



CANDIDATE
NAME

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CENTRE
NUMBER

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CANDIDATE
NUMBER

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0478/13

May/June 2021

1 hour 45 minutes

No additional materials are needed.

- 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.

- 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 **16** pages. Any blank pages are indicated.

1 Greta has a computer that she uses for schoolwork and leisure.

(a) The computer has the Media Access Control (MAC) address:

00:A0:C9:14:C8:29

(i) Tick (✓) to show whether the MAC address is initially assigned to the computer by the network, the manufacturer or the user.

Tick (✓)

Network

☐

Manufacturer

☐

User

☐

[1]

(ii) The values in the MAC address are hexadecimal values.

Convert the **three** given hexadecimal values into 8-bit binary.

14

A0

C9

[3]

Working space

.....

.....

.....

(iii) Convert the **two** given hexadecimal values into denary.

29

C8

[2]

Working space

.....

.....

.....

- (b) Greta stores data on several off-line storage devices, including an external hard disk drive (HDD), a USB flash memory drive and a compact disc (CD).

- (i) Identify the type of storage for each device.

External HDD

USB flash memory drive

CD

[3]

- (ii) Describe the operation of a HDD and how it stores data.

.....

.....

.....

.....

.....

.....

.....

..... [4]

- 2 Jolene displays videos on her website. She uses lossy compression to reduce the file size of the videos.

(a) Describe how lossy compression reduces the file size of the videos.

.....

.....

.....

.....

.....

..... [3]

(b) State **two** reasons why Jolene would use lossy rather than lossless compression for the videos.

Reason 1

.....

Reason 2

..... [2]

3 An optical mouse is a type of input device that can be used to input data into a computer system.

(a) Complete the paragraph about the operation of an optical mouse, using the most appropriate terms from the given list. **Not** all terms need to be used.

- Ball
- Battery
- LCD
- LED
- Lens
- Magnifies
- Matrix
- Microswitch
- Photoelectric
- Photographic
- Reduces
- USB

An optical mouse shines an from the bottom of the mouse onto a surface. Light bounces straight back from the surface into a cell. This has a that the reflected light to allow detection of smaller movements. When a button on the mouse is clicked, a is pressed. A connection is used to carry the data to the computer.

[6]

(b) Identify **two** other input devices that can be used to enter data into a computer.

- 1
- 2 [2]

- 4 Spencer finds out that his online music account has been accessed by an unauthorised person. He believes his personal details for the account were obtained using phishing.

(a) Explain how the personal details could have been obtained using phishing.

.....

.....

.....

.....

.....

..... [3]

(b) Give **two** other Internet security risks that could have been used to obtain the personal details.

1

2 [2]

5 Six statements are given about programming languages.

Tick (✓) to show whether each statement applies to high-level language, assembly language or machine code. Some statements may apply to more than one type of programming language.

Statement	High-level language (✓)	Assembly language (✓)	Machine code (✓)
it requires a translator to be processed by a computer			
it is an example of low-level language			
it uses mnemonics			
it uses English-like statements			
it can be used to directly manipulate hardware in the computer			
it is portable			

[6]

- 6 Four 7-bit binary values are transmitted from one computer to another. A parity bit is added to each binary value creating 8-bit binary values. All the binary values are transmitted and received correctly.

- (a) Identify whether each 8-bit binary value has been sent using odd or even parity by writing odd or even in the type of parity column.

8-bit binary value	Type of parity
01111100	
10010000	
10011001	
00101001	

[4]

- (b) The 8-bit binary value 10110001 is transmitted and received as 10110010

A parity check does **not** identify any errors in the binary value received.

State why the parity check does **not** identify any errors.

.....
 [1]

- (c) The data is sent using serial duplex data transmission.

- (i) Describe how data is sent using serial duplex data transmission.

.....

 [4]

- (ii) State **one** drawback of using serial data transmission, rather than parallel data transmission.

.....
 [1]

- 7 Marco uses his computer for work. The data he uses on a daily basis is valuable to his business.

Marco is concerned about his data being accidentally damaged. Human error, such as incorrectly removing external storage devices, is one way that the data can be accidentally damaged.

- (a) Identify **two** other ways that data can be accidentally damaged.

