Cambridge IGCSE™

CANDIDATE NAME	

CENTRE NUMBER	
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COMPUTER SCIENCE **0478/11**

Paper 1 Computer Systems **May/June 2023**

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. Any blank pages are indicated.

1 Binary is a number system used by computers.

(a) Tick (✓) **one** box to show which statement about the binary number system is correct.

A It is a base 1 system ☐

B It is a base 2 system ☐

C It is a base 10 system ☐

D It is a base 16 system ☐

[1]

(b) Denary numbers are converted to binary numbers to be processed by a computer.

Convert these **three** denary numbers to 8-bit binary numbers.

50 ....

102 ....

221 ....

[3]

Working space

....

....

....

....

(c) Binary numbers are stored in registers.

Negative denary numbers can be represented as binary using two's complement.

Complete the binary register for the denary number –78

You must show all your working.

Working space ....

....

....

....

....

....

Register:

[2]

(d) Two 8-bit binary numbers are given.

Add the **two** 8-bit binary numbers using binary addition.

Give your answer in binary. Show all your working.

$$0\ 0\ 1\ 1\ 0\ 0\ 1\ 1$$
$$+\ \underline{0\ 1\ 1\ 0\ 0\ 0\ 0\ 1}$$

[3]

(e) Two binary numbers are added by a computer and an overflow error occurs.

Explain why the overflow error occurred.

....

....

....

.... [2]

2 A student has a sound file that is too large to be stored on their external secondary storage device. The student compresses the sound file to make the file size smaller.

The compression method used reduces the sample rate and the sample resolution of the sound file.

(a) State what is meant by the sample rate and sample resolution.

Sample rate ....

....

Sample resolution ....

....
[2]

(b) Identify which type of compression has been used to compress the sound file.

....

.... [1]

(c) The student sends the sound file to a friend. The file is transmitted across a network that uses packet switching.

(i) Identify **two** pieces of data that would be included in the header of each packet.

1 ....

2 ....
[2]

(ii) Explain how the file is transmitted using packet switching.

....

....

....

....

....

....

....

....

....

.... [5]

3 Secondary storage devices are used to store data in a computer.

(a) Circle **three** components that are secondary storage devices.

central processing unit (CPU)   compact disk (CD)

hard disk drive (HDD)   random access memory (RAM)   read only memory (ROM)

register   sensor   solid-state drive (SSD)

[3]

(b) Tick (✓) **one** box to show which statement about secondary storage is correct.

A   It is directly accessed by the CPU. ☐

B   It is magnetic storage only. ☐

C   It is used to permanently store software and data files. ☐

D   It is volatile. ☐

[1]

4 Complete the statements about different types of software.

Use the terms from the list.

Some of the terms in the list will **not** be used. You should only use a term once.

application   assembly language   bootloader   central processing unit (CPU)

firmware   hardware   operating   output   system   user

.... software provides the services that the computer

requires; an example is utility software.

.... software is run on the operating system.

The .... system is run on the firmware, which is run on

the ....

[4]

5   A farm has an automated drinking system for its animals. The drinking system has a water bowl that contains the water. When the water bowl is empty, it is automatically refilled.

The system uses a sensor and a microprocessor.

(a) Identify the most appropriate sensor for this system.

.... [1]

(b) Describe how the sensor and the microprocessor are used to automatically refill the water bowl.

....

....

....

....

....

....

....

....

....

....

....

.... [6]

6 A user wants to connect their computer to a network.

(a) (i) Identify the component in the computer that is needed to access a network.

.... [1]

(ii) Identify the type of address that is allocated to the component by the manufacturer, which is used to uniquely identify the device.

.... [1]

(b) A dynamic internet protocol (IP) address is allocated to the computer when it is connected to the network.

(i) Identify the device on the network that can connect multiple devices and automatically assign them an IP address.

.... [1]

(ii) Describe what is meant by a dynamic IP address.

....

....

....

....

....

.... [3]

7 A programmer uses a low-level language to write a computer program for a vending machine.

(a) Describe what is meant by a low-level language.

