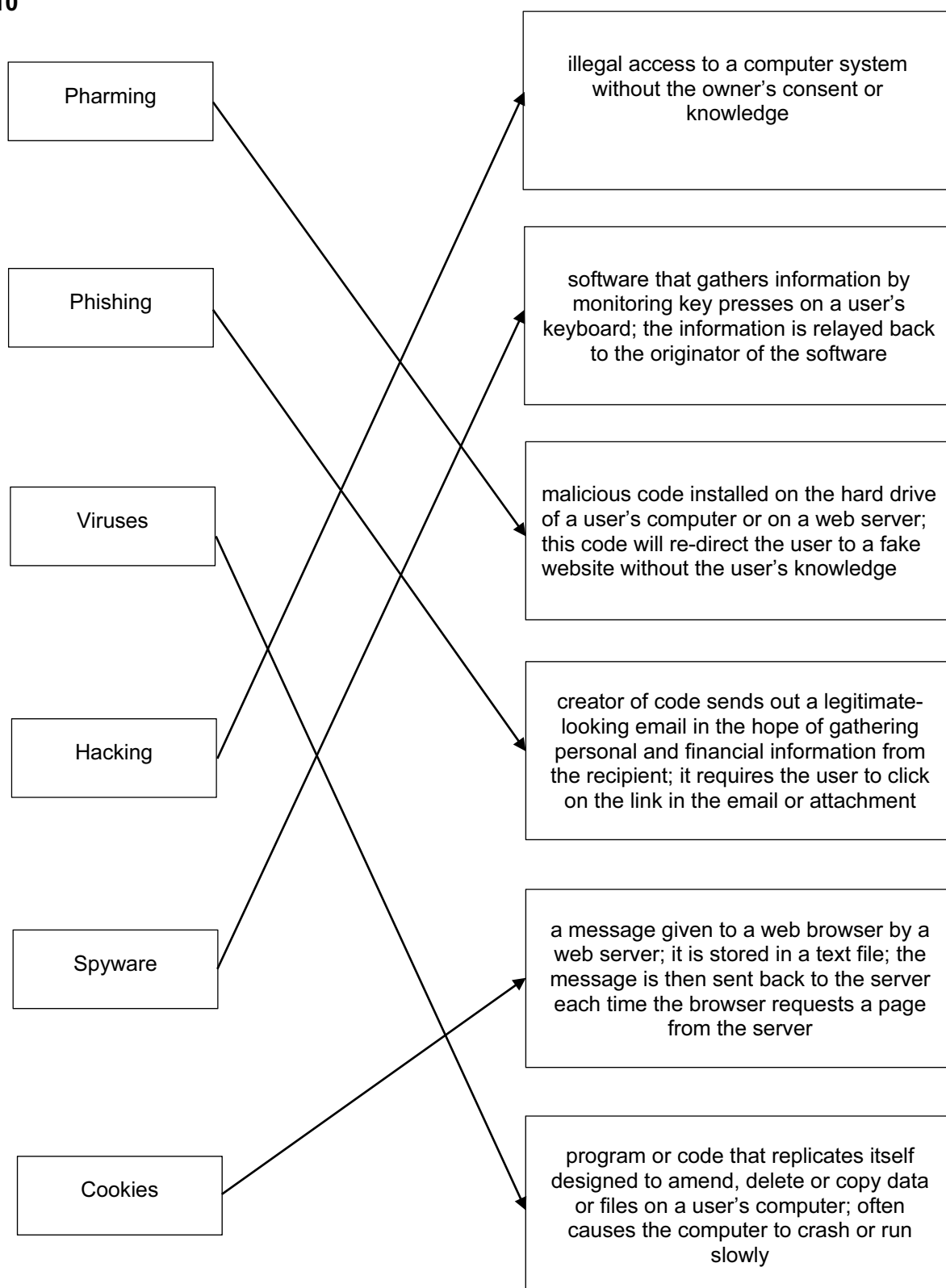
(b) **incorrect** check digit

[1]

- check digit should be 1
- $(3 \times 1) + (2 \times 2) + (4 \times 3) + (0 \times 4) + (0 \times 5) + (4 \times 6) + (5 \times 7) // 3 + 4 + 12 + 0 + 0 + 24 + 35 //$   
Total = 78
- 78/11 gives 7 remainder 1

[2]

10



5/6 matches – 5 marks  
 4 matches – 4 marks  
 3 matches – 3 marks  
 2 matches – 2 marks  
 1 match – 1 mark

