



Cambridge IGCSE™

COMPUTER SCIENCE

0478/13

Paper 1 Theory

October/November 2022

MARK SCHEME

Maximum Mark: 75

Published

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

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

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

Cambridge International is publishing the mark schemes for the October/November 2022 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **15** 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.

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 mark point has an ellipsis at the beginning, but there is no ellipsis on the mark point before it, then this is just a follow-on sentence and **can** be awarded **without** the previous mark point.

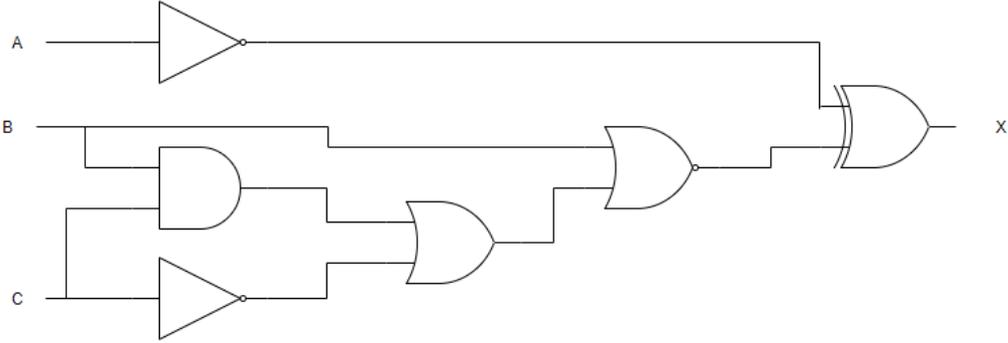
Question	Answer	Marks																								
1	<p>One mark for each correct row</p> <table border="1" data-bbox="687 319 1590 743"> <thead> <tr> <th data-bbox="687 319 1193 416">Component</th> <th data-bbox="1193 319 1308 416">Input (✓)</th> <th data-bbox="1308 319 1440 416">Output (✓)</th> <th data-bbox="1440 319 1590 416">Storage (✓)</th> </tr> </thead> <tbody> <tr> <td data-bbox="687 416 1193 483">actuator</td> <td data-bbox="1193 416 1308 483"></td> <td data-bbox="1308 416 1440 483">✓</td> <td data-bbox="1440 416 1590 483"></td> </tr> <tr> <td data-bbox="687 483 1193 550">register</td> <td data-bbox="1193 483 1308 550"></td> <td data-bbox="1308 483 1440 550"></td> <td data-bbox="1440 483 1590 550">✓</td> </tr> <tr> <td data-bbox="687 550 1193 617">sensor</td> <td data-bbox="1193 550 1308 617">✓</td> <td data-bbox="1308 550 1440 617"></td> <td data-bbox="1440 550 1590 617"></td> </tr> <tr> <td data-bbox="687 617 1193 684">mouse</td> <td data-bbox="1193 617 1308 684">✓</td> <td data-bbox="1308 617 1440 684"></td> <td data-bbox="1440 617 1590 684"></td> </tr> <tr> <td data-bbox="687 684 1193 743">Digital Versatile Disc (DVD)</td> <td data-bbox="1193 684 1308 743"></td> <td data-bbox="1308 684 1440 743"></td> <td data-bbox="1440 684 1590 743">✓</td> </tr> </tbody> </table>	Component	Input (✓)	Output (✓)	Storage (✓)	actuator		✓		register			✓	sensor	✓			mouse	✓			Digital Versatile Disc (DVD)			✓	5
Component	Input (✓)	Output (✓)	Storage (✓)																							
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mouse	✓																									
Digital Versatile Disc (DVD)			✓																							

