

- 1 (a) Elle has a file stored on her computer that is 20 MB in size. Jordan has a file that is 10 GB in size.

Tick (✓) to show which is the **larger** file.

File size	Tick (✓)
20 MB	
10 GB	

[1]

- (b) Bob has a file stored on his computer that is 3500 kB in size. Gerty has a file that is 3 MB in size.

Tick (✓) to show which is the **larger** file.

File size	Tick (✓)
3500 kB	
3 MB	

[1]

- 2 Many computer systems have an input device and an output device.

- (a) (i) State what is meant by an input device.

.....

..... [1]

- (ii) Give an example of an input device.

..... [1]

- (b) (i) State what is meant by an output device.

.....

..... [1]

- (ii) Give an example of an output device.

..... [1]

- 3 (a) A long distance running race uses an electronic counter that counts each competitor who finishes the race.

The count is stored as binary in a **12-bit** register.

A denary value of the count is displayed on a screen above the finish line.

- (i) The screen currently displays:

0	0	3	9
---	---	---	---

State the binary value that is currently stored to display the count shown.

..... [2]

- (ii) More competitors cross the finish line and the screen now displays:

0	3	5	0
---	---	---	---

State the binary value that is currently stored to display the count shown.

..... [2]

- (iii) At the end of the race the binary value stored is:

011011000111

Give the denary value that would be displayed on the screen at the end of the race.

Show your working.

.....
.....
.....
.....

Screen display:

--

[2]

- (b) Sensors are used at the finish line to identify the number of competitors who finish the race.

(i) Identify **two** different sensors that could be used to identify the number of competitors.

Sensor 1

Sensor 2.....

[2]

- (ii) The sensors are used with a microprocessor to count how many competitors finish the race.

Explain how the sensor and the microprocessor are used.

[6]

[6]

- 4 Darius is writing a computer program that allows binary values to be calculated.

Darius chooses to write the program in a high-level language rather than a low-level language.

- (a) Explain why Darius chooses to write the program in a high-level language.

.....

 [2]

- (b) Darius will use a translator to translate the program. He could use a compiler or an interpreter.

Five statements are given about compilers and interpreters.

Tick (✓) to show if the statement applies to a **Compiler** or an **Interpreter**. Statements may apply to both.

Statement	Compiler (✓)	Interpreter (✓)
A report of errors is produced at the end of translation.		
The program is translated one line at a time.		
The program is translated from high-level language into machine code.		
An executable file is produced.		
The program will not run at all if an error is detected.		

[5]

Darius is sending several programs that he has created to his friend Selma.

- (c) He wants to compress the files to send them as he needs to attach them to an email.

Darius tells Selma he is going to use lossy compression. Selma tells him that he should use lossless instead.

Explain why Selma tells Darius to use lossless compression instead of lossy.

.....
.....
.....
.....
.....
.....
.....
.....
.....

[4]

- (d) Errors can occur when data is transmitted, stored or entered into a system.

Darius could use an error detection method to find whether errors have occurred.

One error detection method he could use is a checksum.

- (i) Describe how a checksum detects errors.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

[5]

- (ii) State **three** other error detection methods that Darius could use.

Method 1

Method 2

Method 3

[3]

- 5 Consider the following logic statement:

$$X = 1 \text{ if } ((A \text{ is } 1 \text{ NAND } C \text{ is } 1) \text{ NOR } A \text{ is NOT } 1) \text{ OR } (B \text{ is } 1 \text{ AND } C \text{ is NOT } 1)$$

- (a) Draw a logic circuit that represents the given logic statement. Your logic gates must have a maximum of two inputs. Do **not** simplify the logic statement.



[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]

- 6 Nadia purchases a printer to print out her homework.

She connects the printer to her computer using USB.

- (a) Explain what is meant by USB.

.....
.....
.....
.....
..... [3]

- (b) Nadia's printer uses powdered toner rather than liquid ink.

- (i) State the type of printer Nadia has purchased.

..... [1]

- (ii) Give **two** benefits of using this type of printer.

Benefit 1

.....
.....
.....
..... [2]

- (iii) Give **one** drawback of using this type of printer.

Drawback 1

..... [1]

- (c) Nadia uses several types of computer storage for her homework and other projects.

- (i) **Five** examples of computer storage are given.

Tick (✓) to show if the computer storage is Primary, Secondary or Off-line.

Storage example	Primary (✓)	Secondary (✓)	Off-line (✓)
Solid state drive (SSD)			
Blu-ray disc			
USB flash memory			
Random access memory (RAM)			
Read only memory (ROM)			

[5]

- (ii) Nadia is considering purchasing a magnetic storage device.

Describe how a magnetic storage device stores data.

[6]

- (iii) Give **two** advantages of using a magnetic storage device rather than a solid state storage device.

Advantage 1

.....
Advantage 2

[2]

- 7 Arya regularly uses the Internet as a research tool for her school projects.

Identify **and** describe **three** risks to Arya's computer when she is using the Internet for research.

Risk 1

Description

.....
.....

Risk 2

Description

.....
.....

Risk 3

Description

.....
.....

[6]

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.

COMPUTER SCIENCE

0478/12

Paper 1

March 2019

MARK SCHEME

Maximum Mark: 50

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 March 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **9** 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:

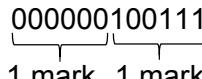
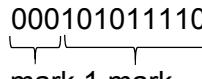
Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

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.

Question	Answer		Marks						
1(a)	<table border="1"> <thead> <tr> <th>File size</th> <th>Tick (✓)</th> </tr> </thead> <tbody> <tr> <td>20 MB</td> <td></td> </tr> <tr> <td>10 GB</td> <td>✓</td> </tr> </tbody> </table>	File size	Tick (✓)	20 MB		10 GB	✓		1
File size	Tick (✓)								
20 MB									
10 GB	✓								
1(b)	<table border="1"> <thead> <tr> <th>File size</th> <th>Tick (✓)</th> </tr> </thead> <tbody> <tr> <td>3500 kB</td> <td>✓</td> </tr> <tr> <td>3 MB</td> <td></td> </tr> </tbody> </table>	File size	Tick (✓)	3500 kB	✓	3 MB			1
File size	Tick (✓)								
3500 kB	✓								
3 MB									

Question	Answer	Marks
2(a)(i)	– (A device that allows) data to be entered (into a computer system)	1
2(a)(ii)	One from e.g.: <ul style="list-style-type: none"> – Keyboard – Mouse – Microphone – Sensor – Touch screen 	1
2(b)(i)	– (A device that allows the user to) view/hear the data (that has been entered into a computer system)	1
2(b)(ii)	One from e.g. : <ul style="list-style-type: none"> – Monitor – Speaker – Headphones – Printer 	1

Question	Answer	Marks
3(a)(i)	<ul style="list-style-type: none"> –  1 mark 1 mark 	2
3(a)(ii)	<ul style="list-style-type: none"> –  1 mark 1 mark 	2
3(a)(iii)	<p>1 mark for working, 1 mark for correct answer</p> <ul style="list-style-type: none"> – $1024 + 512 + 128 + 64 + 4 + 2 + 1$ – 1735 	2
3(b)(i)	<p>Two from:</p> <ul style="list-style-type: none"> – Pressure sensor – Light sensor – Motion sensor – Magnetic field (can be used if competitors are wearing a compatible chip) 	2
3(b)(ii)	<ul style="list-style-type: none"> – Sensor sends signal to microprocessor – Signal is analogue and is converted to digital (using ADC) – Data is compared to stored value // Check for signal – If data does not match / is out of range/ in range // signal detected ... – ... counter is incremented by 1 – Continuous process 	6

Question	Answer	Marks																		
4(a)	<p>Two from:</p> <ul style="list-style-type: none"> - Closer to English statements / human language - Easier / quicker to write / read / understand / remember - Easier / quicker to debug - Less likely to make errors - One line of code can carry out multiple commands - Portable language 	2																		
4(b)	<p>1 mark for correct tick(s) for each statement</p> <table border="1"> <thead> <tr> <th>Statement</th><th>Compiler</th><th>Interpreter</th></tr> </thead> <tbody> <tr> <td>A report of errors is produced at the end of translation</td><td>✓</td><td></td></tr> <tr> <td>The program is translated one line at a time</td><td></td><td>✓</td></tr> <tr> <td>The program is translated from high-level language into machine code</td><td>✓</td><td>✓</td></tr> <tr> <td>An executable file is produced</td><td>✓</td><td></td></tr> <tr> <td>The program will not run at all if an error is detected</td><td>✓</td><td></td></tr> </tbody> </table>	Statement	Compiler	Interpreter	A report of errors is produced at the end of translation	✓		The program is translated one line at a time		✓	The program is translated from high-level language into machine code	✓	✓	An executable file is produced	✓		The program will not run at all if an error is detected	✓		5
Statement	Compiler	Interpreter																		
A report of errors is produced at the end of translation	✓																			
The program is translated one line at a time		✓																		
The program is translated from high-level language into machine code	✓	✓																		
An executable file is produced	✓																			
The program will not run at all if an error is detected	✓																			
4(c)	<ul style="list-style-type: none"> - Lossy would remove data - Lossless does not remove data // No data can be lost ... - Can be restored to original state ... - ... otherwise will not run / work correctly 	4																		
4(d)(i)	<ul style="list-style-type: none"> - Sending device creates value from calculation on data // By example - Value is transmitted with the data - Receiving device performs same calculation - Values are compared after transmission // If values do not match ... - ... an error is detected 	5																		

Question	Answer	Marks
4d(ii)	<ul style="list-style-type: none"> – Parity check – Check digit – Automatic repeat request 	3

Question	Answer	Marks
5(a)	<p>1 mark for each correct logic gate with correct input(s)</p>	6

Question	Answer	Marks																																													
5(b)	<p>4 marks for 8 correct outputs 3 marks for 6/7 correct outputs 2 marks for 4/5 correct outputs 1 mark for 2/3 correct outputs</p> <table border="1"> <thead> <tr> <th>A</th> <th>B</th> <th>C</th> <th>Working space</th> <th>X</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>0</td><td></td><td>0</td></tr> <tr><td>0</td><td>0</td><td>1</td><td></td><td>0</td></tr> <tr><td>0</td><td>1</td><td>0</td><td></td><td>1</td></tr> <tr><td>0</td><td>1</td><td>1</td><td></td><td>0</td></tr> <tr><td>1</td><td>0</td><td>0</td><td></td><td>0</td></tr> <tr><td>1</td><td>0</td><td>1</td><td></td><td>1</td></tr> <tr><td>1</td><td>1</td><td>0</td><td></td><td>1</td></tr> <tr><td>1</td><td>1</td><td>1</td><td></td><td>1</td></tr> </tbody> </table>	A	B	C	Working space	X	0	0	0		0	0	0	1		0	0	1	0		1	0	1	1		0	1	0	0		0	1	0	1		1	1	1	0		1	1	1	1		1	4
A	B	C	Working space	X																																											
0	0	0		0																																											
0	0	1		0																																											
0	1	0		1																																											
0	1	1		0																																											
1	0	0		0																																											
1	0	1		1																																											
1	1	0		1																																											
1	1	1		1																																											

Question	Answer	Marks
6(a)	<p>Three from:</p> <ul style="list-style-type: none"> – Universal Serial Bus – Data transmission method – Uses serial transmission // bits of data are sent one at a time – Universal standard // common interface 	3
6(b)(i)	<ul style="list-style-type: none"> – Laser printer 	1

Question	Answer	Marks																								
6(b)(ii)	<p>Two from:</p> <ul style="list-style-type: none"> – Cheaper printing cost per page – It prints at a faster speed – It prints text at a high quality – Colour fast 	2																								
6(b)(iii)	<p>One from:</p> <ul style="list-style-type: none"> – Expensive to purchase printer – Toner is expensive – Print images at a lower quality – Can be quite large in size 	1																								
6(c)(i)	<p>1 mark per each correct tick</p> <table border="1"> <thead> <tr> <th>Storage example</th><th>Primary</th><th>Secondary</th><th>Off-line</th></tr> </thead> <tbody> <tr> <td>Solid state drive (SSD)</td><td></td><td>✓</td><td></td></tr> <tr> <td>Blu-ray disc</td><td></td><td></td><td>✓</td></tr> <tr> <td>USB flash memory</td><td></td><td></td><td>✓</td></tr> <tr> <td>Random access memory (RAM)</td><td>✓</td><td></td><td></td></tr> <tr> <td>Read only memory (ROM)</td><td>✓</td><td></td><td></td></tr> </tbody> </table>	Storage example	Primary	Secondary	Off-line	Solid state drive (SSD)		✓		Blu-ray disc			✓	USB flash memory			✓	Random access memory (RAM)	✓			Read only memory (ROM)	✓			5
Storage example	Primary	Secondary	Off-line																							
Solid state drive (SSD)		✓																								
Blu-ray disc			✓																							
USB flash memory			✓																							
Random access memory (RAM)	✓																									
Read only memory (ROM)	✓																									

Question	Answer	Marks
6(c)(ii)	<p>Six from:</p> <ul style="list-style-type: none"> – Storage device has platters – Platters/disk divided into tracks – Storage 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 <p>NOTE: Marks can be awarded for an alternative description e.g. magnetic tape</p>	6
6(c)(iii)	<ul style="list-style-type: none"> – Magnetic is cheaper per unit of data – Magnetic has more longevity // Magnetic can perform more read/write cycles 	2

Question	Answer	Marks
7	<p>For each of three risks Naming the risk – 1 mark, describing the risk – 1 mark:</p> <ul style="list-style-type: none"> – Hacking ... – ... when a person tries to gain unauthorised access to a computer system – ... data can be deleted/corrupted by hacker – Malware ... – ... a software program designed to damage data / disrupt the computer system – ... replicates itself and fills the hard disk – Virus ... – ... a program that replicates itself to damage / delete files <p>NOTE: Multiple kinds of malware can be awarded if listed and given a matching description e.g. trojan horse, worm.</p>	6



Cambridge IGCSE™

CANDIDATE
NAME

--	--	--	--	--

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



COMPUTER SCIENCE

0478/12

Paper 1 Theory

February/March 2020

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. Blank pages are indicated.

