Cambridge IGCSE™

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COMPUTER SCIENCE **0478/11**

Paper 1 Theory **May/June 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. Any blank pages are indicated.

1 Jack has an MP3 file stored on his computer.

   (a) (i) Tick (✓) to show which type of data is stored in an MP3 file.

   Tick (✓)

   Video   ☐

   Sound   ☐

   Image   ☐

   [1]

   (ii) Tick (✓) to show whether the MP3 file is a lossy compressed file or a lossless compressed file or **not** a compressed file.

   Tick (✓)

   Lossy compressed file   ☐

   Lossless compressed file   ☐

   Not a compressed file   ☐

   [1]

2 A computer is designed using the Von Neumann model for a computer system.

   The computer has a central processing unit (CPU).

   (a) Data is fetched from primary storage into the CPU to be processed.

   (i) State the name of the primary storage from where data is fetched.

   .... [1]

   (ii) The CPU performs a cycle to process data. Fetch is the first stage in this cycle.

   State the names of the second and third stages in the cycle.

   Second stage ....

   Third stage ....
   [2]

   (iii) Identify **two** components within the CPU that are used in the fetch stage of the cycle.

   Component 1 ....

   Component 2 ....
   [2]

3 Three types of storage media are magnetic, optical and solid state.

(a) One example of solid-state storage is a Solid State Drive (SSD).

Identify **one** other example of solid-state storage.

.... [1]

(b) Optical storage uses a laser to store and read data from a disk.

Explain how the laser is used to store and read data from the disk.

....

....

....

....

....

.... [3]

(c) A business is creating a new mobile device that has an SSD as secondary storage.

(i) Give **three** reasons why an SSD is the most suitable secondary storage for their mobile device.

Reason 1 ....

....

Reason 2 ....

....

Reason 3 ....

....
[3]

(ii) Identify **two** examples of software that can be stored on the SSD.

Example 1 ....

Example 2 ....
[2]

4 All data needs to be converted to binary data so that it can be processed by a computer.

(a) Explain why a computer can only process binary data.

....

....

....

.... [2]

(b) The denary values 64, 101 and 242 are converted to 8-bit binary values.

Give the 8-bit binary value for each denary value.

64 ....

101 ....

242 ....
[3]

Working space

....

....

....

....

....

(c) The hexadecimal values 42 and CE are converted to binary.

Give the binary value for each hexadecimal value.

42 ....

CE ....
[4]

Working space

....

....

....

....

5 An image is stored on a computer. The image is 16-bit colour and is 100 pixels high and 150 pixels wide.

Calculate the file size of the image in bytes. Show all your working.

....

....

....

....

....

Answer .... bytes

[3]

6 A compiler and an interpreter are two different types of translator.

(a) One similarity between a compiler and an interpreter is that they both translate high-level language into machine code.

(i) Give **one** other similarity between a compiler and an interpreter.

....

.... [1]

(ii) Explain **two** differences between a compiler and an interpreter.

....

....

....

....

....

....

....

.... [4]

7 Adele chooses to set a biometric password for her mobile device, instead of a personal identification number (PIN).

(a) State what is meant by a biometric password.

....

.... [1]

(b) Give **two** reasons why a biometric password is more secure than a PIN.

Reason 1 ....

....

Reason 2 ....

....
[2]

(c) Adele has a software-based firewall installed on her mobile device.

The firewall gathers data about the traffic coming into and going out of her mobile device.

Explain how the firewall uses the gathered data to keep the mobile device more secure.

....

....

....

....

....

.... [3]

(d) Adele also encrypts the data on her mobile device to keep it more secure.

State how encryption will keep the data more secure.

....

.... [1]

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8 Consider the following logic statement:

$$X = (((A \text{ AND NOT } B) \text{ OR } (\text{NOT } (B \text{ NOR } C))) \text{ AND } C)$$

(a) Draw a logic circuit to represent the given logic statement.

Do **not** attempt to simplify the logic statement. All logic gates must have a maximum of **two** inputs.