Question	Answer	Marks
<p>2(a)</p>	<p>One mark for each correct line</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>Denary</p> <div style="border: 1px solid black; padding: 5px; width: 150px; margin: 10px auto;">72</div> <div style="border: 1px solid black; padding: 5px; width: 150px; margin: 10px auto;">245</div> <div style="border: 1px solid black; padding: 5px; width: 150px; margin: 10px auto;">15</div> </div> <div style="text-align: center;"> <p>8 bit binary</p> <div style="border: 1px solid black; padding: 5px; width: 150px; margin: 10px auto;">11110101</div> <div style="border: 1px solid black; padding: 5px; width: 150px; margin: 10px auto;">01110010</div> <div style="border: 1px solid black; padding: 5px; width: 150px; margin: 10px auto;">11100101</div> <div style="border: 1px solid black; padding: 5px; width: 150px; margin: 10px auto;">00010101</div> <div style="border: 1px solid black; padding: 5px; width: 150px; margin: 10px auto;">00001111</div> <div style="border: 1px solid black; padding: 5px; width: 150px; margin: 10px auto;">01001000</div> </div> </div>	<p>3</p>
<p>2(b)</p>	<p>One mark for two correct characters, two marks for three correct characters, three marks for four correct characters, in the correct place</p> <ul style="list-style-type: none"> • 09AE 	<p>3</p>

Question	Answer	Marks
3	<p>One mark for the correct answer</p> <ul style="list-style-type: none">• 262 // 250 <p>Three marks for three stages of working</p> <ul style="list-style-type: none">• 100×100• $10\,000 \times 16$ then $/ 8$ // $10\,000 \times 2$• $20\,000 / 1024$ or $1000 = 19.5 \text{ kB}$ // 20 kB• $5 \times 1024 = 5120$ // $5 \times 1000 = 5000$• $5120 / 19.5$ // $5000 / 20$	4

Question	Answer	Marks
4(a)	<p>One mark for a type of touchscreen technology, three marks for benefits</p> <ul style="list-style-type: none"> • Resistive • ... cheap to manufacture/buy • ... more simple/easier technology to manufacture • ... less affected by weather // more waterproof • ... does not need bare finger // can be pressed with most things • ... screen less likely to shatter/break • ... lower power consumption • ... (can) support multitouch • Capacitive • ... good visibility in sunlight • ... supports multitouch • ... more longevity • ... faster response times • ... requires less/no pressure • ... high quality image/screen • ... doesn't need to be calibrated • ... if screen is shattered, it will still register touch • Infrared • ... good visibility in sunlight • ... supports multitouch • ... does not need bare finger // can be pressed with most things • ... high quality image/screen • ... if screen is shattered, it will still register touch • ... does not need to be calibrated • ... requires less/no pressure • ... faster response times 	4

Question	Answer	Marks
4(b)	<p>One mark for the correct storage type and one mark for the explanation</p> <ul style="list-style-type: none"> • Primary storage • Both directly accessed by the CPU 	2
4(c)(i)	<p>Any two from:</p> <ul style="list-style-type: none"> • Using serial transmission • Data is sent one bit at a time • Data is sent down a single wire 	2
4(c)(ii)	<p>Any three from:</p> <ul style="list-style-type: none"> • It can charge/power the device • It is a universal/industry standard • Fast rate of data transfer • Supports different data transmission speeds • Automatically detects the phone • Backward compatible • Little chance of data being skewed 	3
4(d)	<p>Any four from:</p> <ul style="list-style-type: none"> • The interrupt signal is sent to the CPU/processor • The CPU stops the task it is currently processing ... • ... to service the interrupt • An interrupt service routine is used (to service the interrupt) • Once the interrupt is serviced, a message is displayed to notify the user of the call 	4

Question	Answer	Marks
5(a)	<p data-bbox="338 217 1111 248">One mark for each correct logic gate with the correct inputs</p>  <p>The diagram shows a logic circuit with three inputs: A, B, and C. Input A goes through a NOT gate. Input B and input C go into an AND gate. Input C also goes through a NOT gate. The outputs of the B-C AND gate and the NOT-C gate go into another AND gate. The output of this second AND gate goes through a NOT gate. The output of the first NOT gate (A) and the output of the NOT-of-(B-C-AND-C) gate go into a third AND gate. Finally, the output of this third AND gate and the output of the first NOT gate (A) go into an OR gate, which produces the output X.</p>	6