[5]



Page 9	Mark Scheme	Syllabus	Paper
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11 (a) 1 mark for each correct row

	Single track	Many concentric tracks	Blue laser used to read/write data	Red laser used to read/write data	
DVD-RW	✓			✓	1 mark
DVD-RAM		✓		✓	1 mark
CD-ROM	✓			✓	1 mark
Blu-ray disc	✓		✓		1 mark

[4]

(b) (i) Any **three** from:

- don't need to "get up to speed" to work properly/no latency
- lower/less power consumption/more energy efficient
- run cooler
- run quieter
- data access is faster
- occupies less physical space/more compact
- lighter, so more suitable for a portable computer/laptop
- no moving parts so more reliable/durable in a portable computer/laptop

[3]

(ii) Any **two** from:

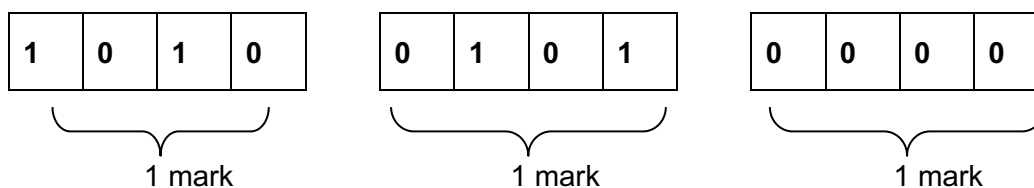
- HDD is cheaper for larger amounts of storage space
- HDD has greater longevity for read/write functions
- Expensive to change the technology // HDD are trusted technology
- No requirement for the increased speed of SSD

[2]

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12 (a) QR (quick response) Code [1]

(b) – A 5 0 (1 mark)



[4]

(c) Any **three** from:

- visitor scans the QR code with (the camera on) the mobile device
- App is used to read/interpret the QR code
- links to a website/opens a document ...
- ... to access local tourist information
- can store the QR code to refer to again for the information

[3]

# **CAMBRIDGE INTERNATIONAL EXAMINATIONS**

Cambridge International General Certificate of Secondary Education

## **MARK SCHEME for the October/November 2015 series**

### **0478 COMPUTER SCIENCE**

**0478/11**

Paper 1, maximum raw mark 75

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**1 (a)** 1 mark for each name of application + 1 mark for description of use

<b>Hardware item</b>	<b>Application and how the hardware item is used</b>
Barcode reader	Supermarket checkout <ul style="list-style-type: none"> <li>– read barcodes to find prices, description</li> <li>– allows automatic stock control</li> </ul> Library system <ul style="list-style-type: none"> <li>– can track books on loan</li> <li>– can link books to borrowers using barcoded cards</li> </ul> Airport checkouts <ul style="list-style-type: none"> <li>– barcodes on luggage to track whereabouts</li> </ul>
Microphone	Voice recognition system <ul style="list-style-type: none"> <li>– allows computer to recognise spoken words and use them as input to, e.g., a word processor</li> </ul> Multimedia presentations <ul style="list-style-type: none"> <li>– allows voice-overs on presentations</li> </ul> Video conferencing/VoIP <ul style="list-style-type: none"> <li>– allows users to speak to each other</li> </ul>
Touch screen	Mobile telephone/tablet <ul style="list-style-type: none"> <li>– allows user to select apps/icons</li> <li>– easy method to input data</li> </ul> Ticket/information kiosk <ul style="list-style-type: none"> <li>– limits the options available for ease of use</li> </ul>
Infrared sensor	Burglar/intruder detection system <ul style="list-style-type: none"> <li>– detects presence of a person by breaking beam/change of temperature</li> </ul> Automatic doors <ul style="list-style-type: none"> <li>– breaking i/r beam allows detection of person approaching door</li> </ul> Counting, e.g. people/cars <ul style="list-style-type: none"> <li>– every time beam is broken it can automatically send data and allow automatic counting</li> </ul>

[8]

<b>Page 3</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
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**(b)** Any **two** from:

- Blu-ray discs use blue/violet lasers rather than red lasers as used by DVDs
- storage capacity of Blu-ray discs is much higher than standard DVDs
- Blu-ray discs use one polycarbonate layer; DVDs use two layers
- Blu-ray discs have a built-in secure encryption system

[2]