A —

B — X

C —
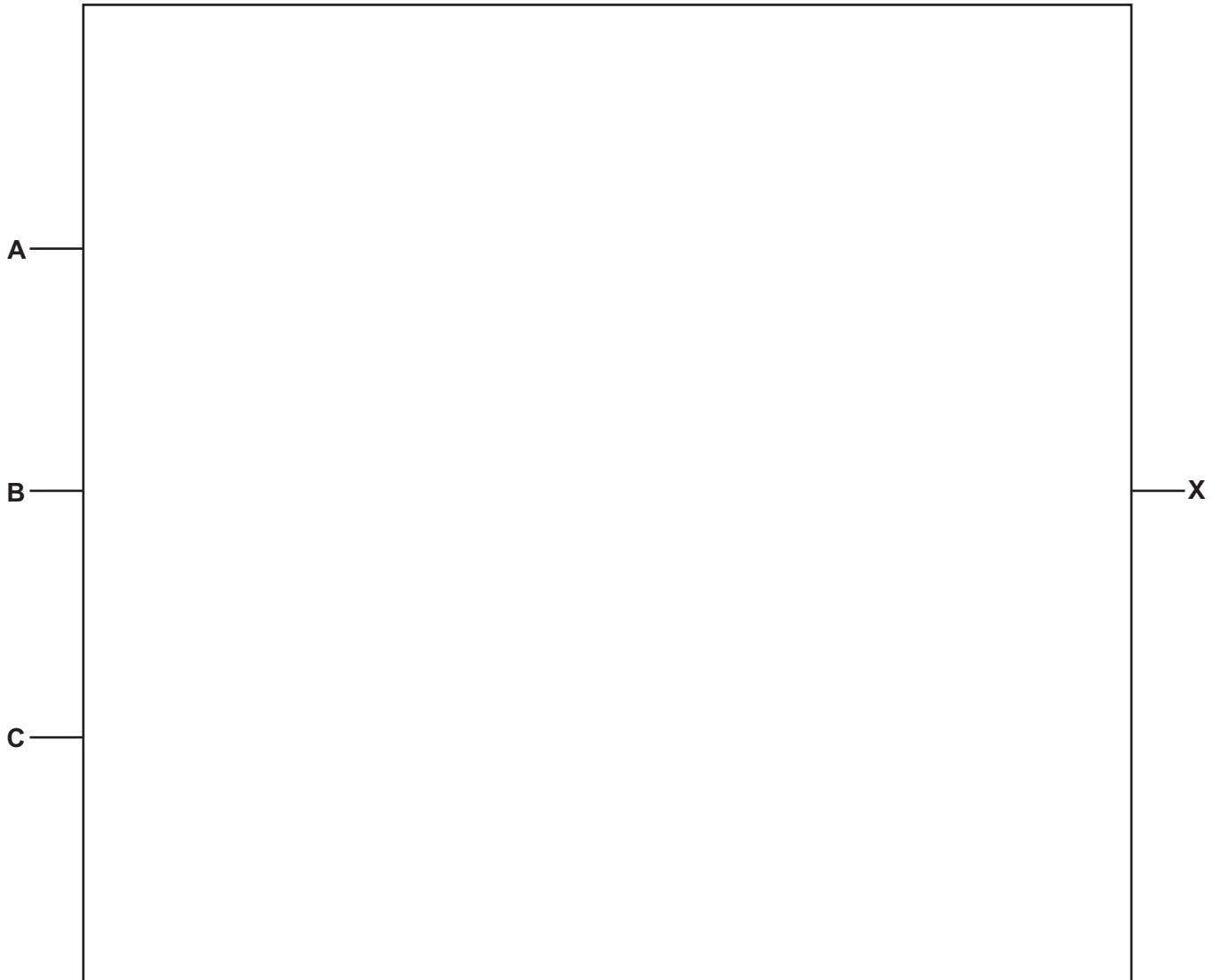
[6]

(b) Complete the truth table for the given logic statement.

A	B	C	Working space	X
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

[4]

 [Turn over

9 Three Internet terms are browser, Internet Protocol (IP) address and
Uniform Resource Locator (URL).

Five statements are given about the Internet terms.

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

Statement	Browser (✓)	IP address (✓)	URL (✓)
it contains the domain name			
it is a type of software			
it converts Hypertext Markup Language (HTML) to display web pages			
it is a type of address			
it stores cookies			

[5]

10 Many devices have a Media Access Control (MAC) address.

Give **three** features of a MAC address.

Feature 1 ....

....

Feature 2 ....