....

....

....

.... [2]

(b) Give **two** reasons why the programmer would choose to write the computer program in a low-level language instead of a high-level language.

1 ....

....

2 ....

....
[2]

8 A manager at a company is concerned about a brute-force attack on its employee user accounts.

(a) Describe how a brute-force attack can be used to gain access to the employee user accounts.

....

....

....

....

....

.... [3]

(b) One possible aim for carrying out a brute-force attack is to install malware onto the company network.

(i) State **two** other aims for carrying out a brute-force attack to gain access to the employee user accounts.

1 ....

....

2 ....

....
[2]

(ii) Identify **three** types of malware that could be installed.

1 ....

2 ....

3 ....
[3]

(c) Give **two** security solutions that could be used to help prevent a brute-force attack being successful.

1 ....

....

2 ....

....
[2]

9 A company uses robots in its factory to manufacture large pieces of furniture.

(a) One characteristic of a robot is that it is programmable.

State **two** other characteristics of a robot.

1 ....

....

2 ....

....
[2]

(b) Give **two** advantages to company employees of using robots to manufacture large pieces of furniture.

1 ....

....

2 ....

....
[2]

(c) Give **one** disadvantage to the company's owners of using robots to manufacture large pieces of furniture.

....

.... [1]

10 A student uses the internet for their schoolwork to research what is meant by pharming.

(a) State the aim of pharming.

....

.... [1]

(b) Draw and annotate a diagram to represent the process of pharming.

[4]

(c) The student uses a web browser to access data on the internet.

Explain the purpose of the web browser.

....

....

....

.... [2]

(d) Storing cookies is one function of the web browser.

Give **three** other functions of the web browser.

1 ....

....

2 ....

....

3 ....

....
[3]

(e) A student visits a website that uses session cookies, instead of persistent cookies.

Explain the difference between session cookies and persistent cookies.

....

....

....

....

....

....

....

.... [4]

12

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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.

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 2023 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This document consists of **10** 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.

<table>
<tr><td>

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.

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GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

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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.

</td></tr>
<tr><td>

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.

</td></tr>
</table>

> 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.

Mark scheme abbreviations

/	separates alternative words / phrases within a marking point
//	separates alternative answers within a marking point
<u>underline</u>	actual word given must be used by candidate (grammatical variants accepted)
max	indicates the maximum number of marks that can be awarded
( )	the word / phrase in brackets is not required, but sets the context

Note: No marks are awarded for using brand names of software packages or hardware.

Question	Answer	Marks
1(a)	• B	1
1(b)	**One** mark per each correct conversion • 00110010 • 01100110 • 11011101	3
1(c)	**One** mark for full method of working e.g. conversion to binary then flipping and adding 1 **One** mark for correct answer • 10110010	2
1(d)	**One** marks per each correct nibble **One** mark for correct working in binary (showing 4 correct carries) 1 1　　　　　1 1 0 0 1 1 0 0 1 1 0 1 1 0 0 0 0 1 ‾‾‾‾‾‾‾‾‾‾‾‾‾‾ 10 0 1　　0 1 0 0	3
1(e)	**Two** from: • The result of the calculation is greater than 255 // The value generated is larger than can be stored in the register • The result of the calculation would require more than **8 bits** to be represented // A **register** has a predetermined **number of bits** and there are **too many bits** for it	2

Question	Answer	Marks
2(a)	**One** mark for each correct definition: • The sample rate is the number of samples taken in a second/per time unit • The sample resolution is the number of bits per sample	**2**
2(b)	• Lossy compression	**1**
2(c)(i)	Any **two** from: e.g. • Destination/receivers (IP) address • Packet number • Originator's/senders (IP) address	**2**
2(c)(ii)	Any **five** from: • Data is **broken/split/divided** into packets • Each packet (could) take a different route • A **router** controls the route/path a packet takes • … selecting the **shortest/fastest** available route/path • Packets may arrive out of order • Once the **last packet** has **arrived**, packets are **reordered** • If a packet is missing/corrupted, it is requested again	**5**