**(c)** Any **two** from:

- DVD has one spiral track; DVD-RAM has several concentric tracks
- DVD-RAM can be written to and read from at the same time; DVD-R only allows the read operation to occur
- DVD-R only allows data to be read (can't write to it) whereas DVD-RAM allows reading and writing operation

[2]

**2 (a)** 1 0 1 1 0 1 0 1

F 6

[2]

**(b)** Any **two** from:

- HTML
- MAC address
- used in assembly language/machine code
- debugging (displays bytes in hex when using memory dumps)

[2]

- (c)** – Can represent 16 bit words as only 4 hexadecimal digits
- It is easy to convert hex digits back to binary if necessary

[2]

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**3 (a)**

<b>Statement</b>	<b>True</b>	<b>False</b>
Cookies can destroy or modify data in a computer without the user's knowledge		✓
Cookies generate website pop-ups		✓
Cookies allow a website to detect whether a viewer has viewed specific web pages	✓	

[3]

**(b) Registers**

Any **two** from:

- PC (Program Counter)
- MAR (Memory Address Register)
- MDR (Memory Data Register)
- CIR or IR ((Current) Instruction Register)
- ACC (Accumulator)

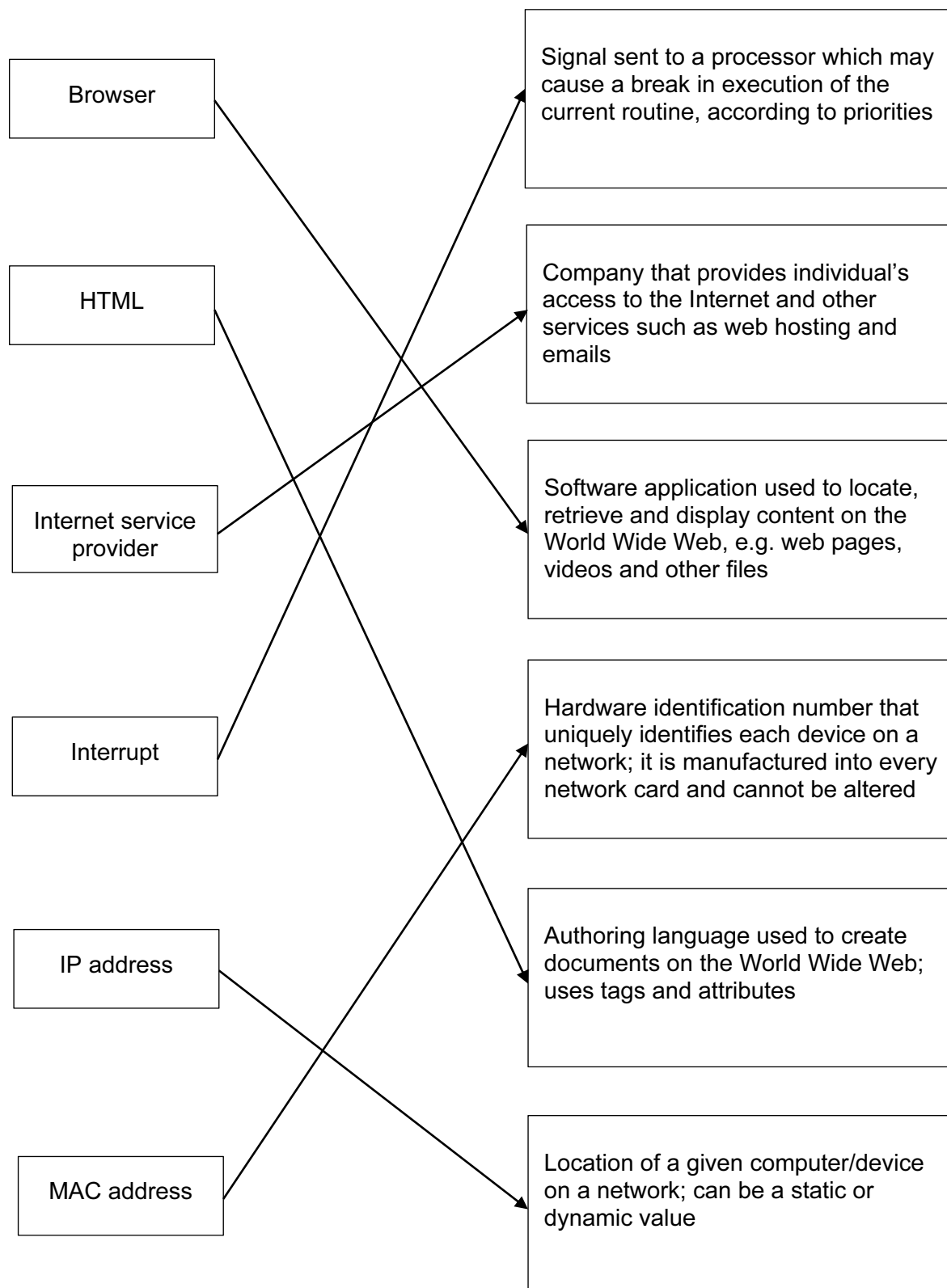
Buses

Any **two** from:

- control
- data
- address

[4]

4



[5]

<b>Page 6</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
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**5 (a) (i)** Inkjet printer

Any **four** from:

- uses cartridges/liquid ink
- makes use of thermal bubble/piezoelectric technology
- sprays ink in droplets on the paper
- uses a moving print head
- suitable for low volume (high quality) output, e.g. a photo

[4]

**(ii)** Laser printer

Any **four** from:

- uses powdered ink/toner cartridges
- uses a (charged) printing drum
- makes use of static electricity charges
- uses a fuser to fix/melt ink onto the paper
- uses a discharge lamp to remove static charge from the drum
- useful for high volume (high quality) output, e.g. leaflets

[4]

**(b)** Any **three** from:

- produces solid, 3D objects/prototypes
- used in CAD/CAM
- makes use of tomography/slices of an object
- solid built up in thin layers
- uses resin, powdered metal, paper, plastic...

[3]

**6 (a)** Any **one** from:

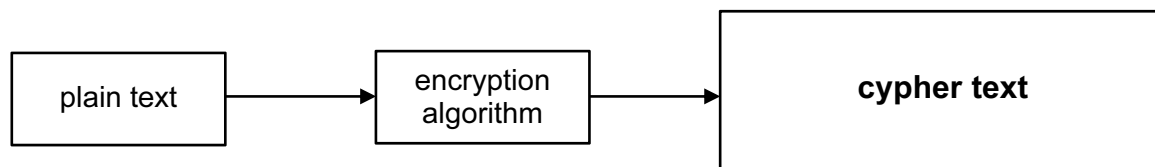
- jumbling up/scrambling characters so that message makes no sense
- requires an encryption key to encrypt data
- need decryption key to decipher encrypted message

[1]

**(b)** Uses the same key to encrypt and decrypt message

[1]

**(c)** 1 mark for correct name in box



[1]



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- 7 (a) Lossy
- when decompressed, some detail is lost and file is not exactly like the original (but difference is usually not noticeable)

Lossless

- when decompressed the original file is restored with no loss of data

[2]

- (b) 1 mark for type of file + 1 mark for description  
e.g:

- JPG
- Used to store images/pictures
- MP3
- Used to store audio/sound files

[2]

- (c) Any **three** from:

- company calculation is based on 1 GByte = 1000 MByte
- so  $(500 \times 1000)/8 = 62\,500$  files
- customer calculation based on 1 GByte = 1024 MByte
- so  $(500 \times 1024)/8 = 64\,000$  files
- giving the difference of 1500 files

[3]

- 8 Any **three** from:

- provides a user interface
- input/output control/handling
- security
- (handling) interrupts
- spooling
- memory management
- processor management
- utilities (e.g. copy, save, delete, rename, etc.)
- maintain user accounts
- load/run software
- error reporting/handling
- multiprogramming
- batch processing/JCL
- multitasking

[3]

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- 9 (a) Any **one** from:
- verification is being described
  - validation is when data follows a set of rules, e.g. length/range/type check
- [1]

- (b) Any **one** from:
- send as JPEG files
  - carry out a file compression first
- [1]

10 (a)

w	w	w	.	c	i	e	.	o	r	g	.	u	k
%77	%77	%77	%2E	%63	%69	%65	%2E	%6F	%72	%67	%2E	%75	%6B

[3]

(b)

%77	%77	%77	%2E	%72	%6F	%63	%6B	%69	%63	%74	%2E	%63	%6F	%6D
W	W	W	.	r	o	c	k	i	c	t	.	c	o	m

[3]

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**11** 1 mark for each input device + 1 mark for correct MATCHING reason for each device

### Input Devices

- Barcode scanner
- ... to scan the barcode on boarding pass/mobile phone screen
- keyboard
- ... to key in data in case barcode fails to scan
- (electronic) scales
- ... weigh luggage at check-in

1 mark for each output device + 1 mark for correct MATCHING reason for each device

