Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

6104118326

COMPUTER SCIENCE **0478/12**

Paper 1 Theory **October/November 2022**

1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- Calculators must **not** be used in this paper.

INFORMATION

- The total mark for this paper is 75.
- The number of marks for each question or part question is shown in brackets [ ].
- No marks will be awarded for using brand names of software packages or hardware.

This document has **12** pages.

1 A bus station has a ticket machine.

A customer can use the ticket machine to select and pay for their ticket.

One input device built into the ticket machine is a touch screen.

(a) Identify **two** other input devices that could be built into the ticket machine.

Input device 1 .....

Input device 2 .....
[2]

(b) The ticket machine has a help icon that a user can touch to contact customer support.

The ticket machine has an output device that allows the user to hear the customer support person.

Identify an output device that would be used for this purpose.

..... [1]

(c) The touch screen for the ticket machine uses resistive technology.

(i) Describe how resistive touch screen technology operates to recognise a user's touch.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(ii) Give **two** benefits of using resistive touch screen technology for the ticket machine.

Benefit 1 .....

.....

Benefit 2 .....

.....

[2]

(iii) Give **two** drawbacks of using resistive touch screen technology for the ticket machine.

Drawback 1 .....

.....

Drawback 2 .....

.....

[2]

(iv) Identify **one** other touch screen technology that could have been used.

..... [1]

(d) The computer in the ticket machine uses the stored program concept.

Describe the stored program concept.

.....

.....

.....

..... [2]

(e) The computer in the ticket machine has an operating system.

One function of the operating system is to provide an interface for the user.

State **three** other functions of the operating system.

Function 1 .....

Function 2 .....

Function 3 .....

[3]

(f) The computer uses 12-bit binary registers to store data whilst it is being processed.

Customers are given a denary ticket number.

(i) Give the 12-bit binary value that is stored in the register for each denary ticket number.

100 .....

235 .....

301 .....

Working space

.....

.....

.....

.....

.....

[3]

(ii) Show the denary ticket number that would be given to the customer for each 12-bit binary value.

000000010110 .....

000001110111 .....

001101011001 .....

Working space

.....

.....

.....

.....

.....

[3]

(iii) Binary values can also be represented as hexadecimal values.

Show the hexadecimal value that represents each of the **two** 12-bit binary values.

000010010101 .....

101011010001 .....

Working space

.....

.....

.....

[4]

2 An automated water tap system uses a sensor and a microprocessor to operate. Water flows from the tap when a person's hands are placed underneath the tap. Water stops flowing when the person's hands are removed from underneath the tap.

(a) Explain how the water tap system uses a sensor and a microprocessor to operate.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

(b) **Three** descriptions are shown of different systems.

Identify the most suitable sensor that could be used in each system.

Description of system	Sensor
it checks the air is dry enough in a garage that spray paints cars	
it automatically switches on the headlights on a car when it is dark	
it checks that the soil in a greenhouse has the correct level of acidity	

[3]

3 **Five** statements are shown about Random Access Memory (RAM), an internal Solid State Drive (SSD) and a USB flash memory drive.

Tick (✓) to show which statements apply to each component. Some statements may apply to more than **one** component.

	Component		
Statement	**RAM (✓)**	**Internal SSD (✓)**	**USB flash memory drive (✓)**
it is a type of primary storage			
it is volatile			
it uses NAND and NOR technology			
it does **not** have any moving parts			
it is **not** directly connected to the central processing unit (CPU)			

[5]

4 Doris has data stored on her computer.

She accidentally loses some data by deleting a file.

State **two** methods she could use to help prevent accidental loss of data in this way.

Describe how each method would help prevent accidental loss of the data.

Method 1 .....

.....

.....

.....

Method 2 .....

.....

.....

.....

[4]

5 8 bytes of data are transmitted from one computer to another. Each byte of data has a parity bit.

The data is also sent with a parity byte. Each bit in the parity byte allows a check to be performed on each column of bits.

A parity check is performed on the data and an error is found in one bit. The table shows the data that was received.

	Parity bit	**Bit 2**	**Bit 3**	**Bit 4**	**Bit 5**	**Bit 6**	**Bit 7**	**Bit 8**
Byte 1	0	1	0	1	0	0	1	1
Byte 2	1	0	0	1	1	1	1	1
Byte 3	1	1	1	1	1	1	0	0
Byte 4	1	1	0	1	0	1	0	1
Byte 5	1	0	0	0	1	1	1	0
Byte 6	1	1	1	0	1	0	1	1
Byte 7	1	1	0	0	1	1	0	0
Byte 8	1	1	1	1	0	0	1	1
Parity byte	1	0	1	1	0	1	1	1

Identify which bit has an error by giving the Byte number and Bit number.