Question	Answer	Marks
3(a)	**One** mark for each correctly circled storage device: • Compact disk (CD) • Solid-state drive (SSD) • Hard disk drive (HDD)	**3**
3(b)	• C	**1**

Question	Answer	Marks
4	**One** mark for each correct term in the correct place: • System • Application • Operating • Hardware	**4**

Question	Answer	Marks
5(a)	Any **one** from: • Level • Pressure • Moisture	**1**
5(b)	Any **Six** from: • Sensor **continually** sends **digitised** data to microprocessor • Microprocessor compares data to stored value(s) • If value is outside range / matches microprocessor sends **signal** to release water to refill water bowl • … bowl filled by set amount // bowl filled for certain time • Actuator used to release water • Whole process repeats **until turned off/stopped**	**6**

Question	Answer	Marks
6(a)(i)	• Network interface card/controller // NIC // WNIC	**1**
6(a)(ii)	• Media access control/MAC address // MAC	**1**
6(b)(i)	• Router	**1**
6(b)(ii)	**Three** from: • It can be used to **uniquely identify** a device (on a network) • It can change … • … each time the device is connected to the network	**3**

Question	Answer	Marks
7(a)	Any **two** from: • Close to the language processed by computers • May use mnemonics • An example is assembly language/machine code	**2**
7(b)	Any **two** from: • Can directly manipulate the hardware • No requirement for the program to be portable • Program will be more **memory efficient** • No requirement for a compiler/interpreter • Quicker to execute • Can use specialised hardware	**2**

Question	Answer	Marks
8(a)	**Three** from: • Trial and error to **guess** a **password** • **Combinations** are repeatedly entered … • … until correct password is found • Can be carried out manually or automatically by software	**3**
8(b)(i)	Any **two** from: e.g. • Steal/view/access data • Delete data • Change data • Lock account // Encrypt data • Damage reputation of a business	**2**

Question	Answer	Marks
8(b)(ii)	Any **three** from: e.g. • Virus • Worm • Trojan horse • Spyware • Adware • Ransomware	**3**
8(c)	Any **two** from: • Two-step verification//Two-factor authentication//by example • Biometrics • Firewall // Proxy-server • **Strong/complex** password // by example • Setting a limit for login attempts • Drop-down boxes • Request for partial entry of password	**2**

Question	Answer	Marks
9(a)	Any **two** from: • It has a **mechanical** structure/framework • It has **electrical** components // by example	**2**
9(b)	Any **two** from: e.g. • Employees don't need to lift heavy furniture • Employees can be protected from dangerous tasks • Employees can utilise their skills in other tasks • Employees don't need to perform repetitive/mundane tasks	**2**

Question	Answer	Marks
9(c)	Any **one** from: e.g. • Expensive to **install/purchase/setup** • High ongoing costs/maintenance costs • May deskill the workforce • If they malfunction, production may stop	**1**

Question	Answer	Marks
10(a)	• To obtain **personal** data/details // by example	**1**
10(b)	**One** mark for each correct part of the diagram. Diagram shows: • User clicks/opens attachment/link that triggers download • Malicious software downloaded onto user's computer • User enters website address • User is **redirected** to fake website e.g. 	**4**

Question	Answer	Marks
10(c)	**Two** from: Displays web pages … by rendering HTML	**2**
10(d)	Any **three** from: e.g. • Storing bookmarks/favourites • Recording user history • Allowing use of multiple tabs • Providing navigation tools // by example • Providing an address bar • Managing protocols // by example // checking digital certificate • Send URL to DNS • Sends a request to the **IP address/web server** (to obtain the contents of a webpage) • Runs active script/JavaScript/client-side script • Allows **files** to be downloaded from **website/internet**	**3**
10(e)	Any **four** from: • Session cookies are stored in memory/RAM • … whereas persistent cookies are stored on the hard drive/secondary storage • When the browser is closed a session cookie is lost • … whereas a persistent cookie is not lost • … until deleted by the user/they expire	**4**