- 1 The Von Neumann model for a computer system uses components, such as registers and buses, in the fetch-execute cycle.

- (a) Draw a line to connect each component to its correct description.

Component	Description
Control Bus	Increments to point to the address of the next instruction to be fetched
Program Counter (PC)	Holds the result of a calculation. It is located within the Arithmetic Logic Unit (ALU)
Memory Data Register (MDR)	Carries signals to synchronise the fetch-execute cycle
Accumulator (ACC)	Temporary storage between the Central Processing Unit (CPU) and primary memory

[3]

- (b) State **two** buses, other than the control bus, used in the Von Neumann model for a computer system.

1

2

[2]

- 2 A school network is used to transmit and store data about students.

- (a) Different types and methods of transmission can be used to send data across the network.

Three descriptions about data transmission are given.

Tick () **one Method** and tick () **one Type** for each description.

Description	Method		Type		
	Serial (<input checked="" type="checkbox"/>)	Parallel (<input checked="" type="checkbox"/>)	Simplex (<input checked="" type="checkbox"/>)	Half-duplex (<input checked="" type="checkbox"/>)	Duplex (<input checked="" type="checkbox"/>)
Data is sent down a single wire in a single direction only.					
Data is sent down multiple wires in both directions, at the same time.					
Data is sent down a single wire in both directions, but never at the same time.					

[3]

- (b) Parity bits are used to help detect errors in data transmission. A parity bit is added to each binary value before transmission.

Three binary values are to be transmitted using **even** parity.

- (i) Complete the parity bit that would be added to each binary value for even parity.

Binary value							Parity bit
1	1	0	0	1	1	1	
1	0	1	0	1	0	1	
0	1	1	0	1	0	0	

[3]

- (ii) A number of errors occurred during data transmission.

State why a parity check may **not** detect transmission errors.

.....
.....
.....

[1]

- (c) Data is encrypted using 128-bit symmetric encryption before it is transmitted.

- (i) Explain what is meant by encryption.

.....
.....
.....
.....

[2]

- (ii) State how the strength of the encryption can be improved.

.....
.....

[1]

- (d) Describe how the school could prevent the loss of stored data.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
..... [6]

3 Priya studies music at school. She is buying a new computer to complete her school work at home.

- (a) Priya has a choice between an internal Hard Disk Drive (HDD) and an internal Solid State Drive (SSD) to store data.

- (i) Give **one** similarity between an HDD and an SSD.

.....
..... [1]

- (ii) Explain **three** differences between an HDD and an SSD.

1

.....
.....

2

.....
.....

3

.....
.....
..... [3]

- (b) Priya needs to transfer files between the school and her home computer.

Identify **one** off-line storage device she could use to transport the files.

..... [1]

- (c) Priya is using sound editing software to record and edit different music tracks.

- (i) Identify **two** input devices she would use for this task.

Device 1

Device 2

[2]

- (ii) Identify **two** output devices she would use for this task.

Device 1

Device 2

[2]

- (d) Priya shares her sound files with other students. Before sharing the sound files, she compresses the files using lossless compression.

Describe how lossless compression reduces the size of a sound file.

.....
.....
.....
.....

[2]

- (e) Priya currently uses MIDI files to store her music. Priya's friends have asked her if they can have an MP3 version of the file.

- (i) Give **two** features of a MIDI file.

1

.....
2

[2]

- (ii) Give **two** features of an MP3 file.

1

.....
2

[2]

- 4 Assemblers, compilers and interpreters are types of translators.

Tick () to show which statements apply to each translator. Each statement may apply to more than one type of translator.

Statement	Assembler (<input checked="" type="checkbox"/>)	Compiler (<input checked="" type="checkbox"/>)	Interpreter (<input checked="" type="checkbox"/>)
Translates low-level language to machine code			
Translates high-level language to machine code			
Produces error messages			
Translates high-level language one line at a time			
Produces an executable file			

[5]

- 5 Programmers can use denary and hexadecimal values. These values are stored in a computer system using binary.

- (a) Explain why binary is used to store data in a computer system.

.....
.....
.....
.....

[2]

- (b) Complete the table to show how the denary value would be stored as binary in an 8-bit register.

Denary value	8-bit register
129	
56	

[2]

Working space

.....

.....

.....

.....

.....

.....

- (c) Complete the table to show how the hexadecimal value **3A9** would be stored as binary in a 12-bit register.

--	--	--	--	--	--	--	--	--	--	--	--

[3]

- (d) Identify **two** uses of hexadecimal values in computer science.

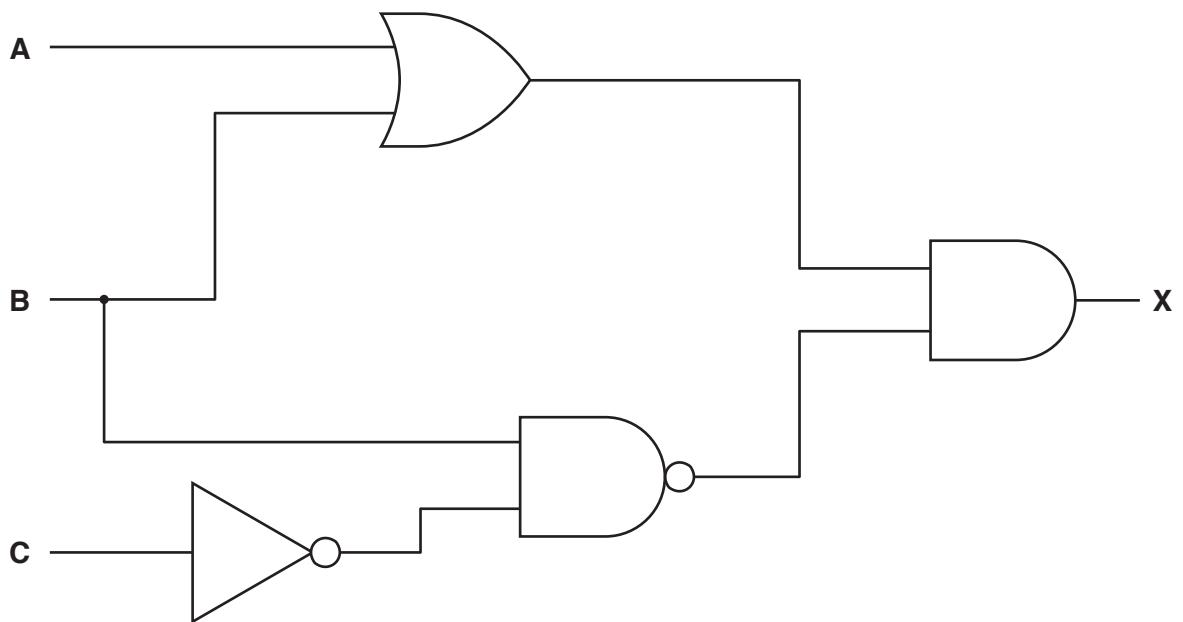
1

2

[2]

- 6 (a) Complete the truth table for the given logic circuit.

Do **not** attempt to simplify the logic circuit.



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]

- (b) A water control system uses a switch and two pressure sensors.

The outputs of the switch and sensors are shown in the table.

Sensor or Switch	Output of 1	Output of 0
Switch (S1)	On	Off
Pressure Sensor (P1)	≥ 3	< 3
Pressure Sensor (P2)	≥ 3	< 3

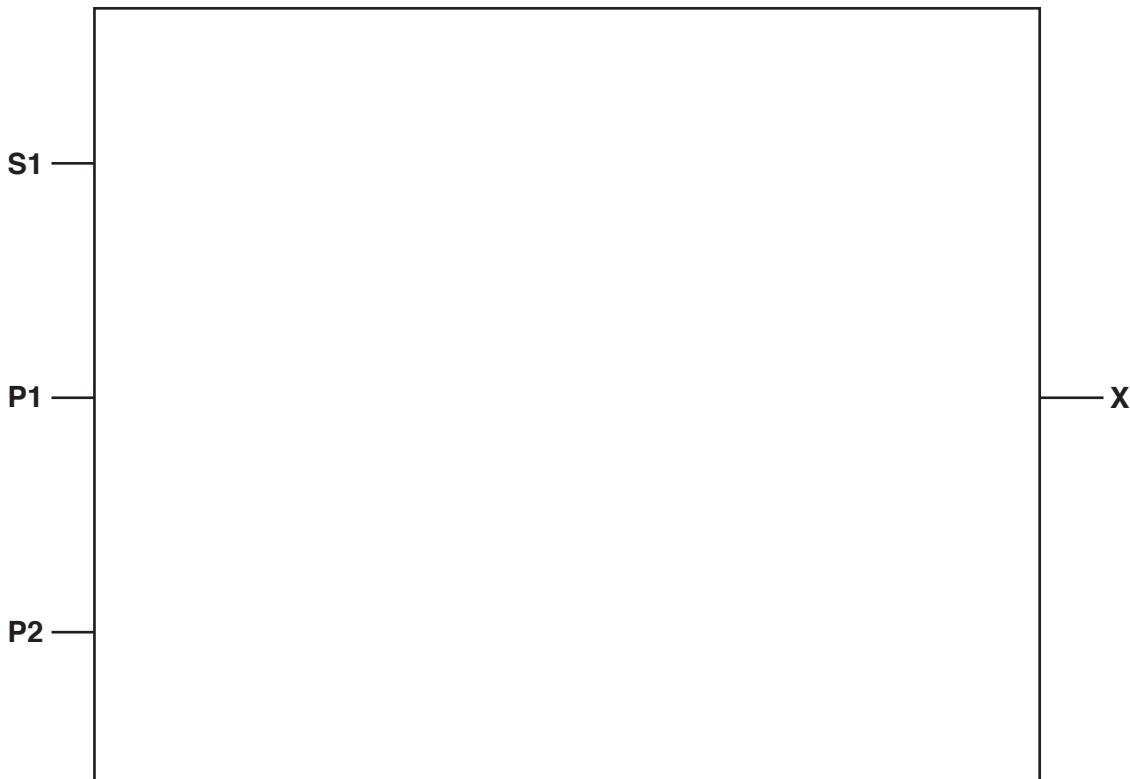
Create a logic circuit that will produce an output (X) of 1 when:

The switch S1 is on

and

either P1 is less than 3 or P2 is less than 3, but not both.

All logic gates used must have a maximum of two inputs.



[4]

- 7 A room has an automatic lighting system. Electric lights are automatically turned on when a person enters the room and the natural light level in the room is 10 or less.

Explain how sensors and a microprocessor are used to control the electric lights in the room.

[7]

8 A student website provides research support and software downloads.

(a) Students use a browser to access the web pages. Explain the role of a browser in this process.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
..... [5]

(b) The website owners are worried about a denial of service (DoS) attack.

Explain the term denial of service attack.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
..... [3]

(c) The website owners are also concerned about the ethical issues of copyright and plagiarism.

(i) State what is meant by the term copyright.

.....
..... [1]

(ii) State what is meant by the term plagiarism.

.....
..... [1]

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.



Cambridge IGCSE™

COMPUTER SCIENCE

0478/12

Paper 1

March 2020

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 March 2020 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **14** printed pages.

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.

Question	Answer	Mark										
1(a)	<table border="0"> <thead> <tr> <th>Component</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Control Bus</td> <td>Increments to point to the address of the next instruction to be fetched</td> </tr> <tr> <td>Program Counter (PC)</td> <td>Holds the result of a calculation. It is located within the Arithmetic Logic Unit (ALU)</td> </tr> <tr> <td>Memory Data Register (MDR)</td> <td>Carries signals to synchronise the fetch-execute cycle</td> </tr> <tr> <td>Accumulator (ACC)</td> <td>Temporary storage between the Central Processing (CPU) and primary memory</td> </tr> </tbody> </table> <p>1 mark for 1 correct line 2 marks for 2 correct lines 3 marks for 3/4 correct lines</p>	Component	Description	Control Bus	Increments to point to the address of the next instruction to be fetched	Program Counter (PC)	Holds the result of a calculation. It is located within the Arithmetic Logic Unit (ALU)	Memory Data Register (MDR)	Carries signals to synchronise the fetch-execute cycle	Accumulator (ACC)	Temporary storage between the Central Processing (CPU) and primary memory	3
Component	Description											
Control Bus	Increments to point to the address of the next instruction to be fetched											
Program Counter (PC)	Holds the result of a calculation. It is located within the Arithmetic Logic Unit (ALU)											
Memory Data Register (MDR)	Carries signals to synchronise the fetch-execute cycle											
Accumulator (ACC)	Temporary storage between the Central Processing (CPU) and primary memory											
1(b)	<p>Any two from:</p> <ul style="list-style-type: none"> <li>• Address bus <li>• Data bus 	2										

Question	Answer	Mark																																				
2(a)	<p>1 mark per each correct row:</p> <table border="1"> <thead> <tr> <th rowspan="2">Description</th> <th colspan="2">Method</th> <th colspan="3">Type</th> </tr> <tr> <th>Serial (✓)</th> <th>Parallel (✓)</th> <th>Simplex (✓)</th> <th>Half-duplex (✓)</th> <th>Duplex (✓)</th> </tr> </thead> <tbody> <tr> <td>Data is sent down a single wire in a single direction only.</td><td>✓</td><td></td><td>✓</td><td></td><td></td></tr> <tr> <td>Data is sent down multiple wires in both directions, at the same time.</td><td></td><td>✓</td><td></td><td></td><td>✓</td></tr> <tr> <td>Data is sent down a single wire in both directions, but never at the same time.</td><td>✓</td><td></td><td></td><td>✓</td><td></td></tr> </tbody> </table>	Description	Method		Type			Serial (✓)	Parallel (✓)	Simplex (✓)	Half-duplex (✓)	Duplex (✓)	Data is sent down a single wire in a single direction only.	✓		✓			Data is sent down multiple wires in both directions, at the same time.		✓			✓	Data is sent down a single wire in both directions, but never at the same time.	✓			✓		3							
Description	Method		Type																																			
	Serial (✓)	Parallel (✓)	Simplex (✓)	Half-duplex (✓)	Duplex (✓)																																	
Data is sent down a single wire in a single direction only.	✓		✓																																			
Data is sent down multiple wires in both directions, at the same time.		✓			✓																																	
Data is sent down a single wire in both directions, but never at the same time.	✓			✓																																		
2(b)(i)	<p>1 mark for each correct parity bit:</p> <table border="1"> <thead> <tr> <th colspan="8">Binary Value</th> <th>Parity Bit</th> </tr> </thead> <tbody> <tr> <td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td></td></tr> <tr> <td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td></td></tr> <tr> <td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td></td></tr> </tbody> </table>	Binary Value								Parity Bit	1	1	0	0	1	1	1	1		1	0	1	0	1	0	1	0		0	1	1	0	1	0	0	1		3
Binary Value								Parity Bit																														
1	1	0	0	1	1	1	1																															
1	0	1	0	1	0	1	0																															
0	1	1	0	1	0	0	1																															
2(b)(ii)	<p>Any one from:</p> <ul style="list-style-type: none"> • Transposition error // bits are interchanged • Bits still add up to even number • Even number of errors has occurred 	1																																				