1

2 [2]

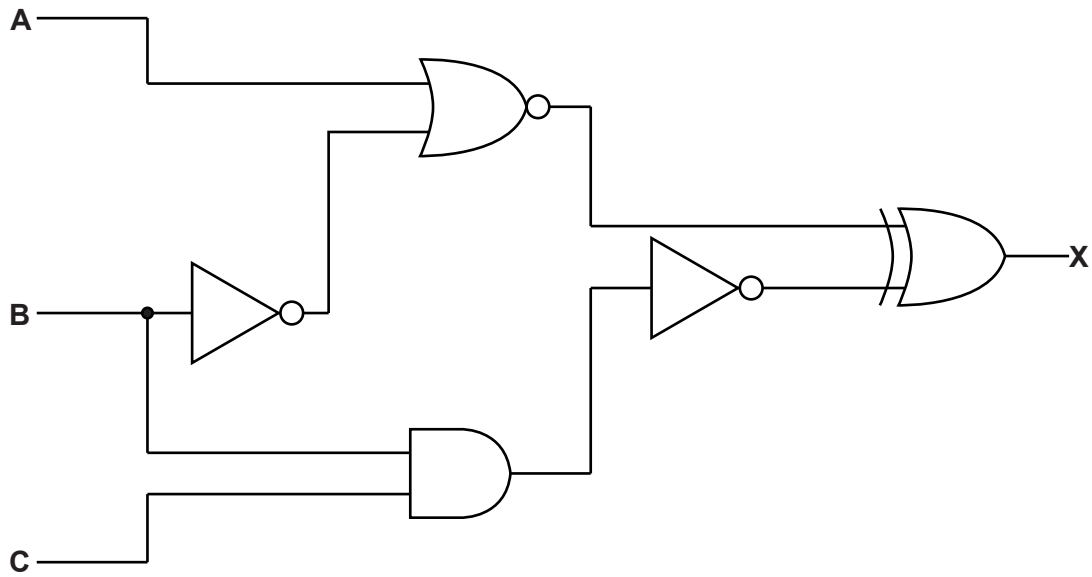
- (b) Removing storage devices correctly from the computer can help prevent data being accidentally damaged.

Give **two** other ways that accidental damage to data can be prevented.

1
.....

2
..... [2]

8 Consider the following logic circuit:



(a) Two **NOT** gates are used in the given logic circuit.

Identify **three** other logic gates that are used in the given logic circuit.

1

2

3

[3]

(b) Consider the completed truth table for the given logic circuit.

Row number	A	B	C	Working space	X
1	0	0	0		0
2	0	0	1		1
3	0	1	0		0
4	0	1	1		0
5	1	0	0		1
6	1	0	1		1
7	1	1	0		0
8	1	1	1		1

There are four errors in the truth table in the output (X) column.

Identify the **four** incorrect outputs.

Write the row number to identify each incorrect output.

Row

Row

Row

Row

[4]

- The system also counts the number of vehicles that have entered the car park, so that it can display how many parking spaces are still available.

Sensors and a microprocessor are used to control the system.

- | Task | Sensor |
|---|--------|
| check if a vehicle is too high | |
| count the vehicles entering the car park | |
| check if a vehicle is parked in a parking space | |

(b) Describe how the sensor and the microprocessor are used to display the red or green light above the parking space.

[6]

- 10** Several components are involved in processing an instruction in a Von Neumann model for a computer system.

Three of these components are the arithmetic logic unit (ALU), control unit (CU) and random access memory (RAM).

- (a)** Six statements are given about the components.

Tick (✓) to show if each statement applies to the ALU, CU or the RAM. Some statements may apply to more than one component.

Statement	ALU (✓)	CU (✓)	RAM (✓)
stores data and instructions before they enter the central processing unit (CPU)			
contains a register called the accumulator			
manages the transmission of data and instructions to the correct components			
contained within the CPU			
uses the data bus to send data into or out of the CPU			
carries out calculations on data			

[6]

- (b)** The accumulator is a register that is part of the Von Neumann model.

Give **two** other registers that are part of the Von Neumann model.

1

2

[2]

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Cambridge IGCSE™

COMPUTER SCIENCE

0478/13

Paper 1

May/June 2021

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 May/June 2021 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

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.

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)(i)	– manufacturer	1
1(a)(ii)	One mark per each correct binary value. – 00010100 – 10100000 – 11001001	3
1a(iii)	One mark per each correct denary value. – 41 – 200	2
1(b)(i)	– Magnetic – Solid state – Optical	3
1(b)(ii)	Any four from: – It has platters – Platters/disk divided into tracks – Platter/disk is spun – Has a read/write arm that moves across storage media – Read/writes data using electromagnets – Uses magnetic fields to control magnetic dots of data – Magnetic field determines binary value	4

Question	Answer	Marks
2(a)	Any three from: – A compression algorithm is used – Redundant data is removed – Reduce colour depth – Reduce image resolution – Reduce sample rate – Reduce sample resolution – Reduce frame rate – Use perceptual music shaping – Data is permanently removed	3
2(b)	Any two from: – Lossy decreases the file size more – Take up less storage space on webserver/users' computer – Quicker to upload/download – May not need to be high quality – Website will load faster for users – Less lag/buffering when watching – Takes up less bandwidth to download/upload – Uses less data allowance	2

Question	Answer	Marks
3(a)	One mark per each correct term, in the correct place. – LED – Photoelectric – Lens – Magnifies – Microswitch – USB	6
3(b)	Any two from: – Keyboard – Microphone – 2D/3D Scanner – Sensor – Touchscreen – Keypad – Webcam – Joystick	2