Question	Answer	Marks																																													
5(b)	<p> Four marks for 8 correct outputs Three marks for 6/7 correct outputs Two marks for 4/5 correct outputs One mark for 2/3 correct outputs </p> <table border="1" data-bbox="638 384 1637 971"> <thead> <tr> <th>A</th> <th>B</th> <th>C</th> <th>Working space</th> <th>X</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> <td></td> <td>1</td> </tr> <tr> <td>0</td> <td>0</td> <td>1</td> <td></td> <td>0</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>0</td> </tr> <tr> <td>1</td> <td>1</td> <td>1</td> <td></td> <td>0</td> </tr> </tbody> </table>	A	B	C	Working space	X	0	0	0		1	0	0	1		0	0	1	0		1	0	1	1		1	1	0	0		0	1	0	1		1	1	1	0		0	1	1	1		0	4
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6(a)	<p>Four from:</p> <ul style="list-style-type: none"> • The device shines a light/laser onto the QR code • Corners of code are used to determine position/orientation • Black and white sections of code reflect light differently • The device captures the light that is reflected back ... • ... using sensors • The light reflections are converted to binary • <u>Link/URL</u> to video is stored in the QR code 	4
6(b)	<ul style="list-style-type: none"> • MP4 	1
6(c)	<p>Any two from:</p> <ul style="list-style-type: none"> • Reduces the size of the file • Takes up less storage space • Quicker to transmit to device • Use less bandwidth • Less buffering 	2
6(d)	<p>Four from:</p> <ul style="list-style-type: none"> • Display made up of pixels • ... that are arranged in a matrix • LEDs are behind the screen • Light shone at pixels • Can have diffuser is used to distribute light evenly • RGB filters used • ... and are mixed to create different colours 	4

Question	Answer	Marks
7	One mark for each correct term in the correct order <ul style="list-style-type: none">• Fetched• MDR• Data bus• Decoded• ALU• Calculations• Execute	7

Question	Answer	Marks
8(a)	Any two from: <ul style="list-style-type: none">• They are both unique addresses• They can both be used to identify a device (on a network)• They are both assigned to hardware• They can both be represented as hexadecimal	2
8(b)	Any two from: e.g. <ul style="list-style-type: none">• A MAC address is assigned by the manufacturer, whereas an IP address is assigned by the network/router/ISP• A MAC address is represented as hexadecimal, whereas an IP address can sometimes be represented as numeric• A MAC address is normally static, whereas an IP address can be dynamic• A MAC address has 6 groups of digits, whereas an IP address has 4/8 groups• A MAC address is 6 bytes (48 bit), whereas an IP address is 4/16 bytes (32/128 bit)	2

Question	Answer	Marks
9	<p>Any six from (MAX four for ARQ):</p> <ul style="list-style-type: none">• Odd or even parity is set/agreed for the data• A parity bit is added to each byte of data• ... to make the number of 1s match parity• Data is checked after transmission to see if parity is correct• ARQ uses acknowledgement and timeout• If no error is found, a positive acknowledgement is sent to the sender / no acknowledgement is sent to the sender• If an error is found, a negative acknowledgement is sent to the sender ...• ... that triggers the data to be resent• When the data is sent, a timer is started• If an acknowledgement is not received within the time set, the data is resent ...• ... until an acknowledgement is received / resend limit is reached	6

Question	Answer	Marks
10(a)(i)	Any three from: <ul style="list-style-type: none">• It is a secure protocol // hypertext transfer protocol secure• It is a set of rules for data transmission• It combines HTTP and SSL/TLS to transmit data• It encrypts data for transmission	3
10(a)(ii)	Any one from: <ul style="list-style-type: none">• Look for a locked padlock• Check the digital certificate	1
10(b)	Any three from: <ul style="list-style-type: none">• Hacking• Virus• Malware <p>Note: If three different types of correct malware are given, they can be awarded.</p>	3