Question	Answer	Mark
2(c)(i)	Any two from: <ul style="list-style-type: none">• Scrambles data• ... making it meaningless/unintelligible• Uses an algorithm / key• Data / plain text is changed to cipher text	2
2(c)(ii)	Any one from: <ul style="list-style-type: none">• Increase the length of the key // use more than 128 bits• Uses a more complex encryption algorithm	1

Question	Answer	Mark
2(d)	<p>Any six from (max four for identification of method only):</p> <ul style="list-style-type: none"> • Backups <ul style="list-style-type: none"> ... if data is lost can be replaced • Install antivirus // Anti malware <ul style="list-style-type: none"> ... detects/deletes viruses that could corrupt/delete data • Install firewall <ul style="list-style-type: none"> ... helps prevent hackers gaining access and deleting/corrupting data • Password / Biometrics • Two factor authentication // two-step verification <ul style="list-style-type: none"> ... helps prevent unauthorised access and the deletion/corruption of data • Access rights <ul style="list-style-type: none"> ... helps prevent users accessing data they should not see and deleting it • Network/usage policy <ul style="list-style-type: none"> ... gives users guidance on data use // by example • Surge protection // Uninterrupted power supply (UPS) <ul style="list-style-type: none"> ... prevents loss of data that has not been saved ... prevents damage to hardware (that stores data) • Physical method // by example <ul style="list-style-type: none"> ... helps prevent unauthorised access and the deletion/corruption of data 	6

Question	Answer	Mark
3(a)(i)	<p>Any one from:</p> <ul style="list-style-type: none"> • They are both non-volatile • They are both secondary storage // Both not directly accessed by the CPU • They both have a high capacity of storage • Both have read and write abilities 	1
3(a)(ii)	<p>Any three from:</p> <ul style="list-style-type: none"> • HDD has moving parts but SSD does not • HDD uses magnetic storage whereas SSD uses flash memory • HDD is slower to access data than SSD // HDD has greater latency than SSD • HDD will create noise/heat, whereas SSD runs quieter/cooler • HDD has higher power consumption than SSD • HDD have greater longevity/more read-write cycles whereas SSD has lower longevity/limited number of read-write cycles • HDD larger in physical size/heavier than SSD • HDD is normally cheaper for the same capacity of storage as SSD • HDD is available in a larger storage capacity than SSD 	3
3(b)	<p>Any one from:</p> <ul style="list-style-type: none"> • USB flash memory drive • External HDD/SSD • SD Card • CD / DVD / Blu-ray 	1
3(c)(i)	<p>Any two from:</p> <ul style="list-style-type: none"> • Keyboard • Mouse • Microphone • Touchscreen 	2
3(c)(ii)	<p>Any two from:</p> <ul style="list-style-type: none"> • Monitor / Screen • Speakers • Headphones • Printer 	2

Question	Answer	Mark
3(d)	<p>Any two from:</p> <ul style="list-style-type: none"> • Uses a compression algorithm • Does not permanently remove any data • Repeated patterns of notes are identified ... • ... and are grouped, with an index <p>NOTE: Other possible methods of lossless compression of sound can be credited</p>	2
3(e)(i)	<p>Any two from:</p> <ul style="list-style-type: none"> • Stores the notes played and not the sound • Contains instructions/commands for digital instruments // Is recorded / played on a digital instrument e.g. synthesiser • Stores data about notes e.g. pitch byte (Note: Two examples can be awarded) • Can be a compressed format • Can edit individual notes 	2
3(e)(ii)	<p>Any two from:</p> <ul style="list-style-type: none"> • Contains actual sound • Contains samples of the sound wave • Contains metadata // by example • Uses lossy compression • Recorded using microphone // Is recorded/played on an MP3 recorder/player 	2

Question	Answer				Mark																					
4	<table border="1"> <thead> <tr> <th>Statement</th><th>Assembler (✓)</th><th>Compiler (✓)</th><th>Interpreter (✓)</th></tr> </thead> <tbody> <tr> <td>Translates low-level language to machine code</td><td>✓</td><td></td><td></td></tr> <tr> <td>Translates high-level language to machine code</td><td></td><td>(✓)</td><td>✓</td></tr> <tr> <td>Produces error messages</td><td>(✓)</td><td>✓</td><td>✓</td></tr> <tr> <td>Translates high-level language one line at a time</td><td></td><td></td><td>✓</td></tr> <tr> <td>Produces an executable file</td><td>(✓)</td><td>✓</td><td></td></tr> </tbody> </table>	Statement	Assembler (✓)	Compiler (✓)	Interpreter (✓)	Translates low-level language to machine code	✓			Translates high-level language to machine code		(✓)	✓	Produces error messages	(✓)	✓	✓	Translates high-level language one line at a time			✓	Produces an executable file	(✓)	✓		5
Statement	Assembler (✓)	Compiler (✓)	Interpreter (✓)																							
Translates low-level language to machine code	✓																									
Translates high-level language to machine code		(✓)	✓																							
Produces error messages	(✓)	✓	✓																							
Translates high-level language one line at a time			✓																							
Produces an executable file	(✓)	✓																								
1 mark per each correct row: NOTE: tick shown in brackets (✓) is optional																										

Question	Answer	Mark						
5(a)	Any two from: <ul style="list-style-type: none"> • Computer consist of transistors / logic circuits • ... that can only store/process data in two states / as high-low / on-off / 1 and 0 	2						
5(b)	1 mark per each correct 8-bit binary value: <table border="1"> <thead> <tr> <th>Denary Value</th><th>8-bit binary register</th></tr> </thead> <tbody> <tr> <td>129</td><td>10000001</td></tr> <tr> <td>56</td><td>00111000</td></tr> </tbody> </table>	Denary Value	8-bit binary register	129	10000001	56	00111000	2
Denary Value	8-bit binary register							
129	10000001							
56	00111000							

Question	Answer	Mark																								
5(c)	<p>1 mark per each correct conversion:</p> <table border="1"><tr><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td></tr><tr><td colspan="4"></td><td colspan="4"></td><td colspan="4"></td></tr></table> <p style="text-align: center;">1 mark 1 mark 1 mark</p>	0	0	1	1	1	0	1	0	1	0	0	1													3
0	0	1	1	1	0	1	0	1	0	0	1															
5(d)	<p>Any two from:</p> <ul style="list-style-type: none">• Represent colours in HTML // HTML colour codes• MAC address• Assembly Language• Error messages• IP address• ASCII values• URL• Memory dump• Memory locations	2																								

Question	Answer	Mark																																													
6(a)	<table border="1"><thead><tr><th>A</th><th>B</th><th>C</th><th>Working space</th><th>X</th></tr></thead><tbody><tr><td>0</td><td>0</td><td>0</td><td></td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td></td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td><td></td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td></td><td>1</td></tr><tr><td>1</td><td>0</td><td>0</td><td></td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td><td></td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td></td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td></td><td>1</td></tr></tbody></table> <p>4 marks for 8 correct outputs 3 marks for 6/7 correct outputs 2 marks for 4/5 correct outputs 1 mark for 2/3 correct outputs</p>	A	B	C	Working space	X	0	0	0		0	0	0	1		0	0	1	0		0	0	1	1		1	1	0	0		1	1	0	1		1	1	1	0		0	1	1	1		1	4
A	B	C	Working space	X																																											
0	0	0		0																																											
0	0	1		0																																											
0	1	0		0																																											
0	1	1		1																																											
1	0	0		1																																											
1	0	1		1																																											
1	1	0		0																																											
1	1	1		1																																											

Question	Answer	Mark
6(b)	<p>1 mark for each correct logic gate:</p> <p>NOTE: Can also award 4 marks to a circuit that shows $X = (P1 \text{ XOR } P2) \text{ AND } (S1)$</p>	4

Question	Answer	Mark
7	<p>Any seven from:</p> <ul style="list-style-type: none"> • Uses light sensor and Infrared / Motion / Pressure sensor • Sensors send data to the microprocessor • Data is converted from analogue to digital (using ADC) • Microprocessor compares both values to stored values • If motion value is out of range/in range, light value is checked // If light value is ≤ 10, motion value is checked • If light value is ≤ 10 lights are turned on // If motion value is out of range/in range lights are turned on ... • ... by sending a signal to actuator • Lights remain on for set period (and then turn off) // If motion is in range/out of range or light is > 10 then signal sent to turn lights off • Process repeats / is continuous 	7

Question	Answer	Mark
8(a)	<p>Any five from:</p> <ul style="list-style-type: none"> • Sends the URL of the website • ... to a DNS to find the IP address • Connects to the webserver (using the IP address) ... • ... using HTTP / HTTPS • Renders/Translates the HTML • Runs active/client-side scripts built into webpages • Manages SSL/TLS certificate process • Stores/retrieves cookies 	5
8(b)	<p>Any three from:</p> <ul style="list-style-type: none"> • Webserver is sent multiple requests // Requests flood the webserver ... • ... at the same time • Webserver crashes / runs slow • Designed to prevent access to e.g. a website // Stops legitimate requests being processed/serviced 	3
8(c)(i)	<ul style="list-style-type: none"> • A law/legislation that requires permission to use intellectual property / other people's work 	1
8(c)(ii)	<p>Any one from:</p> <ul style="list-style-type: none"> • To claim other's work as your own • To use other people's work without consent / acknowledgement • Theft of intellectual property 	1



Cambridge IGCSE™

CANDIDATE
NAME

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



COMPUTER SCIENCE

0478/12

Paper 1 Theory

February/March 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 A hockey club records the number of people that watch each match. An 8-bit binary register is used to store this value.

- (a) 46 people watch the first match and 171 people watch the second match.

Show how the registers would store these denary values as 8-bit binary.

Denary value	8-bit binary							
46								
171								

[2]

Working space

.....
.....
.....
.....
.....

- (b) Give the largest denary value that can be stored in the 8-bit binary register.

..... [1]

- (c) The hockey club wants to increase the number of people that can watch each match to 2000. The 8-bit binary register may no longer be able to store the value.

Give the smallest number of bits that can be used to store the denary value 2000.

..... [1]

Working space

.....
.....
.....
.....
.....

- (d) Electronic data about the final score for the match is transmitted to a central computer 30 kilometres away, using serial transmission.

- (i) Explain why serial transmission is more appropriate than parallel transmission in this scenario.

.....
.....
.....
.....
.....
..... [3]

- (ii) The data transmission is also half-duplex.

Describe half-duplex data transmission.

.....
.....
.....
.....
..... [2]

- (iii) The data transmission uses checksums.

Describe how checksums are used to detect errors in data transmission.

.....
.....
.....
.....
.....
..... [3]

- 2 Gurdeep takes high definition photographs using a digital camera. She has set up a website where users can view thumbnails of her photographs. A thumbnail is a small version of the high definition photograph.

- (a) Gurdeep compresses the high definition photographs to create the thumbnails. She uses lossy compression.

Describe how lossy compression creates the thumbnails.

.....
.....
.....
.....
.....
..... [3]

- (b) Gurdeep sets up a web server to host her website. She reads about an Internet Protocol (IP) address, a Media Access Control (MAC) address and a Uniform Resource Locator (URL).

Draw a line to connect each term to the correct example.

Term	Example
IP address	192.168.0.255
MAC address	https://www.cambridgeinternational.org
URL	00:15:E9:2B:99:3C

[2]

- (c) Users can buy the high definition photographs from the website. When a user buys a high definition photograph, a Secure Socket Layer (SSL) connection is created.

- (i) Give **one** benefit of using an SSL connection.

.....
.....

[1]

- (ii) Explain how the SSL connection is created.

.....
.....
.....
.....
.....
.....
.....
.....

[4]

- 3 The given table shows the name or description of four devices. The table is incomplete.

Complete the missing device names and descriptions.

Device name	Description
.....	Uses either thermal bubble or piezoelectric technology
Actuator
.....	Uses thousands of tiny mirrors that can move very quickly to create an image
Mouse

[4]

- 4** A supermarket sells many products. Each product has a barcode.

(a) Explain how the barcode is read at the supermarket checkout and how the price of the product is found.

[6]

[6]

- (b)** The supermarket stores data using a Solid State Drive (SSD).

- (i) Explain how an SSD stores data.

[3]

- (ii) One advantage of an SSD rather than a Hard Disk Drive (HDD) is that it has no moving parts, so it is more durable.

State **one** other advantage of the supermarket using SSD rather than HDD.

[1]

[1]

- 5 Computers use logic gates.

- (a) State the **single** logic gate that produces each truth table.

Truth table			Logic gate
A	B	Output	
0	0	1
0	1	1
1	0	1
1	1	0

Truth table			Logic gate
A	B	Output	
0	0	0
0	1	1
1	0	1
1	1	0

Truth table			Logic gate
A	B	Output	
0	0	1
0	1	0
1	0	0
1	1	0

[3]

- (b) An aeroplane has a warning system that monitors the height of the aeroplane above the ground, whether the aeroplane is ascending or descending, and the speed of the aeroplane.