Question	Answer	Marks
4(a)	– Legitimate looking/fake email sent to user – ... that contains a link to a fake website – User clicks link and enters personal details (into fake website)	3
4(b)	Any two from: – Pharming – Spyware – Hacking/cracking	2

Question	Answer	Marks																												
5	<p>One mark per each correct row</p> <table><tr><th>Statement</th><th>High-level language (✓)</th><th>Assembly language (✓)</th><th>Machine code (✓)</th></tr><tr><td>It requires a translator to be processed by a computer</td><td>✓</td><td>✓</td><td></td></tr><tr><td>It is an example of low-level language</td><td></td><td>✓</td><td>✓</td></tr><tr><td>It uses mnemonics</td><td></td><td>✓</td><td></td></tr><tr><td>It uses English-like statements</td><td>✓</td><td></td><td></td></tr><tr><td>It can be used to directly manipulate hardware in the computer</td><td></td><td>✓</td><td>✓</td></tr><tr><td>It is portable</td><td>✓</td><td></td><td></td></tr></table>	Statement	High-level language (✓)	Assembly language (✓)	Machine code (✓)	It requires a translator to be processed by a computer	✓	✓		It is an example of low-level language		✓	✓	It uses mnemonics		✓		It uses English-like statements	✓			It can be used to directly manipulate hardware in the computer		✓	✓	It is portable	✓			6
Statement	High-level language (✓)	Assembly language (✓)	Machine code (✓)																											
It requires a translator to be processed by a computer	✓	✓																												
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It uses English-like statements	✓																													
It can be used to directly manipulate hardware in the computer		✓	✓																											
It is portable	✓																													

Question	Answer	Marks
6(a)	<ul style="list-style-type: none"> – Odd – Even – Even – Odd 	4
6(b)	<p>Any one from:</p> <ul style="list-style-type: none"> – There is a transposition of bits – Bits still add up to correct parity 	1
6(c)(i)	<ul style="list-style-type: none"> – Data is sent one bit at a time – Data is sent using a single wire – Data is sent in both direction ... – ... at the same time 	4
6(c)(ii)	<p>Any one from:</p> <ul style="list-style-type: none"> – Data transmission can be slower (than parallel) – Additional data may need to be sent 	1

Question	Answer	Marks
7(a)	Any two from: – Hardware failure – Software failure – Power failure/surge – Fire – Flood – Natural disaster	2
7(b)	Any two from: – Use verification methods before deleting files – Keep data in a fireproof box – Do not drink liquids near a computer – Use surge protection // UPS – Correct shutdown procedures – Access rights – Back data up	2

Question	Answer	Marks
8(a)	– AND – NOR – XOR	3
8(b)	– Row 1 – Row 4 – Row 7 – Row 8	4

Question	Answer	Marks
9(a)	One mark per each correct sensor	3

Question	Answer	Marks
9(b)	Six from: <ul style="list-style-type: none"> – Sensor sends data to microprocessor – Data is converted from analogue to digital (using ADC) – Data is compared to stored value ... – ... If data is greater than stored value microprocessor sends signal to turn red light on and the green light off – ... If data is less than stored value microprocessor sends signal to turn green light on the red light off – ... If data still within range, no action taken/existing light remains on – Lights turned on/off using actuator – Process is continuous 	6

Question	Answer	Marks																												
10(a)	<div>One mark per each correct row</div> <table><tr><th>Statement</th><th>ALU (✓)</th><th>CU (✓)</th><th>RAM (✓)</th></tr><tr><td>Stores data and instructions before they enter the central processing unit (CPU)</td><td></td><td></td><td>✓</td></tr><tr><td>Contains a register called the accumulator</td><td>✓</td><td></td><td></td></tr><tr><td>Manages the transmission of data and instructions to the correct components</td><td></td><td>✓</td><td></td></tr><tr><td>Contained within the CPU</td><td>✓</td><td>✓</td><td></td></tr><tr><td>Uses the data bus to send data into or out of the CPU</td><td>(✓)</td><td></td><td>✓</td></tr><tr><td>Carries out calculations on data</td><td>✓</td><td></td><td></td></tr></table>	Statement	ALU (✓)	CU (✓)	RAM (✓)	Stores data and instructions before they enter the central processing unit (CPU)			✓	Contains a register called the accumulator	✓			Manages the transmission of data and instructions to the correct components		✓		Contained within the CPU	✓	✓		Uses the data bus to send data into or out of the CPU	(✓)		✓	Carries out calculations on data	✓			6
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Contained within the CPU	✓	✓																												
Uses the data bus to send data into or out of the CPU	(✓)		✓																											
Carries out calculations on data	✓																													
10(b)	<div>Any two from:</div> <div><ul style="list-style-type: none">– MAR– MDR // MBR– PC– CIR // IR</div>	2																												