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**COMPUTER SCIENCE**

**0478/13**

Paper 1

**October/November 2019**

MARK SCHEME

Maximum Mark: 75

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**Published**

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

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

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

Cambridge International is publishing the mark schemes for the October/November 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

**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.

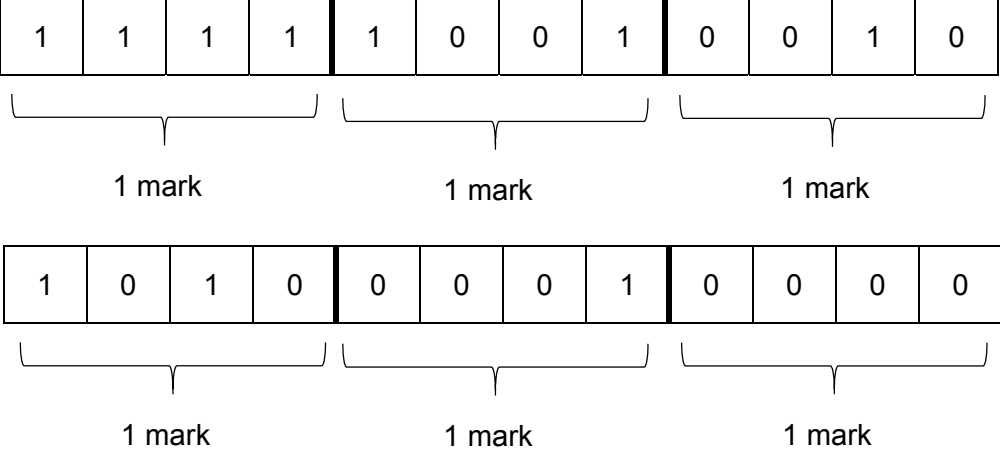
**GENERIC MARKING PRINCIPLE 5:**

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)(i)	<b>Two</b> from: <ul style="list-style-type: none"> <li>• 2D scanner</li> <li>• Touchscreen</li> <li>• Keypad/keyboard</li> <li>• Card reader</li> <li>• Mouse</li> <li>• Digital camera</li> </ul>	<b>2</b>
1(a)(ii)	<b>Two</b> from: <ul style="list-style-type: none"> <li>• HDD</li> <li>• SSD</li> <li>• USB flash memory drive</li> <li>• SD card</li> <li>• Any optical</li> </ul>	<b>2</b>
1(a)(iii)	<b>Two</b> from: <ul style="list-style-type: none"> <li>• Monitor/Touch screen</li> <li>• Speaker</li> <li>• Printer</li> <li>• LED // Light</li> </ul>	<b>2</b>
1(b)(i)	<ul style="list-style-type: none"> <li>• Increase the length of the key // make key 12-bit, etc.</li> </ul>	<b>1</b>
1(b)(ii)	<ul style="list-style-type: none"> <li>• Cypher text</li> </ul>	<b>1</b>

Question	Answer	Marks
1(b)(iii)	<p><b>Six</b> from:</p> <ul style="list-style-type: none"> <li>• The system could use <u>odd</u> or <u>even</u> parity</li> <li>• A parity bit is added</li> <li>• The data is checked to see if it has incorrect/correct parity // by example</li>   <li>• If parity is correct no error is found</li> <li>• An acknowledgement is sent that data is received correctly</li> <li>• The next packet of data is transmitted</li>   <li>• If incorrect parity is found an error has occurred</li> <li>• A signal is sent back to request the data is resent</li> <li>• The data is resent until data is received correctly/timeout occurs</li> </ul>	<b>6</b>
1(c)(i)	 <p>The diagram shows two rows of data packets, each consisting of 12 bits. The bits are grouped into three 4-bit segments by vertical bars. Brackets below each segment indicate that each segment is worth 1 mark.</p> <p>Row 1: 1 1 1 1   1 0 0 1   0 0 1 0</p> <p>Row 2: 1 0 1 0   0 0 0 1   0 0 0 0</p>	<b>6</b>

