Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

COMPUTER SCIENCE **0478/11**

Paper 1 Theory **May/June 2021**

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

1 Benedict has a computer that is assigned an Internet Protocol (IP) address. The IP address is:

198.167.214.0

The IP address is represented as denary values.

(a) Convert the denary values 167 and 214 from the IP address to 8-bit binary.

167 | | | | | | | | |
|---|---|---|---|---|---|---|---|

214 | | | | | | | | |
|---|---|---|---|---|---|---|---|

Working space

....

....

....

....
[2]

(b) Benedict's computer is also assigned a Media Access Control (MAC) address.

(i) Identify **one** similarity between an IP address and a MAC address.

....

.... [1]

(ii) Identify **two** differences between an IP address and a MAC address.

Difference 1 ....

....

....

Difference 2 ....

....

....
[2]

2 Julia inputs personal data into her computer.

She stores three copies of the data using a hard disk drive (HDD), a solid state drive (SSD) and a USB flash memory drive.

(a) Identify **three** devices Julia can use to input personal data into her computer.

Device 1 ....

Device 2 ....

Device 3 ....
[3]

(b) Six statements are shown about HDDs, SSDs and USB flash memory drives.

Tick (✓) to show which statements apply to each type of storage. Some statements can apply to more than one type of storage.

Statement	HDD (✓)	SSD (✓)	USB flash memory drive (✓)
it has no moving parts			
it is non-volatile			
it can use NAND gates to store data			
it uses magnetic properties to store data			
it has the smallest physical size			
it has the slowest read/write speeds			

[6]

(c) Julia uses a USB connection to transfer data onto her USB flash memory drive.

    (i) One benefit of using a USB connection is that it is a universal connection.

       State **two** other benefits of using a USB connection.

       Benefit 1 ....

       ....

       Benefit 2 ....

       ....
            [2]

    (ii) Identify the type of data transmission used in a USB connection.

       .... [1]

3 A firewall can be used to help keep the data secure that is stored on a computer.

(a) The given paragraph describes how the firewall operates to help keep the data secure.

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

- Accept
- Criteria
- Hacking
- Input
- Network
- Outgoing
- Output
- Processor
- Reject
- Software
- Store
- Storage

A firewall can be .... or hardware based. It monitors traffic between

the computer and the .... The user sets ....

for the traffic. The firewall will .... or ....

the traffic based on this. It can help prevent .... and malicious

software that could be a threat to the security of the data.

[6]

(b) Identify **three** other methods that could be used to keep the data secure.

Method 1 ....

Method 2 ....

Method 3 ....

[3]

4 Two internet risks are phishing and pharming.

Describe what is meant by phishing and pharming.

Phishing ....

....

....

....

....

Pharming ....

....

....

....

....

[6]

5 Jamelia has a greenhouse that she uses to grow fruit and vegetables. She needs to make sure the temperature in the greenhouse stays between 25 °C and 30 °C (inclusive).

A system that has a temperature sensor and a microprocessor is used to maintain the temperature in the greenhouse. The system will:

- open a window and turn a heater off if it gets too hot
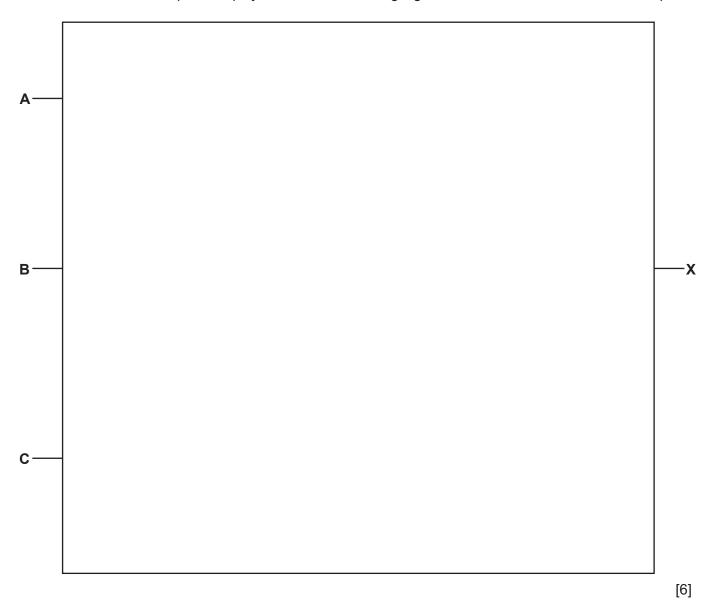- close a window and turn a heater on if it gets too cold.

Describe how the system uses the temperature sensor and the microprocessor to maintain the temperature in the greenhouse.

....

....

....

....

....

....

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....

....

....

....

....

....

.... [8]

6 Consider the logic statement:

$$X = (((A \text{ AND } B) \text{ OR } (C \text{ AND NOT } B)) \text{ XOR NOT } C)$$

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

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

A ──────

B ──────   ──X

C ──────

[6]

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

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		1
5	1	0	0		0
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]

7 A music company has a website that allows users to stream music. The music is stored in sound files.

(a) The sound files are compressed using lossless compression.

(i) Describe how the sound files are compressed using lossless compression.

....

....

....

....

....

....

....

....

....

.... [4]

(ii) State **one** reason why the music company would compress the sound files using lossless, rather than lossy, compression.

....

.... [1]

(iii) Give **one** benefit, to the user, of the music company compressing the sound files.

....

.... [1]

(iv) Give **one** drawback of the music company using lossless, rather than lossy, compression for the sound files.

....

.... [2]

(b) Describe how the web pages for the website are requested and displayed on a user's computer.

....

....

....

....

....

....

....

.... [4]

(c) The web server that hosts the website suffers a denial of service (DoS) attack.