Input	Binary value	Condition
Height (H)	1	Height is less than 500 metres
	0	Height is greater than or equal to 500 metres
Ascending or Descending (A)	1	Aeroplane is ascending or in level flight
	0	Aeroplane is descending
Speed (S)	1	Speed is less than or equal to 470 knots
	0	Speed is greater than 470 knots

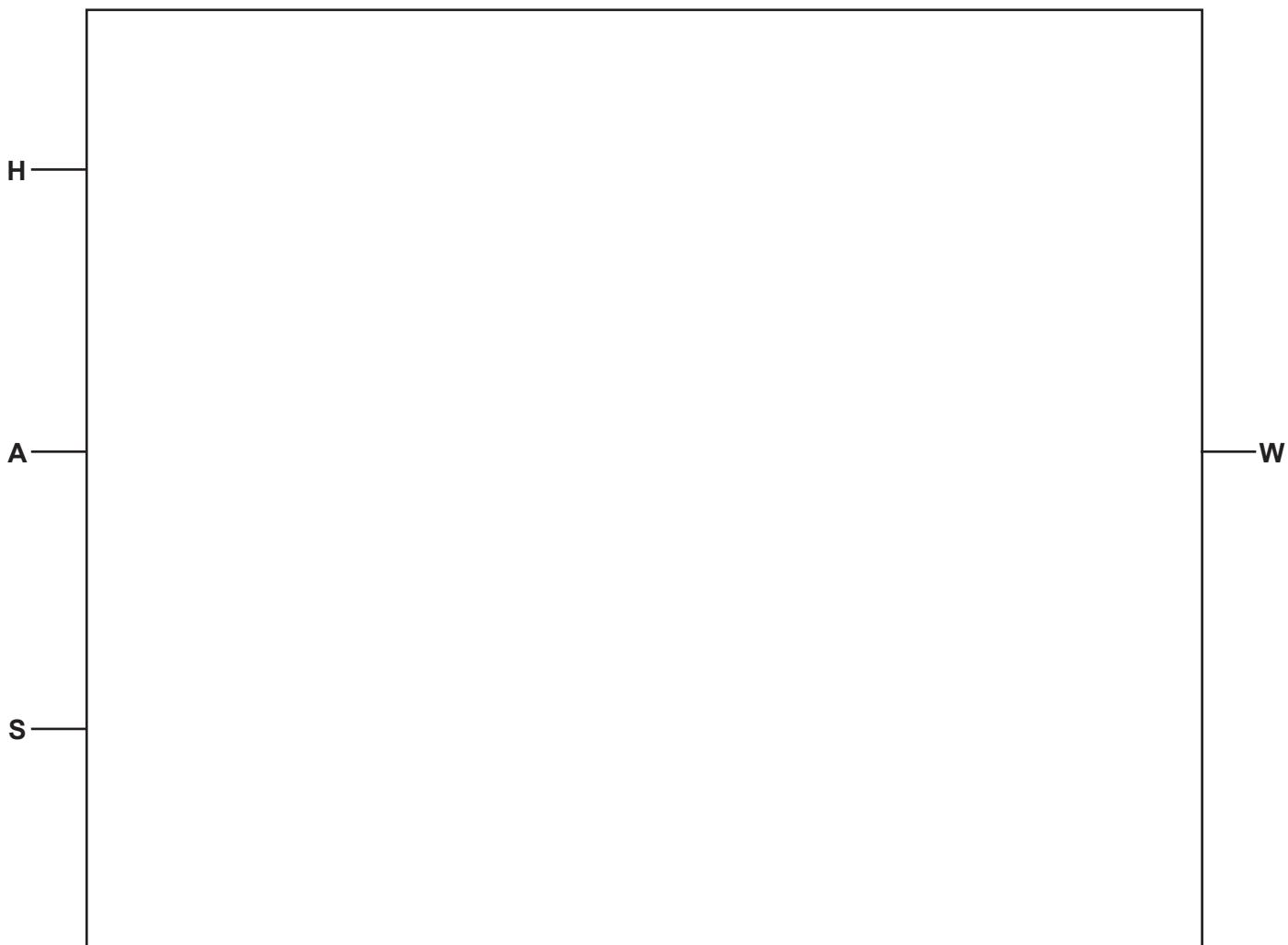
The warning system will produce an output of 1 that will sound an alarm (W) when either of these conditions apply:

Height is less than 500 metres and the aeroplane is descending

or

The aeroplane is descending and speed is greater than 470 knots

Draw a logic circuit to represent the warning system.



[5]

- 6 Hacking is one type of Internet risk used to obtain personal data that is stored on a computer.
- (a) Explain how a firewall can help prevent hacking.

.....
.....
.....
.....
.....
.....
.....
.....
..... [4]

- (b) Identify and describe **two** other types of internet risk that are used to obtain personal data.

Internet risk 1

Description

.....
.....
.....
.....

Internet risk 2

Description

.....
.....
.....
.....

[6]

- 7** Adeel has used a high-level language to program a mobile application.

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

[2]

[2]

- (b) Adeel uses an interpreter while developing and testing the application.

Adeel uses a compiler when the application is ready to be shared with others.

Compare the features of interpreters and compilers.

[4]

[4]

- (c) Adeel is considering distributing his application as free software or shareware.

Explain the difference between free software and shareware.

[5]

- (d)** Adeel is concerned about his application being plagiarised.

Define the term plagiarism.

..... [1]

- (e)** Adeel copyrights his application.

State why Adeel copyrights his application.

..... [1]

- 8 The Von Neumann model, for a computer system, uses the stored program concept.

- (a) Describe what is meant by the stored program concept.

.....
.....
.....
..... [2]

- (b) The fetch-execute cycle of a Von Neumann model, for a computer system, uses registers and buses.

- (i) Describe the role of the Program Counter.

.....
.....
.....
..... [2]

- (ii) Describe the role of the Control Bus.

.....
.....
.....
..... [2]

- (c) Computers based on the Von Neumann model, for a computer system, use interrupts.

Explain why interrupts are needed.

.....
.....
.....
..... [2]

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.



Cambridge IGCSE™

COMPUTER SCIENCE

0478/12

Paper 1

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

This document consists of **10** 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.

Question	Answer	Marks																											
1(a)	1 mark each <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Denary Value</th> <th colspan="8">8-bit binary</th> </tr> </thead> <tbody> <tr> <td>46</td> <td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td> </tr> <tr> <td>171</td> <td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td> </tr> </tbody> </table>	Denary Value	8-bit binary								46	0	0	1	0	1	1	1	0	171	1	0	1	0	1	0	1	1	2
Denary Value	8-bit binary																												
46	0	0	1	0	1	1	1	0																					
171	1	0	1	0	1	0	1	1																					
1(b)	– 255	1																											
1(c)	– 11	1																											
1(d)(i)	Any three from: – More accurate/reliable/efficient over long distances – Less chance of interference / cross talk – ...that will skew / distort the data // less likely to get errors – Data will arrive in order – Serial is cheaper to purchase/install/maintain	3																											
1(d)(ii)	– Transmission in both directions ... – ...not at the same time // asynchronous	2																											
1(d)(iii)	Any three from: – Calculates a value from the bits/data (to be transferred) // by example/description – Value is appended to the bits/data – Value is transferred with the bits/data – Receiver recalculates the checksum – If both values are different error is detected // if both values are the same the transmission is successful	3																											

Question	Answer	Marks
2(a)	Any three from: – A compression algorithm is used – Data will be lost/deleted permanently // original file cannot be recreated – Reduce the range of colours used / colour depth / bits per pixel – Reduce the number of pixels / image resolution removes data that will not be noticed by the user // removes unnecessary data	3

Question	Answer	Marks												
2(b)	<p>1 mark for 1 line, 2 marks for 3 lines</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; padding: 5px;">Term</th> <th style="text-align: center; padding: 5px;">Details</th> <th style="text-align: right; padding: 5px;">2</th> </tr> </thead> <tbody> <tr> <td style="padding: 10px; border: 1px solid black; text-align: center;">IP address</td> <td style="padding: 10px; border: 1px solid black; text-align: center;">192.168.0.255</td> <td style="text-align: right; padding: 10px;"></td> </tr> <tr> <td style="padding: 10px; border: 1px solid black; text-align: center;">MAC address</td> <td style="padding: 10px; border: 1px solid black; text-align: center;">https://www.cambridgeinternational.org</td> <td style="text-align: right; padding: 10px;"></td> </tr> <tr> <td style="padding: 10px; border: 1px solid black; text-align: center;">URL</td> <td style="padding: 10px; border: 1px solid black; text-align: center;">00:15:E9:2B:99:3C</td> <td style="text-align: right; padding: 10px;"></td> </tr> </tbody> </table>	Term	Details	2	IP address	192.168.0.255		MAC address	https://www.cambridgeinternational.org		URL	00:15:E9:2B:99:3C		
Term	Details	2												
IP address	192.168.0.255													
MAC address	https://www.cambridgeinternational.org													
URL	00:15:E9:2B:99:3C													
2(c)(i)	<ul style="list-style-type: none"> – Data if intercepted cannot be understood // Data is encrypted // Data is scrambled // uses keys to encode/decode data 	1												
2(c)(ii)	<p>Four from:</p> <ul style="list-style-type: none"> – Uses (digital) certificates –requested from web server by browser/client // browser/client asks web server to identify itself – Server send SSL/digital signature to browser/client – Client and server agree on encryption method to use – ... that contains the server's public key – Browser checks authenticity of certificate... – ... then session key is generated – ... the transaction will begin // sends signal to server to start transmission 	4												

Question	Answer		Marks										
3	<p>One mark for each device/description</p> <table border="1"> <thead> <tr> <th>Name of device</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td><u>Inkjet Printer</u></td> <td>Uses either thermal bubble or piezoelectric technology</td> </tr> <tr> <td>Actuator</td> <td> <ul style="list-style-type: none"> – Operated by signals to cause a physical movement Controls the movement of a machine // by example </td> </tr> <tr> <td>DLP//Projector</td> <td>Uses thousands of tiny mirrors that can move very quickly to create an image</td> </tr> <tr> <td>Mouse</td> <td> <ul style="list-style-type: none"> – Uses rolling ball / optical sensor / laser to detect motion // by example – Movement echoed on screen // moves curser/pointer (on screen) – Has scroll wheel / Buttons to allow data input // by example </td> </tr> </tbody> </table>		Name of device	Description	<u>Inkjet Printer</u>	Uses either thermal bubble or piezoelectric technology	Actuator	<ul style="list-style-type: none"> – Operated by signals to cause a physical movement Controls the movement of a machine // by example 	DLP//Projector	Uses thousands of tiny mirrors that can move very quickly to create an image	Mouse	<ul style="list-style-type: none"> – Uses rolling ball / optical sensor / laser to detect motion // by example – Movement echoed on screen // moves curser/pointer (on screen) – Has scroll wheel / Buttons to allow data input // by example 	4
Name of device	Description												
<u>Inkjet Printer</u>	Uses either thermal bubble or piezoelectric technology												
Actuator	<ul style="list-style-type: none"> – Operated by signals to cause a physical movement Controls the movement of a machine // by example 												
DLP//Projector	Uses thousands of tiny mirrors that can move very quickly to create an image												
Mouse	<ul style="list-style-type: none"> – Uses rolling ball / optical sensor / laser to detect motion // by example – Movement echoed on screen // moves curser/pointer (on screen) – Has scroll wheel / Buttons to allow data input // by example 												

Question	Answer	Marks
4(a)	<p>Six from Max four from:</p> <ul style="list-style-type: none"> – Scanned using a barcode reader – Shines (red) laser/light – Light is reflected back // white lines reflect light // black lines reflect less light – Sensors/photoelectric cells detect the light – Different reflections/bars give different binary/digital values // (pattern) converted to binary/digital values – Microprocessor interprets the data – Uses check digit error checking <p>Max three from:</p> <ul style="list-style-type: none"> – Database stores data/barcodes/products/prices – Barcode/value/key transmitted to database/system // Searches for barcode/value/key in the database/system... – ... price is returned/found 	6

Question	Answer	Marks
4(b)(i)	<p>Max three from:</p> <ul style="list-style-type: none"> – Flash storage – Uses transistors/controls gates/floating gates – Can be NAND/NOR technology // Can use flip-flops – Stores data by flashing it onto the chips/device – Controlling/using the flow of electrons through/using transistors/chips/gates – The electric current reaches the control gate and flows through to the floating gate to be stored – When data is stored the transistor is converted from 1 to 0 / 0 to 1 	3
4(b)(ii)	<p>Max one from:</p> <ul style="list-style-type: none"> – Faster read/write operation – Produces less heat // needs less cooling – Less susceptible to interference/magnets – Less power consumption 	1

Question	Answer			Marks																																																								
5(a)	<table border="1"> <thead> <tr> <th colspan="3">Truth table</th> </tr> <tr> <th>A</th> <th>B</th> <th>Output</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>1</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> </tr> <tr> <td>1</td> <td>1</td> <td>0</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>A</th> <th>B</th> <th>Output</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> </tr> <tr> <td>1</td> <td>1</td> <td>0</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>A</th> <th>B</th> <th>Output</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>1</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>0</td> </tr> </tbody> </table>	Truth table			A	B	Output	0	0	1	0	1	1	1	0	1	1	1	0	A	B	Output	0	0	0	0	1	1	1	0	1	1	1	0	A	B	Output	0	0	1	0	1	0	1	0	0	1	1	0	<table border="1"> <thead> <tr> <th colspan="3">Logic gate</th> </tr> </thead> <tbody> <tr> <td>NAND</td> <td>[1]</td> </tr> <tr> <td>XOR / Exclusive OR</td> <td>[1]</td> </tr> <tr> <td>NOR</td> <td>[1]</td> </tr> </tbody> </table>	Logic gate			NAND	[1]	XOR / Exclusive OR	[1]	NOR	[1]	3
Truth table																																																												
A	B	Output																																																										
0	0	1																																																										
0	1	1																																																										
1	0	1																																																										
1	1	0																																																										
A	B	Output																																																										
0	0	0																																																										
0	1	1																																																										
1	0	1																																																										
1	1	0																																																										
A	B	Output																																																										
0	0	1																																																										
0	1	0																																																										
1	0	0																																																										
1	1	0																																																										
Logic gate																																																												
NAND	[1]																																																											
XOR / Exclusive OR	[1]																																																											
NOR	[1]																																																											