### Output Devices

- beeper/speaker
- ... confirm barcode read/indicate error if barcode not read
- (LCD) screen
- ... select options (e.g. airline) at check-in
- printer
- ... produce bag labels

[4]

**12 (a)**

<b>1</b>	1	1	1	1	0	0	0
<b>0</b>	0	0	0	0	1	1	1

[2]

**(b)** 1 mark for error detection method and 1 mark for description

- Check sum
- ... sum of bits is transmitted and checked against the sum of the received bits
- Check digit
- ... a digit that is calculated (e.g. using modulo-11) and transmitted with the data
- ARQ
- ... when an error is detected in a packet of data a request is automatically sent for the data to be resent

[2]

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- 13 (a)** Firewall [1]
- (b)** Shareware [1]
- (c)** SSL (secure socket layer) (accept HTTPS and TLS) [1]
- (d)** MIDI [1]
- (e)** Microphone [1]

# **CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**Cambridge International General Certificate of Secondary Education**

## **MARK SCHEME for the May/June 2015 series**

### **0478 COMPUTER SCIENCE**

**0478/11**

Paper 1 (Written), maximum raw mark 75

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.

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**1 (a) parallel**

any **one** from:

- 8 bits/1 byte/multiple bits sent at a time
  - using many/multiple/8 wires/lines
- (1 mark)

**serial**

any **one** from:

- one bit sent at a time
  - over a single wire
- (1 mark) [2]

**(b) parallel**

- faster rate of data transmission
- (1 mark)

**serial**

any **one** from:

- more accurate/fewer errors over a longer distance
  - less expensive wiring
  - less chance of data being skewed/out of synchronisation/order
- (1 mark) [2]

**(c) parallel**

any **one** from:

- sending data from a computer to a printer
  - internal data transfer (buses)
- (1 mark)

**serial**

- connect computer to a modem
- (1 mark) [2]

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- 2 (a) – universal serial bus  
– description of USB [1]

(b) Any **two** from:

- devices are automatically detected and configured when initially attached
- impossible to connect device incorrectly/connector only fits one way
- has become the industry standard
- supports multiple data transmission speeds
- lots of support base for USB software developers
- supported by many operating systems
- backward compatible
- faster transmission compared to wireless

[2]

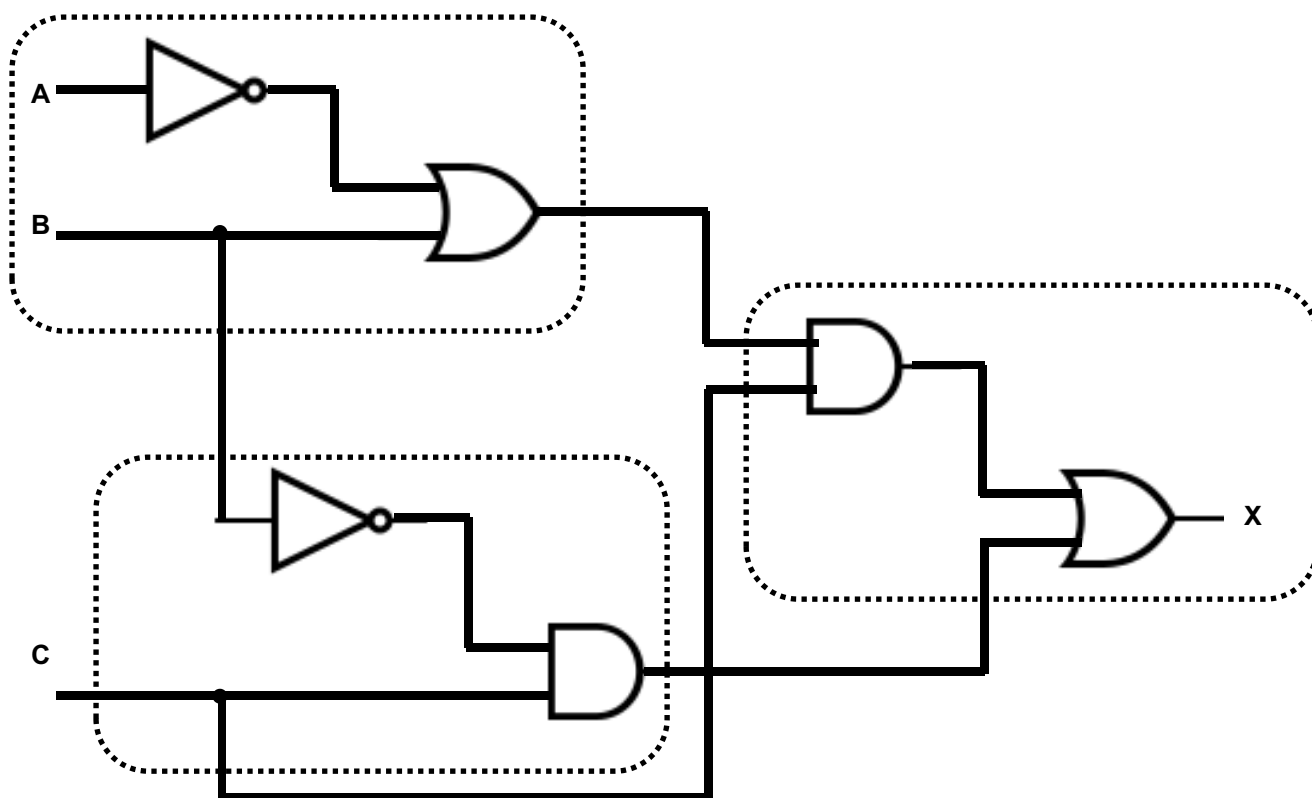
3 (a)