Explain how you found the error.

Byte number .....

Bit number .....

Explanation .....

.....

.....

.....

.....

.....

[4]

6 Jian has a website that uses the Secure Socket Layer (SSL) protocol to make sure that data is kept secure during transmission.

(a) Give **two** ways that a user could check that a website uses the SSL protocol.

1 .....

.....

2 .....

.....
[2]

(b) State the name of the updated version of the SSL protocol.

..... [1]

(c) Jian's system for his website has a proxy server.

Explain why Jian uses a proxy server as part of the system for his website.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(d) Jian sells products using his website. He wants to create a secure login system for user accounts.

He is worried that a user's login details may be gathered by malware when they are logging into their account.

(i) State the type of malware that could be used to gather a user's login details.

..... [1]

(ii) Give **three** methods that could be used to help prevent a user's login details being gathered by malware, when they are logging into their account.

Describe how each method can help prevent this happening.

Method 1 .....

.....

.....

.....

Method 2 .....

.....

.....

.....

Method 3 .....

.....

.....

.....

[6]

(e) The paragraph describes how the web pages are obtained and displayed for the user.

Complete the paragraph using the list of terms. **Not** all terms in the list need to be used.

- browser
- Hypertext Markup Language (HTML)
- Internet Protocol (IP) address
- Internet Service Provider (ISP)
- Media Access Control (MAC) address
- presentation
- protocols
- structure
- Uniform Resource Locator (URL)
- web pages
- web server

The browser sends the ..... to the

Domain Name Server (DNS) that looks up the corresponding

..... . This is returned to the browser, which

then sends a request to the ..... where the

..... are stored. The website is written in

..... that is rendered by the

..... .

[6]

7 NAND, OR and XOR are three types of logic gate.

(a) **Four** statements are shown about the logic gates.

Tick (✓) to show which statements apply to each logic gate. Some statements may apply to more than one logic gate.

Statement	NAND (✓)	OR (✓)	XOR (✓)
if both inputs are 1, the output is 1			
if both inputs are different from each other, the output is 1			
if both inputs are 0, the output is 0			
if both inputs are the same as each other, the output is always 0			

[4]

(b) NAND, OR, XOR, NOR and NOT are all examples of logic gates.

State the name of **one** other logic gate and complete its truth table.

Logic gate .....

Truth table:

A	B	Output
0	0	
0	1	
1	0	
1	1	

[2]

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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.

[Turn over

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(a)	Any **two** from: • Keyboard • Trackpad • Trackball • Microphone • Keypad • Sensor • Button • **Barcode**/**QR** scanner/reader • Webcam/**digital** camera	**2**
1(b)	Any **one** from: • Speaker • Headphones	**1**
1(c)(i)	Any **four** from: • The screen is made up of (two) layers/multiple layers • The user pushes the top layer into the bottom layer // The user pushes the layers together • The layers create a circuit (when pushed together) • causing electricity to flow • allowing the **co-ordinates/location** of the users touch to be **calculated**	**4**
1(c)(ii)	Any **two** from: • Cheap to **manufacture**/**buy** • Can still be used whilst wearing gloves • Waterproof // Can be used in bad weather • Does not easily shatter • Low power consumption • (Can) support multitouch	**2**

Question	Answer	Marks
1(c)(iii)	Any **two** from: • Does not (normally) support multitouch • Screen **visibility** can be poor in sunlight • Longevity issues • (Normally) lower resolution • Not very sensitive to touch // Lower response time (than capacitive) • Prone to scratches	**2**
1(c)(iv)	Any **one** from: • Capacitive • Infrared	**1**
1(d)	Any **two** from: • Data and instructions are stored in the **same** memory • and can only be fetched one at a time	**2**
1(e)	Any **three** from: • Multitasking • Multiprogramming • Input and output control • Running software • Memory management • Processor management • File management • Handling interrupts • Providing security • Managing user accounts • Batch / real-time processing	**3**

Question	Answer	Marks
1(f)(i)	• 000001100100 • 000011101011 • 000100101101	**3**
1(f)(ii)	• 22 • 119 • 857	**3**
1(f)(iii)	**One** mark for two correct characters in the correct place, **two** marks for three • 095 • AD1	**4**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(a)</td><td>Six from:

• Motion/proximity/infra-red sensor is used
• Sensor sends data to microprocessor
• Data is converted from analogue to digital (using ADC)
• Data is compared to stored/set value(s)
• If data is inside range/outside range/greater than/less than, signal is sent to turn water tap on
• If data is outside range /inside range/less than/greater than, tap remains off / signal is sent to turn water tap off
• Actuator is used to turn the tap off/on
• Whole process is continuous</td><td>6</td></tr>
<tr><td>2(b)</td><td>One mark for each correct sensor

<table><tr><th>Description of system</th><th>Sensor</th></tr><tr><td>it checks the air is dry enough in a garage that spray paints cars</td><td>Moisture/humidity</td></tr><tr><td>it automatically switches on the headlights on a car when it is dark</td><td>Light</td></tr><tr><td>it checks that the soil in a greenhouse has the correct level of acidity</td><td>pH</td></tr></table></td><td>3</td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>3</td><td>One mark for each correct row
<table>
<tr><th rowspan="2">Statement</th><th colspan="3">Component</th></tr>
<tr><th>RAM (✓)</th><th>Internal SSD (✓)</th><th>USB flash memory drive (✓)</th></tr>
<tr><td>it is a type of primary storage</td><td>✓</td><td></td><td></td></tr>
<tr><td>it is volatile</td><td>✓</td><td></td><td></td></tr>
<tr><td>it uses NAND and NOR technology</td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>it does not have any moving parts</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>it is not directly connected to the Central Processing Unit (CPU)</td><td></td><td>✓</td><td>✓</td></tr>
</table></td><td>5</td></tr>
</table>

Question	Answer	Marks
4	**One** mark for the method, **one** mark for a corresponding description • Create a back-up • this means the data can be **restored/recovered** • Add verification • to get the user to confirm they want to delete the data • Set access rights • so that she cannot delete any files	**4**

Question	Answer	Marks
5	**One** mark each for the correct byte and bit • Byte 4 • Bit 5 Any **two** from: • Counted all the 1s • An even parity has been used • Odd number of ones in that row (byte 4) **and** column (bit 5)	**4**

Question	Answer	Marks
6(a)	Any **two** from: • Check if web address starts with HTTPS • Check if there is a locked padlock • Check the digital certificate for the website	**2**
6(b)	• Transport layer security // TLS	**1**
6(c)	Any **four** from: • To act as intermediary between browser and web server • to filter/examine/monitor traffic to the web server • to help stop malicious traffic to the web server • To cache frequently viewed web pages • to allow faster response time for requests • to reduce the number of requests the server needs to process • To help prevent DoS • stopping the webserver being overloaded with requests • by redirecting away from server // by stopping DoS attack reaching server • To act as a firewall	**4**
6(d)(i)	• Spyware	**1**

Question	Answer	Marks
6(d)(ii)	**One** mark for a correct method, **one** mark for a corresponding description • Drop down boxes • this means that the keypresses cannot be recorded • Onscreen/virtual keyboard • this means that the keypresses cannot be recorded • Biometrics // by example • this means that the keypresses cannot be recorded • no password entered to be gathered • Anti-malware // anti-spyware • this will **scan for/remove** any malware that could be recording keypresses • Random/select values requested from password • this means that full password cannot be obtained (in a single login) • Firewall • to prevent the **download** of any malware that could gather keypresses	**6**
6(e)	**One** mark for each correct term in the correct order • URL • IP address • Web server • Web pages • HTML • Browser	**6**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>7(a)</td><td>One mark for each correct row

<table>
<tr><th>Statement</th><th>NAND (✓)</th><th>OR (✓)</th><th>XOR (✓)</th></tr>
<tr><td>if both inputs are 1, the output is 1</td><td></td><td>✓</td><td></td></tr>
<tr><td>if both inputs are different from each other, the output is 1</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>if both inputs are 0, the output is 0</td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>if both inputs are the same as each other, the output is always 0</td><td></td><td></td><td>✓</td></tr>
</table></td><td>4</td></tr>
<tr><td>7(b)</td><td>One mark for a correct logic gate, one mark for a corresponding truth table

• AND
<table>
<tr><th>A</th><th>B</th><th>Output</th></tr>
<tr><td>0</td><td>0</td><td>0</td></tr>
<tr><td>0</td><td>1</td><td>0</td></tr>
<tr><td>1</td><td>0</td><td>0</td></tr>
<tr><td>1</td><td>1</td><td>1</td></tr>
</table></td><td>2</td></tr>
</table>