Question	Answer	Marks
5(b)	<p>One mark for each logic gates with correct inputs</p> <p> - NOT A - NOT S - H AND NOT A - NOT A AND NOT S - Final OR </p>	5

Question	Answer	Marks
6(a)	<p>Any four from:</p> <ul style="list-style-type: none"> - Monitors incoming and outgoing traffic - Allows the setting of criteria/blacklist/whitelist/by example - Blocks access to signals that do not meet requirements/criteria/blacklist/whitelist ... - ... sends signal to warn the user - Restrict access to specific applications - Blocks entry/exit by specific ports 	4
6(b)	<p>One mark for risk, two marks for description</p> <ul style="list-style-type: none"> - Phishing - Legitimate looking email sent to user - Clicking on link/attachment takes user to fake website - Pharming - Software is installed on user's computer - Redirects (correct URL) to different/fraudulent website - Spyware (accept keylogger but do not award for MP3) - Software is installed on user's computer - Records key strokes // keylogger - Transmits data to third part for analysis 	6

Question	Answer	Marks
7(a)	<p>Any two from:</p> <ul style="list-style-type: none"> – Makes use of words // close to human language – Machine independent // portable – Problem / logic focussed – Needs to be translated/interpreter/compiled (to low-level for processing by computer) // needs converting to machine code 	2
7(b)	<p>Four from Max 2 for only giving compiler/interpreter features</p> <ul style="list-style-type: none"> – Both translate high level / source code to machine code – Both generate error diagnostics/messages // identify errors – Interpreter translates one line at a time // checks one line and then runs it – Compiler translates whole code in one go // checks all code and then runs it – Interpreter stops when meets an error – ...and then allows you to continue running from where you stopped // correct errors in real-time – Compiler provides list of all errors – Interpreter does not produce an executable file – Compiler produces an executable file 	4
7(c)	<p>Any five from:</p> <ul style="list-style-type: none"> – Free software is distributed with the source code – ...whereas shareware is not distributed with the source code – Free software allows modification of the application – ...whereas shareware cannot be modified – Shareware normally allows a trial period for the end user // shareware has limited features to start with – Free software is often available free of charge – ...whereas shareware normally has a charge after trial period // shareware has charge to access all features // shareware makes you sign-up/register after trial period // shareware makes you sign-up/register to access all features 	5
7(d)	<ul style="list-style-type: none"> – Claiming another person's work as your own 	1
7(e)	<ul style="list-style-type: none"> – To identify legal ownership // to claim ownership // protect intellectual property 	1

Question	Answer	Marks
8(a)	<ul style="list-style-type: none"> – Instructions and data stored in the same/main memory – Instructions fetched and executed in order / one after another / in sequence 	2
8(b)(i)	<ul style="list-style-type: none"> – Holds the address ... – ... of next / current instruction 	2
8(b)(ii)	Any two from: <ul style="list-style-type: none"> – Carries / transfers control signals/instructions // carries/transfers commands ... – ... from CPU/CU to components // from devices to CPU/CU – To synchronise the FE cycle 	2
8(c)	Any two from: <ul style="list-style-type: none"> – To identify that the processor's attention is required // to stop the current process/task – To allow multitasking – To allow for efficient processing // prioritising actions – To allow for efficient use of hardware – To allow time-sensitive requests to be dealt with – To avoid the need to poll devices 	2



Cambridge IGCSE™

CANDIDATE
NAME

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



COMPUTER SCIENCE

0478/12

Paper 1 Theory

February/March 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 A computer stores data in binary form. Binary numbers can be represented as hexadecimal and denary numbers.

(a) Convert the 8-bit binary number 01010101 to denary.

..... [1]

Working space

.....
.....
.....

(b) Convert the binary number 11000000 to hexadecimal.

..... [1]

Working space

.....
.....
.....

(c) Convert the hexadecimal number 1A to denary.

..... [1]

Working space

.....
.....
.....

(d) Binary numbers can be stored as bytes.

State how many bits are in **two** bytes.

..... [1]

2 Nadia creates a digital image for a school project.

(a) Give **one** example of an image format.

..... [1]

(b) Describe how a digital image file is stored by a computer.

.....
.....
.....
.....
.....
..... [3]

(c) Nadia compresses the digital image file before emailing it to a friend.

(i) State what is meant by data compression.

..... [1]

(ii) Explain why Nadia compresses the digital image file before emailing it.

.....
.....
.....
..... [2]

- (iii) Nadia's email service uses parity bits as a method of error detection during the transmission of data.

Describe how the parity bits are used to detect errors.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

[5]

- (iv) Identify and describe **one** other method of error detection used during the transmission of data.

Method

Description

.....
.....
.....
.....
.....
.....
.....
.....

[4]

- 3 (a) Tick (\checkmark) to show which logic gates will give an output of 1 for the given inputs A and B.

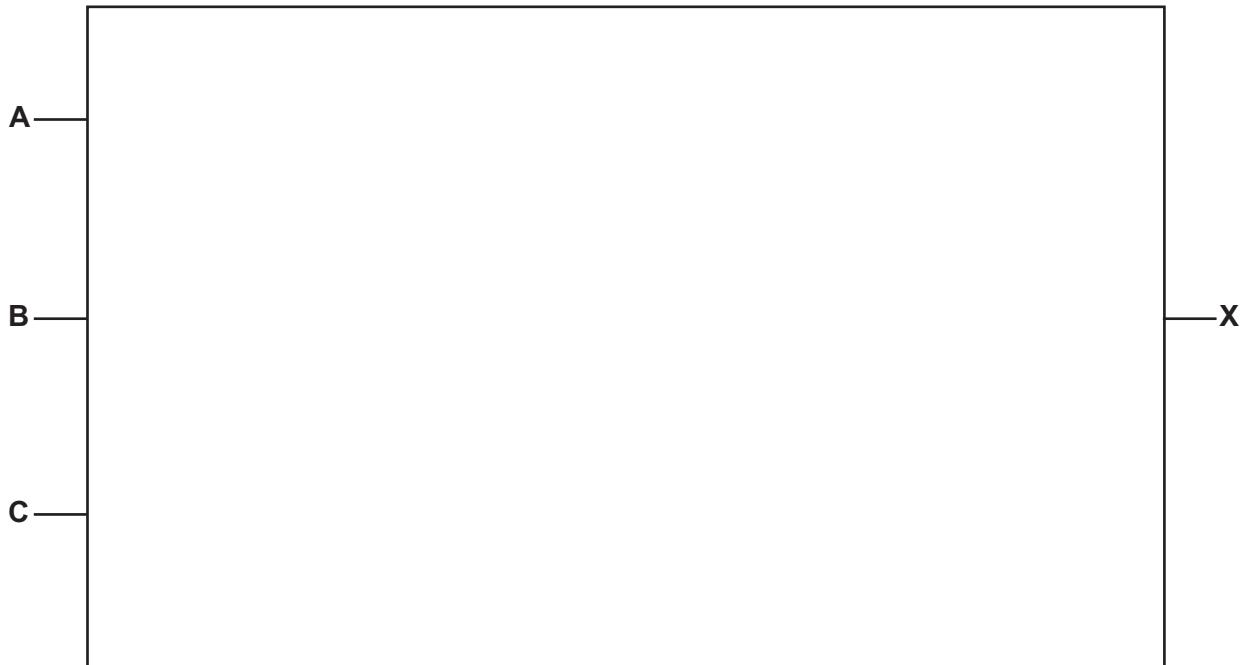
Inputs	AND	OR	NAND	NOR	XOR
A = 1 B = 1					
A = 0 B = 0					
A = 1 B = 0					

[3]

- (b) Draw the logic circuit for the given logic statement:

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

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



[4]

4 Pradeep uses his personal computer to complete work at home.

(a) Pradeep uses a mouse and a keyboard to control the computer.

(i) Complete the descriptions of the principles of operation of a mouse and a keyboard using the most appropriate terms from the list. **Not** all terms in the list need to be used.

- absorbs
- ball
- biometric
- circuit
- colour
- digital
- direction
- Light-Emitting Diode (LED)
- Liquid Crystal Display (LCD)
- reflects
- speed
- switch
- transparency

An optical mouse shines a red light from a underneath the mouse. The light back from a surface through a lens in the mouse and is converted to a value. This value is transmitted to the computer. The computer then determines the and of the movement.

When the user presses a key on a keyboard, the key pushes the on the circuit board. This completes a Signals are sent to the computer. The computer uses the data to calculate which key was pressed.

[6]

(ii) Identify **two** other input devices Pradeep could use with his personal computer.

Input device 1

Input device 2

[2]

- (b) Pradeep uses a projector attached to the ceiling at his home to watch high-definition (HD) films.

The projector has broken. He wants to buy a replacement. He needs to choose between an LCD projector and a Digital Light Projector (DLP).

Explain why an LCD projector would be more appropriate for Pradeep.

.....
.....
.....
.....
.....
..... [3]

- (c) Pradeep stores his collection of films and his work files on his personal computer.

Pradeep wants to save a copy of all his films and files onto a single storage device.

Identify and justify an appropriate storage device to store the copies.

Storage device

Justification

.....
.....
.....
.....
.....
..... [4]

- 5 A holiday company has a website where customers can create accounts and can book and pay for holidays.

- (a) The website is written in Hypertext Markup Language (HTML).

Give **two** examples of HTML structure and **two** examples of HTML presentation.

Structure 1

Structure 2

Presentation 1

Presentation 2

[4]

- (b) The website is stored on a web server. Customers use their own computers to access the website.

Uniform Resource Locator (URL), Internet Protocol (IP) and Media Access Control (MAC) are three types of address used by computers when accessing the Internet.

Give **two** features of each type of address in the table.

Type of address	Features
URL
IP
MAC

[6]

- (c) The company is concerned about threats to its web server.

Complete the table by identifying:

- **two** potential threats to its web server
- the impact each threat could have on the company
- software the company can use to help to limit each threat.

Each impact must be different.

Threat	Impact on company	Software
.....

.....

[6]

- 6** A business uses a closed-circuit television (CCTV) system that starts recording when motion is detected. It stops recording after two minutes if no further motion is detected. The system uses a motion sensor and a microprocessor.

Describe how the motion sensor and microprocessor work together to control the CCTV system.

[7]

7 Ishani is a software developer who is creating a new computer game.

(a) Ishani uses an interpreter and a compiler at different stages of the game creation.

(i) Explain when it is most appropriate for Ishani to use an interpreter.

.....
.....
.....
.....
.....
..... [3]

(ii) Explain when it is most appropriate for Ishani to use a compiler.

.....
.....
.....
.....
.....
.....
..... [3]

(b) Ishani has to decide between releasing her game as freeware or free software.

Describe freeware and free software.

Freeware

.....
.....
.....
.....

Free software

.....
.....
.....
.....

[4]

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of Cambridge Assessment. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which is a department of the University of Cambridge.



Cambridge IGCSE™

COMPUTER SCIENCE

0478/12

Paper 1

February/March 2022

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 February/March 2022 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of 13 printed pages.

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).

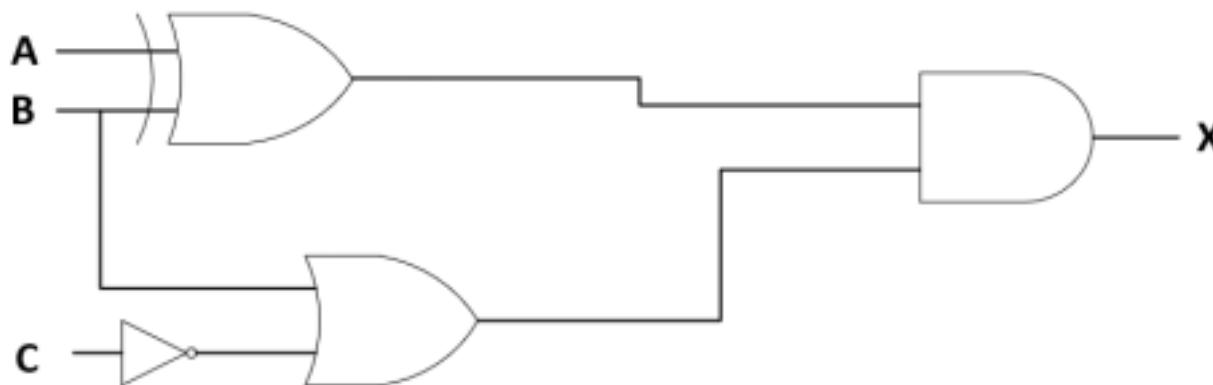
GENERIC MARKING PRINCIPLE 6:

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.