A	B	C	Working	X	
0	0	0		1	] 1 mark
0	0	1		0	
0	1	0		0	] 1 mark
0	1	1		0	
1	0	0		0	] 1 mark
1	0	1		1	
1	1	0		1	] 1 mark
1	1	1		1	

[4]

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(b) 1 mark per dotted section



[3]

(c) X is 1 if:

(A is 1 OR B is 1)

(1 mark)

AND

(1 mark)

(B is 1 OR C is NOT 1)

(1 mark)

accept equivalent ways of writing this:

e.g.  $(A \text{ OR } B = 1) \text{ AND } (B \text{ OR NOT } C = 1)$

e.g.  $(A \text{ OR } B) \text{ AND } (B \text{ OR NOT } C)$

e.g.  $(A + B) (B + \bar{C})$

[3]



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4 1 mark per correct word

- |   |                        |   |                                       |
|---|------------------------|---|---------------------------------------|
| 1 | <u>protocol</u>        | } | accept these three items in any order |
| 2 | <u>web server name</u> |   |                                       |
| 3 | <u>file name</u>       |   |                                       |
- HTML tags/text
- firewall
- proxy server

[6]

5 1 mark per device, 1 mark per category

Description of storage device	Name of storage device	Category of storage		
		Primary	Secondary	Off-line
optical media which uses one spiral track; red lasers are used to read and write data on the media surface; makes use of dual-layering technology to increase the storage capacity	<b>DVD</b>			✓
non-volatile memory chip; contents of the chip cannot be altered; it is often used to store the start-up routines in a computer (e.g. the BIOS)	<b>ROM</b>	✓		
optical media which uses concentric tracks to store the data; this allows read and write operations to be carried out at the same time	<b>DVD-RAM</b>	✓		(✓)
non-volatile memory device that uses NAND flash memories (which consist of millions of transistors wired in series on single circuit boards)	<b>Solid State Drive/memory (SSD)</b>		✓	
	<b>(SD/XD card) (USB storage device)</b>			(✓)
optical media that uses blue laser technology to read and write data on the media surface; it uses a single 1.1 mm polycarbonate disc	<b>Blue-ray</b>			✓

[10]

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**6 (a) virus**

any **two** from:

- program/software that replicates/copies itself
- can delete or alter files/data stored on a computer
- can make the computer “crash”/run slow

**pharming**

any **two** from:

- malicious code/software installed on a user’s hard drive/actual web server
- this code redirects user to a fake website (without their knowledge)
- to obtain personal/financial information/data

**phishing**

any **two** from:

- legitimate-looking emails sent to a user
- as soon as recipient opens/clicks on link in the email/attachment ...
- ... the user is directed to a fake website (without their knowledge)
- To obtain personal/financial information/data

[6]

**(b) (i) Any two from:**

- spyware/key logging software can only pick up key presses
- using mouse/touchscreen means no key presses to log
- the numbers on the key pad are in random/non-standard format, which makes it more difficult to interpret

[2]