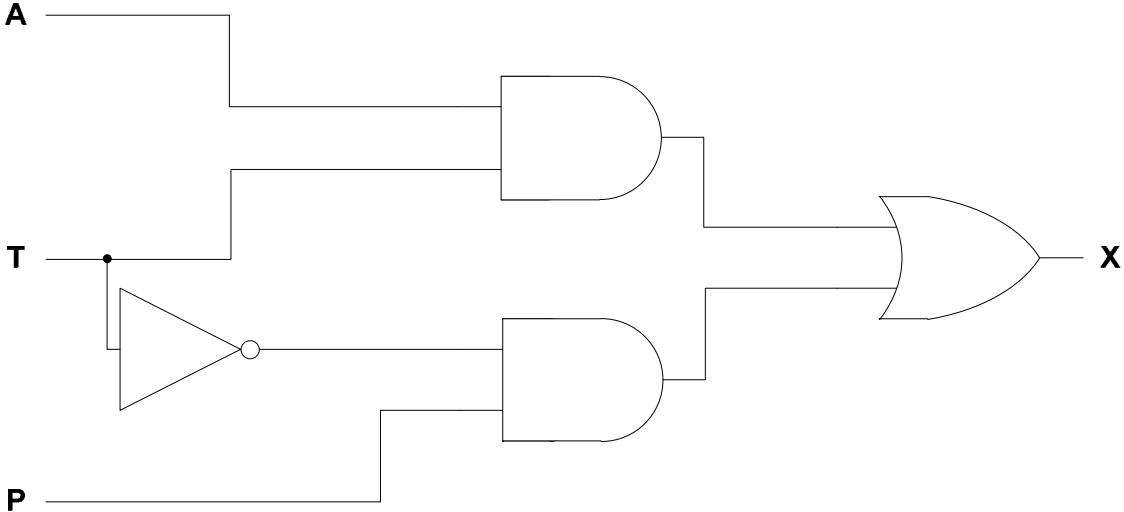
Question	Answer	Marks
1(c)(ii)	<p><b>One</b> mark for identification:</p> <ul style="list-style-type: none"> <li>• Compression</li> </ul> <p><b>Three</b> from e.g.:</p> <ul style="list-style-type: none"> <li>• Best compression would be lossy</li> <li>• Use compression algorithm</li> <li>• This would remove all the unnecessary data from the file // removes detail/sound that the human eye/ear may not see/hear</li> <li>• Reduce colour palette ...</li> <li>• ... so each pixel requires fewer bits</li> <li>• Reduce resolution</li> <li>• Only store what changes between frames // temporal redundancy</li> </ul>	<b>4</b>
1(d)	<p><b>Five</b> from:</p> <ul style="list-style-type: none"> <li>• The display is made up of pixels ...</li> <li>• ... that are arranged together as a matrix</li> <li>• Each pixel has three filters, red, blue and green</li> <li>• Shades of colour are achieved by mixing red, blue and green</li> <li>• The screen is backlit</li> <li>• Light is shone through the liquid crystals</li> <li>• The liquid crystals can be made to turn solid or transparent/on or off ...</li> <li>• ... by changing the shape of the crystal</li> </ul>	<b>5</b>

Question	Answer			Marks
2(a)	<b>One</b> mark for each correct row			<b>4</b>
	<b>Statement</b>	<b>True (✓)</b>	<b>False (✓)</b>	
	High-level languages need to be translated into machine code to run on a computer	✓		
	High-level languages are written using mnemonic codes		✓	
	High-level languages are specific to the computer's hardware		✓	
	High-level languages are portable languages	✓		

Question	Answer	Marks								
2(b)	<p><b>One mark for the correct tick</b></p> <table border="1" data-bbox="286 316 1023 943"> <thead> <tr> <th data-bbox="286 316 887 416">Example program</th> <th data-bbox="887 316 1023 416">Tick (✓)</th> </tr> </thead> <tbody> <tr> <td data-bbox="286 416 887 517"> <pre>1011100000110000 0000011011100010</pre> </td> <td data-bbox="887 416 1023 517"></td> </tr> <tr> <td data-bbox="286 517 887 711"> <pre>INP STA ONE INP STA TWO ADD ONE</pre> </td> <td data-bbox="887 517 1023 711"></td> </tr> <tr> <td data-bbox="286 711 887 943"> <pre>a = input() b = input() if a == b:     print("Correct") else:     print("Incorrect")</pre> </td> <td data-bbox="887 711 1023 943">✓</td> </tr> </tbody> </table>	Example program	Tick (✓)	<pre>1011100000110000 0000011011100010</pre>		<pre>INP STA ONE INP STA TWO ADD ONE</pre>		<pre>a = input() b = input() if a == b:     print("Correct") else:     print("Incorrect")</pre>	✓	1
Example program	Tick (✓)									
<pre>1011100000110000 0000011011100010</pre>										
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<pre>a = input() b = input() if a == b:     print("Correct") else:     print("Incorrect")</pre>	✓									

Question	Answer	Marks
3	<p><b>One mark for each correct term in the correct order</b></p> <ul style="list-style-type: none"> <li>• Serial</li> <li>• Parallel</li> <li>• Serial</li> <li>• Simplex</li> <li>• Parallel</li> </ul>	5



Question	Answer	Marks
4(a)	<p data-bbox="286 252 1032 284"><b>One</b> mark for each correct logic gate with correct input(s)</p>  <p>The diagram shows a logic circuit with three inputs: A, T, and P. Input A is connected to the top input of an AND gate. Input T is connected to the top input of another AND gate and also passes through an inverter before being connected to the bottom input of the same AND gate. Input P is connected to the bottom input of a third AND gate. The outputs of the two AND gates that take input T are connected to the two inputs of an OR gate. The output of the OR gate is labeled X.</p>	4