Explain why this will prevent users from accessing the website.

....

....

....

.... [2]

8 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
01100100	
10010001	
00000011	
10110010	

[4]

(b) An error may **not** be detected when using a parity check.

Identify why an error may **not** be detected.

....

.... [1]

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

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

....

....

....

....

....

....

....

.... [4]

(ii) State **two** drawbacks of using parallel data transmission.

Drawback 1 ....

....

Drawback 2 ....

....

[2]

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Cambridge IGCSE™

COMPUTER SCIENCE **0478/11**

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)	One mark per each correct register. | 1	0	1	0	0	1	1	1 | | 1	1	0	1	0	1	1	0		**2**
1(b)(i)	Any **one** from: − Both addresses can be used to identify a computer/device − Both are unique − Both can be represented as hexadecimal − Both addresses do not change if IP address is static	**1**
1(b)(ii)	Any **two** from: − An IP address is assigned by the network/router/ISP, A MAC address is assigned by the manufacturer − An IP address can be changed (if dynamic), MAC address cannot be changed − IP address has 4/8 groups of values, MAC address has 6 groups/pairs of values − IP address is 32-bit/128-bit, MAC address is 48-bit − IP address does not contain serial number/manufacturer number, MAC address does − IP(v4) address is denary and MAC address is hexadecimal	**2**

Question	Answer	Marks
2(a)	Any **three** from: − Keyboard − Mouse − Microphone − Keypad − Touchscreen − Touchpad	**3**

Question	Answer	Marks
2(b)	One mark for each correct row.	6

Statement	HDD (✓)	SSD (✓)	USB flash memory drive (✓)
it has no moving parts		✓	✓
it is non-volatile	✓	✓	✓
it can use NAND gates to store data		✓	✓
it uses magnetic properties to store data	✓		
it has the smallest physical size			✓
it has the slowest read/write speeds	✓		

Question	Answer	Marks
2(c)(i)	Any **two** from: – It cannot be inserted incorrectly – Supports different transmission speeds – High speed **transmission** – **Automatically** detected (not connected) // automatically downloads drivers – Powers the device (for data transfer) – Backward compatible	2
2(c)(ii)	– Serial	1

Question	Answer	Marks
3(a)	One mark per each correct term in the correct order. – Software – Network – Criteria – Accept // reject – Reject // accept – Hacking	6

Question	Answer	Marks
3(b)	Any **three** from: – Password – Biometrics (device) – Encryption – Physical methods (e.g. locks) – Two-factor authentication // Two-step verification – Anti-viruses	**3**

Question	Answer	Marks
4	Any **six** from: Phishing – Legitimate looking email sent to user – encourages user to **click a link** that directs user to a fake website – User encouraged to enter personal details into a fake website // designed to obtain personal details from a user Pharming – Malicious code/malware is downloaded/installed // software downloaded without users' knowledge – … that **re-directs** user to fake website (when legitimate URL entered) – User encouraged to enter personal details into a fake website // designed to obtain personal details from a user	**6**

Question	Answer	Marks
5	**Eight** from: – Sensor send data/readings/signal to microprocessor – Data is converted from analogue to digital (using ADC) – Microprocessor compares/checks data to stored values/range of values … – … If data is greater than 30 / above the range microprocessor sends **signal** to open window and to turn heater off – … If data is below 25 the microprocessor sends **signal** to turn on heater and to close window – … If data is between 25 and 30 / within the range no action taken – Actuator is used to operate heater/window – **Whole** process is continuous	**8**

Question	Answer	Marks
6(a)	One mark per each correct logic gate, with correct input:	6
6(b)	– Row 1 – Row 3 – Row 4 – Row 5	4

Question	Answer	Marks
7(a)(i)	**Four** from: – (Compression) **algorithm** is used – No data will be removed // original file can be restored – Example of type of algorithm that would be used e.g. RLE – Repeated patterns in the music are identified – … and indexed NOTE: If another lossless method is described, marks can be awarded.	4
7(a)(ii)	Any **one** from: – To provide the highest quality of music file (that compression will allow) – The user is able to listen to the original sound file – No loss of quality for the sound file provided	1
7(a)(iii)	Any **one** from: – Allow for quicker streaming speed – Would not require as much bandwidth (to stream) – Does not need as much RAM – Smoother listening experience // less lag – Will not use as much of data allowance	1

Question	Answer	Marks
7(a)(iv)	**Two** from: – Streaming speed may be slower – … and may affect listening experience // buffering may occur – User may need more bandwidth to stream – … that could be more expensive – It would be a larger file size – … so may take longer to upload – … so will take up more storage space … – … on webserver	**2**
7(b)	Any **four** from: – Browser sends URL to DNS – … using HTTP/HTTPS – IP address is found on DNS – DNS returns IP address to the browser – Browser sends request to web server/IP address – Web server sends web pages back to browser – Browser **interprets/renders** the HTML (to display web pages) – Security certificates exchanged	**4**
7(c)	**Two** from: – **Web server** has been flooded with traffic // **web server** has been sent many requests at once – … so, server is brought to a halt / crashes	**2**

Question	Answer	Marks
8(a)	– Odd – Odd – Even – Even	**4**
8(b)	Any **one** from: – there is a transposition of bits – it does not check the order of the bits (just the sum of 1s/0s) – even number of bits change – incorrect bits still add up to correct parity	**1**
8(c)(i)	**Four** from: – Multiple **bits** are sent **at the same time** – Uses multiple wires – Data is sent in both directions … – … but only one direction **at a time**	**4**
8(c)(ii)	Any **two** from: – Bits may arrive skewed – More expensive **to setup/manufacture/purchase cable** – Limited distance – More prone to interference/error	**2**