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(ii) 1 mark for name and 1 mark for description

any **one** from:

chip and PIN reader

- only the user and the bank know which codes can be generated

request user name

- additional security together with password/PIN

anti-virus

- removes/warns of a potential virus threat which can't be passed on to customers

firewall

- (helps) to protect bank computers from virus threats and hacking

encryption

- protects customer data by making any hacked information unreadable

security protocol

- governs the secure transmission of data

Biometric

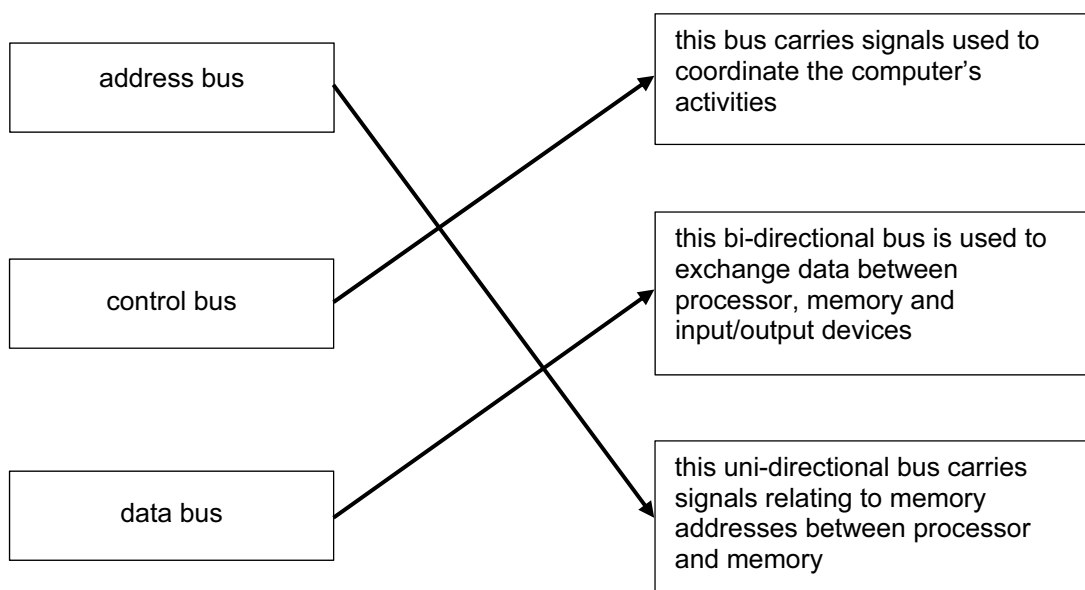
- to recognise user through the use of, e.g. facial/retina/finger print

Alerts

- users IP/MAC address is registered and user is alerted through, e.g. SMS if account is accessed through an unregistered address

[2]

7 (a)



2/3 matches – 2 marks

1 match – 1 mark

[2]

(b)

description of stage	sequence number
the instruction is then copied from the memory location contained in the MAR (memory address register) and is placed in the MDR (memory data register)	3
the instruction is finally decoded and is then executed	7
<i>the PC (program counter) contains the address of the next instruction to be fetched</i>	(1)
the entire instruction is then copied from the MDR (memory data register) and placed in the CIR (current instruction register)	4
the address contained in the PC (program counter) is copied to the MAR (memory address register) via the address bus	2
the address part of the instruction is placed in the MAR (memory address register)	6
the value in the PC (program counter) is then incremented so that it points to the next instruction to be fetched	5*

The incrementation of the program counter can appear at any stage after 2. All other stages must be in the correct given order.

[6]

8 (a) hours: 18

minutes: 53

[2]

(b)

hours ("C")									minutes ("D")							
0	0	0	0	0	1	1	1	:	0	0	0	1	1	1	1	0

[2]

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(c) Any **three** from:

- reads values in registers “C” and “D”
- and checks the values against those stored in registers “A” and “B”  
(**NOTE:** the first two statements can be interchanged, i.e. “A” and “B” read first)
- If values in corresponding registers are the same
- the microprocessor sends a signal to sound alarm/ring

[3]

(d) Any **three** from:

- uses a light sensor
- sends signal/data back to microprocessor
- signal/data converted to digital (using ADC)
- value compared by microprocessor with pre-set/stored value
- if value < stored value, signal sent by microprocessor ...
- ... to the voltage supply (unit)
- ... “value” of signal determines voltage supplied/brightness of LED