Question	Answer	Marks
1(a)	85	1
1(b)	C0	1
1(c)	26	1
1(d)	16	1

Question	Answer	Marks
2(a)	e.g. JPEG	1
2(b)	<p>Any three from:</p> <ul style="list-style-type: none"> • Image is made of pixels • Each pixel stores one colour • Image has a set number of pixels wide by pixels high • Each colour has a unique binary value // Each colour has a unique colour code • The colour/binary value of each pixel is stored in sequence • File contains metadata to identify how the file should be displayed • ... metadata can be the colour depth / resolution 	3
2(c)(i)	Reducing the file size	1
2(c)(ii)	<p>Any two from:</p> <ul style="list-style-type: none"> • reduces the storage/memory space taken on email server // reduces the storage space taken on her friend's computer when downloaded • sending/receiving email accounts may have restricted file size for attachments • reduces the time taken to transmit/upload/download to destination • reduces amount of bandwidth needed to transmit/download • file will mean less data usage is taken (for mobile clients) 	2

Question	Answer	Marks
2(c)(iii)	<p>Any five from:</p> <ul style="list-style-type: none"> • Parity can be set to odd or even • Sender and receiver agree on parity to use • Data/email/image is split into bytes // blocks of 7 bytes • Sender counts the number of 1s/0s in each group/byte • Each group/byte is assigned a parity bit to match the parity/odd/even • Receiving device/server recounts the number of 1s/0s in each group/byte • ... and compares to parity used/odd/even and if it does not match the parity, an error is reported/identified • (in block check) the location of the error(s) can be identified/estimated at the intersection 	5
2(c)(iv)	<p>1 mark for identification Any three for corresponding description:</p> <ul style="list-style-type: none"> • Checksum • Value is calculated from the data ... • ...using an algorithm // by example • Value is transmitted with the data • Value recalculated by receiver (using same algorithm) ... • ...if checksum values are different there is an error // reverse • Automatic Repeat request/reQuery (ARQ) • Uses acknowledgement and timeout • Sender starts a timer when data is transmitted • Receiver uses an error checking method to check whether the data has been received accurately • If no error detected a positive acknowledgement is returned to sender • If error detected negative acknowledgement is returned to sender • If sender gets no acknowledgement within the set time it resends the data 	4

Question	Answer	Marks																								
3(a)	<p>1 mark per row</p> <table border="1"> <thead> <tr> <th>Inputs</th><th>AND</th><th>OR</th><th>NAND</th><th>NOR</th><th>XOR</th></tr> </thead> <tbody> <tr> <td>$A = 1$ $B = 1$</td><td>✓</td><td>✓</td><td></td><td></td><td></td></tr> <tr> <td>$A = 0$ $B = 0$</td><td></td><td></td><td>✓</td><td>✓</td><td></td></tr> <tr> <td>$A = 1$ $B = 0$</td><td></td><td>✓</td><td>✓</td><td></td><td>✓</td></tr> </tbody> </table>	Inputs	AND	OR	NAND	NOR	XOR	$A = 1$ $B = 1$	✓	✓				$A = 0$ $B = 0$			✓	✓		$A = 1$ $B = 0$		✓	✓		✓	3
Inputs	AND	OR	NAND	NOR	XOR																					
$A = 1$ $B = 1$	✓	✓																								
$A = 0$ $B = 0$			✓	✓																						
$A = 1$ $B = 0$		✓	✓		✓																					
3(b)	<p>1 mark per gate</p>  <p>• A XOR B • NOT C • (NOT C) OR B • AND</p>	4																								

Question	Answer	Marks
4(a)(i)	<p>1 mark for each completed statement</p> <p>An optical mouse shines a red light from a Light-Emitting Diode//LED underneath the mouse. The light reflects back from a surface through a lens in the mouse and is converted to a value. This value is transmitted to the computer. The computer then determines the direction and speed of the movement.</p> <p>When the user presses a key on a keyboard, the key pushes the switch on the circuit board. This completes a circuit. Signals are sent to the computer that uses the data to calculate which key was pressed.</p>	6
4(a)(ii)	<p>1 mark each e.g.</p> <ul style="list-style-type: none"> • touchscreen • touchpad • scanner • microphone 	2
4(b)	<p>Any three from:</p> <ul style="list-style-type: none"> • More visible pixels // higher resolution • Higher colour contrast (in ambient lighting) // more vivid colours • Colours are (often) more accurate • Image (usually) appears brighter (with same wattage) • Will be stationary so does not need the portability of DLP • Does not need the compactness of DLP • Cost of purchase (usually) less • Run quieter • Any surface can be used as a display • Uses less power • Produces less heat • Does not give the rainbow effect DLP often gives • Longer lasting lamps 	3

Question	Answer	Marks
4(c)	<p>1 mark for naming appropriate device</p> <ul style="list-style-type: none"> • hard disk / HDD / magnetic • solid state drive / SSD / USB memory stick / flash drive <p>1 mark each for matching justification to max 3. e.g.</p> <p>HDD</p> <ul style="list-style-type: none"> • Large capacity storage • ...for videos/films that have large file sizes / require large storage space • Longevity // Can be read from/written to large number of times • ... the copies will be accessible for a long time // device will not break if accessed regularly • ...may require large number of read/write to access fields • Relatively cheap per GB // cheaper than SSD per GB ... • ... there is a large capacity required therefore overall may cost less than other devices • Device will not be moved regularly so no need for portability/durability <p>SSD</p> <ul style="list-style-type: none"> • Large capacity storage • ...for videos/films that have large file sizes / require large storage space • No moving parts • ...can be carried/moved to other locations with limited risk of damage • Fast access speed • ... videos are large files that will be stored/accessed in less time • Cost per GB is not significant (in comparison) • ...there is a large capacity required therefore overall cost will not be significantly more than others • Used as a copy of files to may not be accessed regularly • ... the limited number of read/write times/longevity is inconsequential • Uses less power // runs cooler • No latency // does not take time to start-up 	4

Question	Answer	Marks
5(a)	<p>1 mark for each example, allow description or tags</p> <p>Structure e.g.</p> <ul style="list-style-type: none">• head• body• table• heading• subheading• paragraph• object position on the page // alignment• margins• borders (position/size)• padding <p>Presentation e.g.</p> <ul style="list-style-type: none">• colour• font size• font style• border (style)	4

Question	Answer		Marks							
5(b)	<p>1 mark for each bullet to max 2 for each</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Type of address</th><th>Features</th></tr> </thead> <tbody> <tr> <td>URL</td><td> <ul style="list-style-type: none"> • protocol • domain name • top level domain • file/folder name/address/directory/path • made up of letters, numbers and symbols </td></tr> <tr> <td>IP</td><td> <p>IPv4:</p> <ul style="list-style-type: none"> • 4 groups of numbers // 12 numbers • separated by full stops (.) • 0-255 in each group • 4 bytes long // 32 bits • Represented in denary <p>IPv6:</p> <ul style="list-style-type: none"> • 8 groups of numbers // 32 numbers • separated by colons (:) • 0-FFFF in each group • 16 bytes long // 128 bits • Consecutive groups of 0000 can be replaced with :: • Represented in hexadecimal </td></tr> <tr> <td>MAC</td><td> <ul style="list-style-type: none"> • First part is manufacturer ID • Second part is serial number • Each part has 3 pairs of numbers // Each part has 6 numbers // 6 pairs of 2-digits // consists of 12 numbers • ...between 00 and FF • ..separated by : • Each part is 3 bytes // Is 6 bytes long // Is 48 bits long • Represented using hexadecimal </td></tr> </tbody> </table>	Type of address	Features	URL	<ul style="list-style-type: none"> • protocol • domain name • top level domain • file/folder name/address/directory/path • made up of letters, numbers and symbols 	IP	<p>IPv4:</p> <ul style="list-style-type: none"> • 4 groups of numbers // 12 numbers • separated by full stops (.) • 0-255 in each group • 4 bytes long // 32 bits • Represented in denary <p>IPv6:</p> <ul style="list-style-type: none"> • 8 groups of numbers // 32 numbers • separated by colons (:) • 0-FFFF in each group • 16 bytes long // 128 bits • Consecutive groups of 0000 can be replaced with :: • Represented in hexadecimal 	MAC	<ul style="list-style-type: none"> • First part is manufacturer ID • Second part is serial number • Each part has 3 pairs of numbers // Each part has 6 numbers // 6 pairs of 2-digits // consists of 12 numbers • ...between 00 and FF • ..separated by : • Each part is 3 bytes // Is 6 bytes long // Is 48 bits long • Represented using hexadecimal 	6
Type of address	Features									
URL	<ul style="list-style-type: none"> • protocol • domain name • top level domain • file/folder name/address/directory/path • made up of letters, numbers and symbols 									
IP	<p>IPv4:</p> <ul style="list-style-type: none"> • 4 groups of numbers // 12 numbers • separated by full stops (.) • 0-255 in each group • 4 bytes long // 32 bits • Represented in denary <p>IPv6:</p> <ul style="list-style-type: none"> • 8 groups of numbers // 32 numbers • separated by colons (:) • 0-FFFF in each group • 16 bytes long // 128 bits • Consecutive groups of 0000 can be replaced with :: • Represented in hexadecimal 									
MAC	<ul style="list-style-type: none"> • First part is manufacturer ID • Second part is serial number • Each part has 3 pairs of numbers // Each part has 6 numbers // 6 pairs of 2-digits // consists of 12 numbers • ...between 00 and FF • ..separated by : • Each part is 3 bytes // Is 6 bytes long // Is 48 bits long • Represented using hexadecimal 									

Question	Answer			Marks											
5(c)	<p>1 mark for threat. 1 for impact. 1 for software.</p> <p>Do not award identical impacts twice but read whole answer and award if additional impact given. Allow the same software twice. e.g.</p> <table border="1"> <thead> <tr> <th>Threat</th> <th>Impact on company</th> <th>Software</th> </tr> </thead> <tbody> <tr> <td>Denial of service</td> <td> <ul style="list-style-type: none"> • Users cannot access the website • Loss of sales (of holidays) • Loss of reputation </td> <td>Proxy/firewall</td> </tr> <tr> <td>Virus/malware</td> <td> <ul style="list-style-type: none"> • Data on the server may be deleted/changed • Website may be deleted/changed • Server may be filled with data and crash </td> <td>Anti-virus</td> </tr> <tr> <td>Unauthorised access // hacker</td> <td> <ul style="list-style-type: none"> • Data could be deleted/stolen/changed </td> <td>Proxy/Firewall</td> </tr> </tbody> </table>	Threat	Impact on company	Software	Denial of service	<ul style="list-style-type: none"> • Users cannot access the website • Loss of sales (of holidays) • Loss of reputation 	Proxy/firewall	Virus/malware	<ul style="list-style-type: none"> • Data on the server may be deleted/changed • Website may be deleted/changed • Server may be filled with data and crash 	Anti-virus	Unauthorised access // hacker	<ul style="list-style-type: none"> • Data could be deleted/stolen/changed 	Proxy/Firewall		6
Threat	Impact on company	Software													
Denial of service	<ul style="list-style-type: none"> • Users cannot access the website • Loss of sales (of holidays) • Loss of reputation 	Proxy/firewall													
Virus/malware	<ul style="list-style-type: none"> • Data on the server may be deleted/changed • Website may be deleted/changed • Server may be filled with data and crash 	Anti-virus													
Unauthorised access // hacker	<ul style="list-style-type: none"> • Data could be deleted/stolen/changed 	Proxy/Firewall													

Question	Answer	Marks
6	<p>Any seven from:</p> <ul style="list-style-type: none"> • (Motion) sensor sends signals to microprocessor • analogue signal is converted to digital • microprocessor compares signal to stored value ... • ...if it does not meet / meets the stored value (and if camera is not recording) the microprocessor sends signal (to camera) to start recording • ... if it does not meet / meets the stored value the microprocessor starts/resets the timer • When the timer reaches 2 minutes the microprocessor sends signal (to camera) to stop recording • Whole process is repeated continually/until turned off 	7

Question	Answer	Marks
7(a)(i)	<p>1 mark for when e.g.</p> <ul style="list-style-type: none"> • Development // when writing the program // when debugging <p>1 mark for explanation to max 2 from: e.g.</p> <ul style="list-style-type: none"> • ... easier to debug • ...stops when an error is detected • ...reports one error at a time • ...can correct errors in run-time // correct the line and then continue running from that point • ...can test one section without the rest of the code being completed 	3
7(a)(ii)	<p>1 mark for when e.g.</p> <ul style="list-style-type: none"> • After completion // For distribution // For final/repeated testing <p>1 mark each to max 2 from: e.g. After completion</p> <ul style="list-style-type: none"> • It creates an executable file • ...than can be distributed without source code • ...so that other people cannot edit/view the code • ...so end users do not need translator software // so end users do not need to compile/interpret each time • ...so it is machine/platform independent (usually) <p>In final testing</p> <ul style="list-style-type: none"> • It creates an executable file • ...do not need to retranslate for each test sequence • ...can test repeatedly with different data faster 	3

Question	Answer	Marks
7(b)	<p>Any four from, max 2 from each:</p> <p>Freeware:</p> <ul style="list-style-type: none">• There is no cost to the user // free trial• No source code provided• ...cannot be modified• Can be redistributed (in same state)• Is subject to copyright <p>Free software:</p> <ul style="list-style-type: none">• User has access to the source code• Can be modified (without restriction)• Can be redistributed (without restriction)• Can have a cost associated but does not have to• Is subject to copyright	4

CANDIDATE
NAME

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



COMPUTER SCIENCE

0478/11

Paper 1 Theory

May/June 2019

1 hour 45 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

No calculators allowed.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name in the spaces at the top of this page.
Write in dark blue or black pen.

You may use an HB pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer **all** questions.

No marks will be awarded for using brand names of software packages or hardware.

Any businesses described in this paper are entirely fictitious.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

The maximum number of marks is 75.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **11** printed pages and **1** blank page.

- 1 Hexadecimal is used for MAC addresses.

Part of a MAC address is given:

97 – 5C – E1

Each pair of digits is stored as binary in an 8-bit register.

- (a) Show what the binary register stores for each pair of the given digits.

97								
5C								
E1								

[6]

- (b) Explain what is meant by a MAC address.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

[4]

- (c) Give **two** other examples where hexadecimal can be used.

Example 1

.....

Example 2

.....

[2]

- 2 Rajesh creates a logic circuit.

He uses three different logic gates in his circuit. Each logic gate has a maximum of **two** inputs.

He describes the logic of each gate.

- (a) "The only time the output will be 1 is when both inputs are 1."

State the single logic gate

Draw the single logic gate:



[2]

- (b) "The only time the output will be 1 is when both inputs are 0."

State the single logic gate

Draw the single logic gate:



[2]

- (c) "The only time the output will be 0 is when both inputs are 1."

State the single logic gate

Draw the single logic gate:



[2]

- 3 Five descriptions of different input or output devices are given in the table.

Complete the table by stating the **name** of each input or output device.