....

Feature 3 ....

....

[3]

11 **(a)** The paragraph describes the process of printing a document using an inkjet printer.

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

- binary
- buffer
- drum
- information
- interrupt
- laser
- liquid
- nozzles
- operating system
- powder
- thermal bubble
- toner

Data is sent from the computer to the printer. The data is held in a print

.... that is temporary storage until the data is

processed to be printed.

Inkjet printers operate by having a print head that moves

.... side to side across the page. These

spray .... ink droplets onto the page. These ink

droplets can be created using piezoelectric or ....

technology.

If the paper jams in the printing process, the printing stops and an

.... is sent to the computer.

[5]

(b) A printer is one example of an output device.

Give **three** other examples of output devices.

Example 1 ....

Example 2 ....

Example 3 ....

[3]

(c) Give **three** examples of input devices.

Example 1 ....

Example 2 ....

Example 3 ....

[3]

12 Computer ethics are a concern for any users of the Internet.

Identify and describe **three** ethical issues that could be a concern when using the Internet.

....

....

....

....

....

....

....

....

....

....

.... [6]

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Paper 1 Theory	**May/June 2022**
MARK SCHEME	
Maximum Mark: 75	

Published

This document consists of **13** printed pages.

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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)(i)	• Sound	1
1(a)(ii)	• Lossy compressed file	1

Question	Answer	Marks
2(a)(i)	• Random access memory // RAM	1
2(a)(ii)	**One** mark for each correct stage Second stage • Decode Third stage • Execute	2
2(a)(iii)	Any **two** from: • Memory address register // MAR • Memory data register //MDR • Program counter // PC • Control unit // CU • Address bus • Data bus • Control bus	2

Question	Answer	Marks
3(a)	Any **one** from e.g.: • SD card • USB flash memory drive • Random access memory // RAM	**1**
3(b)	Any **three** from: • Laser is shone at the disk • An (arm/head) moves the **laser** across the surface of the disk • The **laser** burns **pits** onto the surface of the disk • The **laser** is used to **read the pits and lands** on the surface of the disk • The **reflected** light from the laser shining on the disk is **captured** (by a sensor)	**3**
3(c)(i)	Any **three** from: • It is **small** in size // compact // lightweight // portable • It has low power consumption • It runs quietly • It runs at a cool temperature • It is robust when dropped // durable • Fast **access**/**read**/**write** speed • High capacity • Not affected by magnets	**3**
3(c)(ii)	• Operating system • Application software // by example • Utility software // by example	**2**
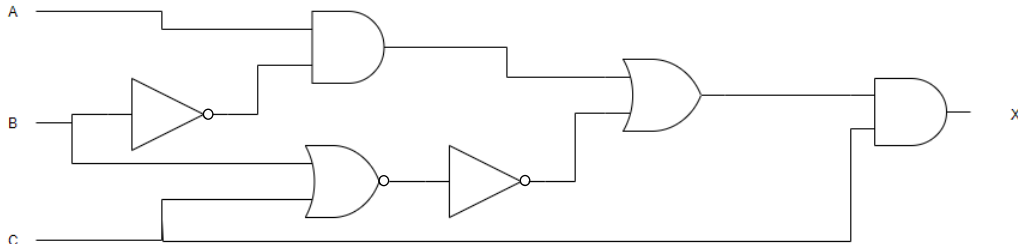
Question	Answer	Marks
4(a)	• Computer consist of transistors / logic circuits/gates … • … that can only **store**/**process** data in **two states / high-low / on-off / 1 and 0**	**2**
4(b)	• 01000000 • 01100101 • 11110010	**3**
4(c)	• 0100 (1 mark) 0010 (1 mark) • 1100 (1 mark) 1110 (1 mark)	**4**

•

Question	Answer	Marks
5	**Two** marks for two correct stages of working, **one** mark for correct final answer • 100×150 • $15\,000 \times 16$ // $15\,000 \times 2$ • $240\,000 / 8$ • 30 000 bytes	**3**