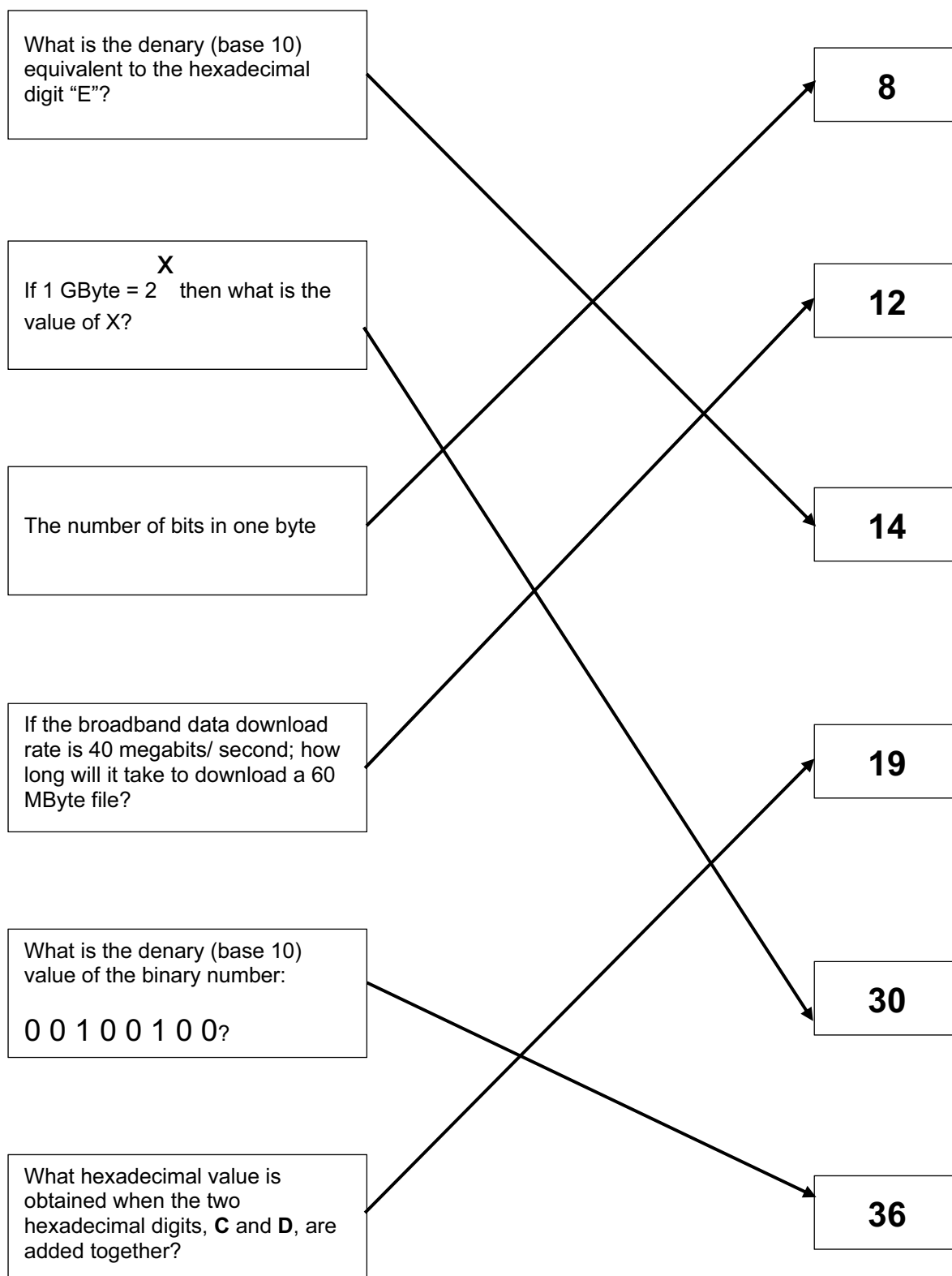
[3]

(e) Any **two** from:

- no need to warm up
- whiter tint/more vivid colours/brighter image
- higher resolution
- much thinner monitors possible/lighter weight
- more reliable technology/longer lasting
- uses much less power/more efficient

[2]

9



5/6 matches – 5 marks  
 4 matches – 4 marks  
 3 matches – 3 marks  
 2 matches – 2 marks  
 1 match – 1 mark

[5]

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**10** 1 mark per correctly placed tick

<b>statement</b>	<b>interpreter</b>	<b>compiler</b>
takes one statement at a time and executes it	✓	
generates an error report at the end of translation of the whole program		✓
stops the translation process as soon as the first error is encountered	✓	
slow speed of execution of program loops	✓	
translates the entire program in one go		✓

[5]