Description	Name of device
This is an input device that works by shining a light onto the surface of a document. The light source is automatically moved across the document and the reflected light is captured by mirrors and lenses.
This is an input device where a laser or a light source is moved across an object. The width, height and depth of the object are measured to allow a model to be created.
This is a large input device that is usually fixed to a wall. A user can calibrate the device to make sure the sensors align with a projected image. The user can use either their finger or a special pen to make selections.
This is an output device that uses many small mirrors to reflect light towards a lens. This will display an image.
This is an output device that creates an object by building layer upon layer of material.

[5]

- 4 (a) Lola is concerned about the risks to her computer when using the Internet.

She wants to use some security methods to help protect her computer from the risks.

Identify a security method she could use for each of the following risks. Each security method must be different.

Describe how each security method will help protect Lola's computer.

- (i) Computer virus

Security method

Description

.....
.....
.....
.....

[3]

- (ii) Hacking

Security method

Description

.....
.....
.....
.....

[3]

- (iii) Spyware

Security method

Description

.....
.....
.....
.....

[3]

- (b) Lola is also concerned that the data she stores could be subject to accidental damage or accidental loss.

- (i) State **three** ways that the data Lola stores could be accidentally damaged or accidentally lost.

1

.....

2

.....

3

.....

[3]

- (ii) Give **two** methods that Lola could use to help keep her data safe from accidental damage or accidental loss.

1

.....

2

.....

[2]

- 5 The following text is stored as a text file:

She sells sea shells on the seashore. The shells that she sells are sea shells I am sure.

Explain how lossless compression would compress this file.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
..... [5]

6 A law company holds a lot of sensitive data about its clients.

- (a) It currently requires employees to enter a username and a password to log-in to an account. Each password must be 8 letters.

The company wants to increase the security of the log-in system.

Identify **two** improvements the company could use to make the log-in system more secure.

Explain how each improvement increases security.

Improvement 1

.....

.....

Improvement 2

.....

.....

.....

[4]

- (b) The law company wants to purchase a new file server.

The company can purchase a server with either solid state storage or magnetic storage. After discussion, it decides to purchase a file server with magnetic storage.

Explain why the company chose magnetic storage rather than solid state storage.

.....

.....

.....

.....

.....

.....

.....

.....

[4]

(c) The law company also uses optical storage.

Give **three** different examples of optical storage.

1

2

3

[3]

7 Annie writes a paragraph of text as an answer to an examination question about programming languages.

Using the list given, complete Annie's answer by inserting the correct **six** missing terms. Not all terms will be used.

- Assembly
- Converter
- Denary
- Hexadecimal
- High-level language
- Low-level language
- Machine Code
- Source Code
- Syntax
- Translator

The structure of language statements in a computer program is called the

..... A programming language that uses natural

language statements is called a When programs

are written in this type of language they need a to

convert them into

A programming language that is written using mnemonic codes is called

..... language. This is an example of a

.....

[6]

- 8** An art gallery has a website that is used to display and sell art.

- (a) The gallery uses Secure Socket Layer (SSL) to provide a secure connection when selling art.

Describe the process of SSL and how it provides a secure connection.

[6]

- (b) The art gallery also uses a firewall.

Six statements are given about firewalls.

Tick (✓) to show if the statement is True or False.

Statement	True (✓)	False (✗)
Firewalls are only available as hardware devices		
Firewalls allow a user to set rules for network traffic		
Firewalls will automatically stop all malicious traffic		
Firewalls only examine traffic entering a network		
Firewalls encrypt all data that is transmitted around a network		
Firewalls can be used to block access to certain websites		

[6]

- (c) The art gallery is concerned about computer ethics relating to its website.

Explain what is meant by computer ethics **and** why the art gallery is concerned about computer ethics.

.....
.....
.....
.....
.....
.....
.....
.....
..... [4]

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.

COMPUTER SCIENCE

0478/11

Paper 1

May/June 2019

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 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **14** printed pages.

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:

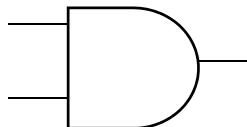
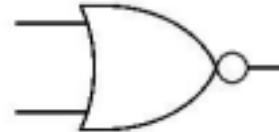
Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

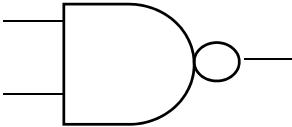
GENERIC MARKING PRINCIPLE 6:

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.

Question	Answer	Marks																								
1(a)	<p>97</p> <table border="1"> <tr> <td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td> </tr> </table> <p style="text-align: center;">1 mark 1 mark</p> <p>5C</p> <table border="1"> <tr> <td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td> </tr> </table> <p style="text-align: center;">1 mark 1 mark</p> <p>E1</p> <table border="1"> <tr> <td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td> </tr> </table> <p style="text-align: center;">1 mark 1 mark</p>	1	0	0	1	0	1	1	1	0	1	0	1	1	1	0	0	1	1	1	0	0	0	0	1	6
1	0	0	1	0	1	1	1																			
0	1	0	1	1	1	0	0																			
1	1	1	0	0	0	0	1																			
1(b)	<p>Four from:</p> <ul style="list-style-type: none"> • Media Access Control (address) • Used to identify a device • It is a unique (address) • It is a static address // It does not change • It is set by the manufacturer • The first part is the manufacturer ID/number/identifies the manufacturer • The second part is the serial number/ID 	4																								

Question	Answer	Marks
1(c)	<p>Two from e.g.:</p> <ul style="list-style-type: none"> • Colour codes // Colour in HTML / CSS • Error messages • Locations in memory • Memory dump // debugging • IP address • ASCII // Unicode • Assembly language • URL 	2

Question	Answer	Marks
2(a)	<p>1 mark for correct name, 1 mark for correct gate symbol</p> <p>– AND</p> 	2
2(b)	<p>1 mark for correct name, 1 mark for correct gate symbol</p> <p>– NOR</p> 	2

Question	Answer	Marks
2(c)	1 mark for correct name, 1 mark for correct gate symbol – NAND 	2

Question	Answer	Marks												
3	<p>1 mark for each correct device</p> <table border="1"> <thead> <tr> <th>Description of input or output device</th> <th>Name of device</th> </tr> </thead> <tbody> <tr> <td>This is an input device that works by shining a light onto the surface of a document. The light source is automatically moved across the document and the reflected light is captured by mirrors and lenses.</td> <td>2D Scanner</td> </tr> <tr> <td>This is an input device where a laser or a light source is moved across an object. The width, height and depth of the object are measured to allow a model to be created.</td> <td>3D scanner</td> </tr> <tr> <td>This is a large input device that is usually fixed to a wall. A user can calibrate the device to make sure the sensors align with a projected image. The user can use either their finger or a special pen to make selections.</td> <td>Interactive whiteboard</td> </tr> <tr> <td>This is an output device that uses many small mirrors to reflect light towards a lens. This will display an image.</td> <td>Projector</td> </tr> <tr> <td>This is an output device that creates an object by building layer upon layer of material.</td> <td>3D printer</td> </tr> </tbody> </table>	Description of input or output device	Name of device	This is an input device that works by shining a light onto the surface of a document. The light source is automatically moved across the document and the reflected light is captured by mirrors and lenses.	2D Scanner	This is an input device where a laser or a light source is moved across an object. The width, height and depth of the object are measured to allow a model to be created.	3D scanner	This is a large input device that is usually fixed to a wall. A user can calibrate the device to make sure the sensors align with a projected image. The user can use either their finger or a special pen to make selections.	Interactive whiteboard	This is an output device that uses many small mirrors to reflect light towards a lens. This will display an image.	Projector	This is an output device that creates an object by building layer upon layer of material.	3D printer	5
Description of input or output device	Name of device													
This is an input device that works by shining a light onto the surface of a document. The light source is automatically moved across the document and the reflected light is captured by mirrors and lenses.	2D Scanner													
This is an input device where a laser or a light source is moved across an object. The width, height and depth of the object are measured to allow a model to be created.	3D scanner													
This is a large input device that is usually fixed to a wall. A user can calibrate the device to make sure the sensors align with a projected image. The user can use either their finger or a special pen to make selections.	Interactive whiteboard													
This is an output device that uses many small mirrors to reflect light towards a lens. This will display an image.	Projector													
This is an output device that creates an object by building layer upon layer of material.	3D printer													

Question	Answer	Marks
4(a)(i)	<p>1 mark for security method, 2 marks for description</p> <p>Anti-virus (software) // Anti-malware (software)</p> <ul style="list-style-type: none">• Scans the computer system (for viruses)• Has a record of known viruses• Removes/quarantines any viruses that are found• Checks data before it is downloaded• ... and stops download if virus found/warns user may contain virus <p>Firewall // Proxy server</p> <ul style="list-style-type: none">• Monitors traffic coming into and out of the computer system• Checks that the traffic meets any criteria/rules set• Blocks any traffic that does not meet the criteria/rules set // set blacklist/whitelist	3

Question	Answer	Marks
4(a)(ii)	<p>1 mark for security method, 2 marks for description</p> <p>Firewall // proxy server</p> <ul style="list-style-type: none"> • Monitors traffic coming into and out of the computer system • Check that the traffic meets any criteria/rules set • Blocks any traffic that does not meet the criteria/rules set // set blacklist/whitelist <p>NOTE: Cannot be awarded if already given in 4(a)(i)</p> <p>Passwords</p> <ul style="list-style-type: none"> • Making a password stronger // by example • Changing it regularly • Lock out after set number of attempts // stops brute force attacks // makes it more difficult to guess <p>Biometrics</p> <ul style="list-style-type: none"> • Data needed to enter is unique to individual • ... therefore very difficult to replicate • Lock out after set number of attempts <p>Two-step verification // Two-factor authentication</p> <ul style="list-style-type: none"> • Extra data is sent to device, pre-set by user • ... making it more difficult for hacker to obtain it • Data has to be entered into the same system • ... so if attempted from a remote location, it will not be accepted 	3

Question	Answer	Marks
4(a)(iii)	<p>1 mark for security method, 2 marks for description</p> <p>Anti-spyware software // Anti-malware (software)</p> <ul style="list-style-type: none"> • Scans the computer for spyware • Removes/quarantines any spyware that is found • Can prevent spyware being downloaded <p>NOTE: Anti-malware (software) cannot be awarded if already given in 4(a)(i)</p> <p>Drop-down boxes // onscreen/virtual keyboard</p> <ul style="list-style-type: none"> • Means key logger cannot collect data // key presses cannot be recorded • ... and relay it to third party <p>Two-step verification // Two-factor authentication</p> <ul style="list-style-type: none"> • Extra data is sent to device, pre-set by user • ... making it more difficult for hacker to obtain it • Data has to be entered into the same system • ... so if attempted from a remote location, it will not be accepted <p>NOTE: Cannot be awarded if already given in 4(a)(ii)</p> <p>Firewall // proxy server</p> <ul style="list-style-type: none"> • Monitors traffic coming into and out of the computer system • Check that the traffic meets any criteria/rules set • Blocks any traffic that does not meet the criteria/rules set // set blacklist/whitelist <p>NOTE: Cannot be awarded if already given in 4(a)(i) or 4(a)(ii)</p>	3
4(b)(i)	<p>Three from:</p> <ul style="list-style-type: none"> • Human error e.g. accidentally deleting a file • Hardware failure • Physical damage e.g. fire/flood • Power failure // power surge • Misplacing a storage device 	3

Question	Answer	Marks
4(b)(ii)	<p>Two from:</p> <ul style="list-style-type: none"> • Back data up • Use surge protection • Keep data in a fireproof / waterproof / protective case • Use verification methods (for deleting files) • Following correct procedure e.g. ejecting offline devices / regularly saving 	2

Question	Answer	Marks
5	<p>Five from:</p> <ul style="list-style-type: none"> • A (compression) algorithm is used • No data is removed in the process // original file can be restored • Repeated words (are identified) // Patterns in the data (are identified) • ... and are indexed/put into a table // by example • ... and are replaced with their index // by example • ... and their positions are stored (in the table) // by example • ... and the number of times the word/pattern appears is stored (in the table) // by example <p>NOTE: Other valid methods of lossless compression can be awarded marks</p>	5

Question	Answer	Marks
6(a)	<p>Four from (max 2 marks per improvement):</p> <ul style="list-style-type: none"> • Make the password require more characters • Makes the password harder to crack/guess • More possible combinations for the password • Make the password require different types of characters • Makes the password harder to crack/guess • More possible combinations for the password • Use a biometric device • Hard to fake a person's biological data // data is unique • Two-step verification // Two factor-authentication • Adds an additional level to hack • Have to have the set device for the code to receive it • Drop-down boxes // onscreen keyboard • To prevent passwords being obtained using keylogger • Request random characters • Won't reveal entire password • Set number of password attempts • Will lock account if attempting to guess • Will stop brute-force attacks 	4

Question	Answer	Marks
6(b)	<p>Four from (max 3 marks for benefits only, without an explanation):</p> <ul style="list-style-type: none">• More read/write cycles (over its lifetime) // greater longevity ...• ... likely to be a lot of read/write functions each day• Read/write speed is sufficient ...• ... even though it is slower than solid-state• Cheaper per unit of data stored ...• ... better value for the company to purchase• ... so the law company can afford to buy a server with greater storage capacity• No requirement for portability ...• ... as a server, it does not need to be moved• Trusted technology ...• ... it has been traditionally used for many years	4
6(c)	<ul style="list-style-type: none">• DVD• CD• Blu-ray	3

Question	Answer	Marks
7	<p>1 mark for each correct term, in the correct place:</p> <ul style="list-style-type: none"> • Syntax • High-level language • Translator • Machine code • Assembly • Low-level language 	6

Question	Answer	Marks
8(a)	<p>Six from:</p> <ul style="list-style-type: none"> • SSL is a (security) protocol • It encrypts any data that is sent • It uses/sends digital certificates ... • ... which is sent to the (buyer's/user's) browser // requested by (buyer's/user's) browser • ... that contains the gallery's public key • ... that can be used to authenticate the gallery • Once the certificate is authenticated, the transaction will begin 	6

Question	Answer	Marks																					
8(b)	<p>1 mark for each correct tick.</p> <table border="1"> <thead> <tr> <th>Statement</th><th>True (✓)</th><th>False (✗)</th></tr> </thead> <tbody> <tr> <td>Firewalls are only available as hardware devices</td><td></td><td>✓</td></tr> <tr> <td>Firewalls allow a user to set rules for network traffic</td><td>✓</td><td></td></tr> <tr> <td>Firewalls will automatically stop all malicious traffic</td><td></td><td>✓</td></tr> <tr> <td>Firewalls only examine traffic entering a network</td><td></td><td>✓</td></tr> <tr> <td>Firewalls encrypt all data that is transmitted around a network</td><td></td><td>✓</td></tr> <tr> <td>Firewalls can be used to block access to certain websites</td><td>✓</td><td></td></tr> </tbody> </table>	Statement	True (✓)	False (✗)	Firewalls are only available as hardware devices		✓	Firewalls allow a user to set rules for network traffic	✓		Firewalls will automatically stop all malicious traffic		✓	Firewalls only examine traffic entering a network		✓	Firewalls encrypt all data that is transmitted around a network		✓	Firewalls can be used to block access to certain websites	✓		6
Statement	True (✓)	False (✗)																					
Firewalls are only available as hardware devices		✓																					
Firewalls allow a user to set rules for network traffic	✓																						
Firewalls will automatically stop all malicious traffic		✓																					
Firewalls only examine traffic entering a network		✓																					
Firewalls encrypt all data that is transmitted around a network		✓																					
Firewalls can be used to block access to certain websites	✓																						
8(c)	<p>Four from:</p> <ul style="list-style-type: none"> • A set of guidelines • Rules/laws that govern the use of computers / by example • Tell people how to behave when using computers // helps keep users safe when using computers // by example • Art gallery could be subject to plagiarism / intellectual property theft • Art gallery could copyright their work (to make it illegal to steal it) 	4																					

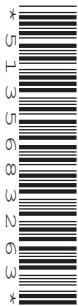
CANDIDATE
NAME

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



COMPUTER SCIENCE

0478/12

Paper 1 Theory

May/June 2019

1 hour 45 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

No calculators allowed.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name in the spaces at the top of this page.
Write in dark blue or black pen.