Question	Answer	Marks
6(a)(i)	• They both report/check for errors	1
6(a)(ii)	**Four** from (**MAX 2** per translator): • An interpreter translates the code line by line (and executes each line immediately) • … whereas a compiler translates the whole code **at the same time** (before executing it) • A compiler produces an executable file • … but an interpreter does not • An interpreter is required to run the code each time if used • … whereas a compiler is not • An interpreter stops and reports an error as it is encountered • … whereas a compiler creates a report of all errors at the end of translation • An interpreter will run code up to the point it finds an error • … whereas a compiler will not run the code at all if an error is found	4

Question	Answer	Marks
7(a)	Any **one** from: • Uses biological data • It uses **characteristics/features** that belong to a **human**	1
7(b)	Any **two** from**:** • A biometric password cannot be guessed • It is very difficult to fake a biometric password • A biometric password cannot be recorded by a keylogger/spyware • A perpetrator cannot shoulder surf to see a biometric password	2

Question	Answer	Marks
7(c)	Any **three** from: • The traffic/data is **compared to** set criteria/rules/whitelist/blacklist • If the traffic/data does/does not meet the criteria/rules/whitelist/blacklist it will be rejected/blocked … • … and an alert can be sent to warn Adele • … this can help prevent hackers/malicious software (gaining access to the data)	**3**
7(d)	• It makes the data meaningless	**1**

Question	Answer	Marks
8(a)	**One** mark for each correct logic gate with correct input(s) 	**6**

Question	Answer	Marks
8(b)	**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	**4**

A	B	C	Working space	X
0	0	0		**0**
0	0	1		**1**
0	1	0		**0**
0	1	1		**1**
1	0	0		**0**
1	0	1		**1**
1	1	0		**0**
1	1	1		**1**

Question	Answer	Marks
9(a)	**One** mark for each correct row:	**5**

Statement	Browser (✓)	IP address (✓)	URL (✓)
it contains the domain name			✓
it is a type of software	✓		
it converts Hypertext Markup Language (HTML) to display web pages	✓		
it is a type of address		✓	✓
it stores cookies	✓		

Question	Answer	Marks
10	Any **three** from: • It is a unique address • It is assigned by the manufacturer • It can be used to identify a device • It contains the manufacturer ID/code/number • It contains the **serial** code/number • It is written in hexadecimal • It has 6 bytes/48 bits/6 pairs of digits • Does not (usually) change // static	**3**

Question	Answer	Marks
11(a)	**One** mark for each of the correct terms, in the correct place • buffer • nozzles • liquid • thermal bubble • interrupt	**5**
11(b)	Any **three** from e.g.: • Monitor // screen • Speaker • Headphones • Light // LED • (2D/3D) cutter • DLP // LCD projector • Actuator	**3**
11(c)	Any **two** from e.g.: • Keyboard • Mouse // trackerball • Microphone • (2D/3D) scanner • Barcode reader • QR code reader • **Digital** camera // webcam • Interactive whiteboard • Touchscreen • Sensor	**3**

Question	Answer	Marks

12	**One** mark for identification of an issue and **one** mark for a description e.g.:
	
	 • Plagiarism
	    – The copying of other people's work without their permission
	    – Claiming someone else's work as your own
	
	 • Hacking
	    – Unauthorised access to a computer/data
	
	 • Malware
	    – Malicious software designed to damage a computer system or stored data
	
	 • Spyware
	    – Keylogger used to record keypresses and sends them to third party
	
	 • Ransomware
	    – Holding hostage a user's data, often for a release fee
	
	 • Intellectual property theft
	    – Stealing other people work
	
	 • Breaching copyright
	    – Breaking the law by copying someone's work
	
	 • Piracy
	    – Using piracy websites to gain content for free that should have been paid for
	
	 • Privacy
	    – A person's data could be leaked
	
	 • Phishing
	    – Sending an email to lure users to a fake site to obtain their personal details
		6

Question	Answer	Marks

12	• Pharming
	  – Downloading of malicious code to redirect user to fake website to obtain their personal details
	
	• Data protection
	  – A person's data is not used according to the law
	
	• Cyber bullying
	  – Using the internet to bully people
	
	• Inappropriate materials
	  – Materials that could cause harm/offense to people e.g. minors
	
	• Fake news
	  – News stories that could be very misleading or harmful
	
	• Software cracking
	  – Changing code to e.g. bypass a licence for software
	
	• Addiction
	  – Aspects of the internet e.g. social media can cause this
	
	• Environmental effects
	  – Increased use of the internet increases the use of electrical power	