Question	Answer	Marks																																													
4(b)	<p><b>Four</b> mark for 8 correct outputs  <b>Three</b> marks for 6 or 7 correct outputs  <b>Two</b> mark for 4 or 5 correct outputs  <b>One</b> mark for 2 or 3 correct outputs</p> <table border="1" data-bbox="286 427 1326 1018"> <thead> <tr> <th>A</th> <th>T</th> <th>P</th> <th>Working space</th> <th>X</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>0</td><td></td><td>0</td></tr> <tr><td>0</td><td>0</td><td>1</td><td></td><td>1</td></tr> <tr><td>0</td><td>1</td><td>0</td><td></td><td>0</td></tr> <tr><td>0</td><td>1</td><td>1</td><td></td><td>0</td></tr> <tr><td>1</td><td>0</td><td>0</td><td></td><td>0</td></tr> <tr><td>1</td><td>0</td><td>1</td><td></td><td>1</td></tr> <tr><td>1</td><td>1</td><td>0</td><td></td><td>1</td></tr> <tr><td>1</td><td>1</td><td>1</td><td></td><td>1</td></tr> </tbody> </table>	A	T	P	Working space	X	0	0	0		0	0	0	1		1	0	1	0		0	0	1	1		0	1	0	0		0	1	0	1		1	1	1	0		1	1	1	1		1	4
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4(c)	<p><b>Six</b> from:</p> <ul style="list-style-type: none"> <li>• Sensor sends a signal/reading/data to the microprocessor</li> <li>• Signal/reading/data is analogue and is converted to digital using ADC</li> <li>• Reading/data is stored in the system</li> <li>• Microprocessor compares data/reading to the pre-set value of 7</li> <li>• If value is greater than 7 ...</li> <li>• ... a signal/data is sent by the microprocessor to display a warning message on a monitor</li> <li>• The process is continuous</li> </ul>	6																																													

Question	Answer	Marks																											
5	<p><b>One mark for each correct parity bit</b></p> <p style="text-align: center;"><b>Parity bit</b></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 5px;"><b>Register A</b></td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">1</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">1</td> <td style="padding: 5px;">1</td> </tr> <tr> <td style="padding: 5px;"><b>Register B</b></td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">1</td> <td style="padding: 5px;">1</td> <td style="padding: 5px;">1</td> </tr> <tr> <td style="padding: 5px;"><b>Register C</b></td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">1</td> <td style="padding: 5px;">1</td> </tr> </table>	<b>Register A</b>	0	0	1	0	0	0	1	1	<b>Register B</b>	0	0	0	0	0	1	1	1	<b>Register C</b>	0	0	0	0	0	0	1	1	<b>3</b>
<b>Register A</b>	0	0	1	0	0	0	1	1																					
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<b>Register C</b>	0	0	0	0	0	0	1	1																					

Question	Answer	Marks
6(a)	• Free software	<b>1</b>
6(b)	• Freeware	<b>1</b>
6(c)	• Shareware	<b>1</b>
6(d)	• Plagiarism // Intellectual property theft	<b>1</b>
6(e)	• Copyright	<b>1</b>

Question	Answer	Marks
7(a)(i)	<b>Three</b> from: <ul style="list-style-type: none"> <li>• RAM</li> <li>• Primary memory</li> <li>• Volatile memory</li> <li>• Holds currently in use data/instructions</li> <li>• Directly accessed by the CPU</li> </ul>	<b>3</b>
7(a)(ii)	<b>Two</b> from: <ul style="list-style-type: none"> <li>• Arithmetic and logic unit (ALU)</li> <li>• Memory address register (MAR)</li> <li>• Memory data register (MDR) // Memory buffer register (MBR)</li> <li>• Accumulator (ACC)</li> <li>• Immediate Access Store (IAS)</li> <li>• Control Unit (CU)</li> <li>• Program counter (PC)</li> <li>• Current instruction register (CIR)</li> <li>• Address bus</li> <li>• Data bus</li> <li>• Control bus</li> <li>• Input device</li> <li>• Output device</li> <li>• Secondary storage device</li> </ul>	<b>2</b>

Question	Answer			Marks	
7(b)	<b>One</b> mark for each correct row			<b>5</b>	
<b>Statement</b>			<b>True (✓)</b>		<b>False (✓)</b>
Interrupts can be hardware based or software based			✓		
Interrupts are handled by the operating system			✓		
Interrupts allow a computer to multitask			✓		
Interrupts work out which program to give priority to					✓
Interrupts are vital to a computer and it cannot function without them			✓		

Question	Answer	Marks
8	<p><b>Four</b> from:</p> <ul style="list-style-type: none"> <li>• A hacker could have hacked the network ...</li> <li>• ... and downloaded the malware onto the network</li>   <li>• Clicking a link/attachment/downloaded a file from an email/on a webpage ...</li> <li>• ... the malware could have been embedded into the link/attachment/file</li>   <li>• Opening an infected software package ...</li> <li>• ... this would trigger the malware to download onto the network</li>   <li>• Inserting an infected portable storage device ...</li> <li>• ... when the drive is accessed the malware is downloaded to the network</li>   <li>• Firewall has been turned off ...</li> <li>• ... so malware would not be detected/checked for when entering network</li>   <li>• Anti-malware has been turned off ...</li> <li>• ... so malware is not detected/checked for when files are downloaded</li> </ul>	<b>4</b>