You may use an HB pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer **all** questions.

No marks will be awarded for using brand names of software packages or hardware.

Any businesses described in this paper are entirely fictitious.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

The maximum number of marks is 75.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **11** printed pages and **1** blank page.

1 Input and output devices are often connected to a personal computer.

(a) Identify **three** input devices that can be connected to a personal computer.

1

2

3

[3]

(b) Identify **three** output devices that can be connected to a personal computer.

1

2

3

[3]

2 A finance company uses off-line storage to archive their accounts.

(a) Explain what is meant by off-line storage.

.....
.....
.....
..... [2]

(b) The computers in the finance company use both primary and secondary storage.

(i) Give **one** example of primary storage.

..... [1]

(ii) Give **two** examples of secondary storage.

1

2

[2]

- 3 Vanessa writes a paragraph as an answer to an examination question about the central processing unit (CPU).

Use the list given to complete Vanessa's answer by inserting the correct **six** missing terms. Not all terms will be used.

- Components
- Data
- Decoded
- Executed
- Fetched
- Instructions
- RAM
- ROM
- Secondary storage

The CPU processes and

An instruction is from

into the CPU where it is then Once this has taken place the instruction is then

[6]

- 4 (a) Marley wants to store a video he has created for his school project.

He considers using a DVD or a Blu-ray to store the video.

Explain **two** differences between a DVD and a Blu-ray.

1

.....

.....

2

.....

.....

[2]

- (b) (i) Marley also needs to store ten 8-bit colour images in a file for his project.

Each image is 500 pixels wide and 300 pixels high.

Calculate the total file size in megabytes (MB) for all Marley's images.

Show all your working.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

File size MB

[3]

- (ii) Marley prints the images for his project using an inkjet printer.

Describe how the inkjet printer prints an image.

.....
.....
.....
.....
.....
.....
.....
.....

[4]

- 5 A music company wants to send a new music file to many radio stations. It will send the music file the day before the release date so that the radio stations can store the file ready for release.

The music company does not want the radio stations to be able to open the music file until 09:00 on the release date.

Identify **two** security measures **and** describe how each measure can be used to make sure the music file cannot be opened until the release date.

Security measure 1

Description

.....
.....

Security measure 2

Description

.....
.....

[4]

- 6 Priya creates a website to sell her old comic books and superhero figures.

- (a) She uses HTML to create her website. The HTML she produces has both structure and presentation.

Explain what is meant by HTML **structure** and **presentation**. Include an **example** of each.

Structure

.....

.....

.....

Presentation

.....

.....

.....

.....

[4]

- (b) Priya uses cookies in her website.

Five statements are given about cookies.

Tick (✓) to show if the statement is **True** or **False**.

Statement	True (✓)	False (✗)
Cookies can be used to store a customer's credit card details		
Cookies can be used to track the items a customer has viewed on a website		
Cookies will corrupt the data on a customer's computer		
Cookies are downloaded onto a customer's computer		
Cookies can be deleted from a customer's computer		

[5]

- (c) Priya stores her website on a webserver.

To transmit the website data to the webserver she uses parallel duplex data transmission.

Describe how data is transmitted using parallel duplex data transmission.

.....
.....
.....
.....
.....
.....
.....
.....

[4]

- (d) Priya has a URL for her website.

State what is meant by a URL.

.....
.....

[1]

- (e) Priya is concerned about a denial of service attack (DoS) occurring on her webserver.

- (i) Explain what is meant by a denial of service attack.

.....
.....
.....
.....
.....
.....
.....
.....
.....

[4]

- (ii) Give **one** security device that can be used to help prevent a denial of service attack.

.....

[1]

- 7 (a) An office has an automated lighting system. When movement is detected in the office the lights are switched on. If movement is not detected for a period of 2 minutes the lights are switched off. The system uses a sensor and a microprocessor.

Describe how the automated lighting system uses a sensor and a microprocessor.

[6]

[6]

- (b) A microprocessor uses ROM.

Explain what is meant by ROM.

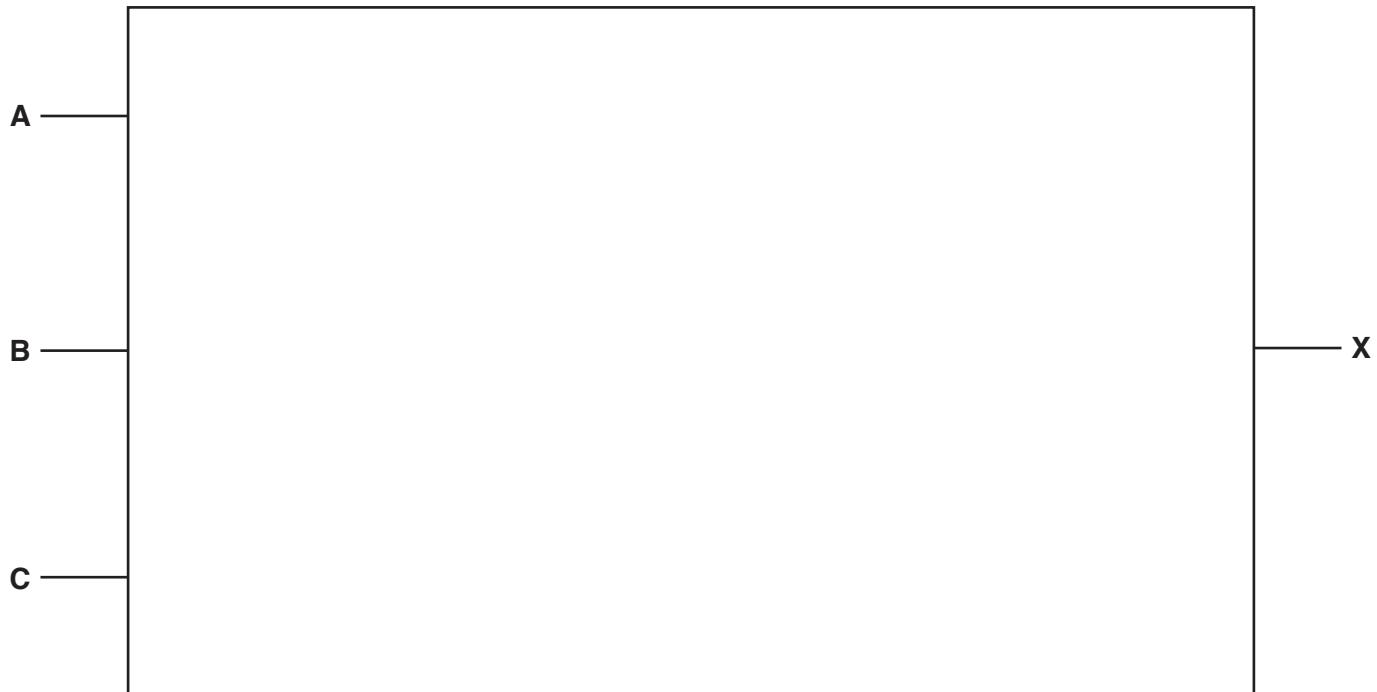
[3]

[3]

- 8 Consider the logic statement:

$$X = 1 \text{ if } ((A \text{ is } 1 \text{ NOR } C \text{ is } 1) \text{ AND } (B \text{ is NOT } 1 \text{ NOR } C \text{ is } 1)) \text{ OR } (A \text{ is } 1 \text{ AND } B \text{ is } 1)$$

- (a) Draw a logic circuit to match the given logic statement. Each logic gate used must have a maximum of **two** inputs. Do **not** attempt to simplify the logic statement.



[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]

- 9 The contents of three binary registers have been transmitted from one computer to another. **Even parity** has been used as an error detection method.

The outcome after transmission is:

Register A and **Register C** have been transmitted **correctly**.

Register B has been transmitted **incorrectly**.

Complete the **Parity bit** for each register to show the given outcome.

Parity bit								
Register A		0	1	0	0	1	0	1

Register B		1	0	0	0	0	0	1
------------	--	---	---	---	---	---	---	---

Register C		1	0	0	0	0	1	1
------------	--	---	---	---	---	---	---	---

[3]

- 10 Remy has a mobile device that has a capacitive touch screen.

Describe how the capacitive touch screen registers Remy's touch.

.....
.....
.....
.....
.....
.....
.....
.....

[4]

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.

COMPUTER SCIENCE

0478/12

Paper 1

May/June 2019

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 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of 12 printed pages.

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.

Question	Answer	Marks
1(a)	Three from e.g.: <ul style="list-style-type: none">– Keyboard– Mouse– Microphone– 2D scanner– 3D scanner– Touchscreen– Webcam // digital camera– Joystick– Trackpad– Sensor– Interactive whiteboard	3
1(b)	Three from e.g.: <ul style="list-style-type: none">– Monitor // touchscreen– Inkjet printer– Laser printer– 3D printer– Speaker– Headphones– LED Projector– DLP– 2D cutter– 3D cutter– Actuator	3

Question	Answer	Marks
2(a)	Two from: – It is non-volatile – Can be easily disconnected from the computer – It is not directly accessed by the CPU – Suitable example e.g. CD, DVD, USB flash memory	2
2(b)(i)	One from: – ROM – RAM	1
2(b)(ii)	Two from: – HDD – SSD – Flash memory	2

Question	Answer	Marks
3	1 mark for each correct term, in the correct place: – Data/instructions – Instructions/data (must be the alternative to MP1) – Fetched – RAM – Decoded – Executed	6

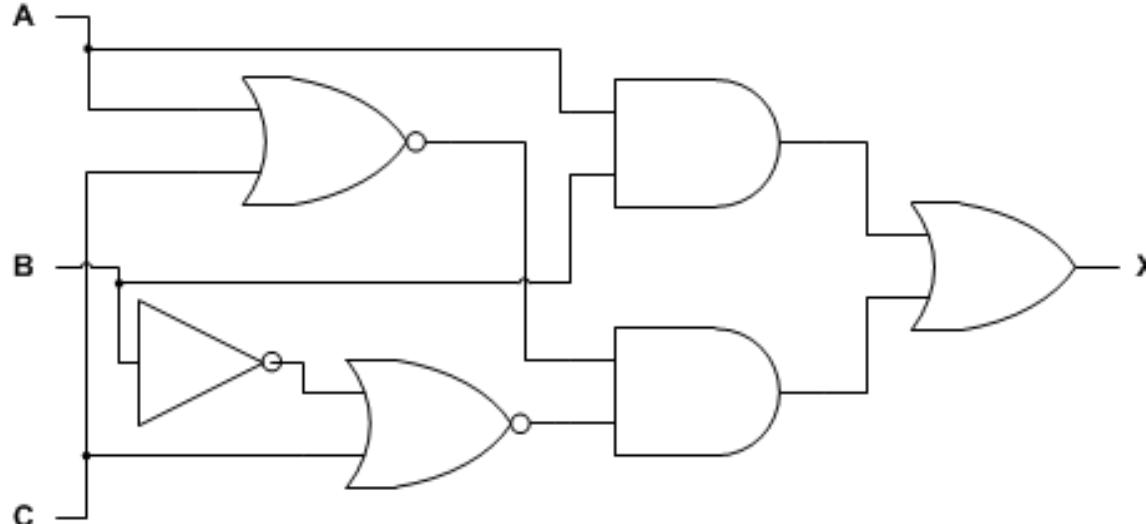
Question	Answer	Marks
4(a)	<p>Two from e.g.:</p> <ul style="list-style-type: none"> – <u>DVD</u> uses red laser/light whereas <u>blu-ray</u> uses blue/violet laser/light – <u>DVD</u> has a smaller (storage) capacity // <u>Blu-ray</u> has a larger (storage) capacity – <u>DVD</u> has two layers (of polycarbonate) whereas <u>Blu-ray</u> disks have a single layer (of polycarbonate) – <u>DVD</u> has a slower transfer rate (of approximately 10 mbps) // <u>Blu-ray</u> has a faster transfer rate (of approximately 36 mbps) 	2
4(b)(i)	<p>2 marks for any two correct stages of working, 1 mark for correct answer.</p> <ul style="list-style-type: none"> – $500 * 300 * 10 // 150\,000 * 10$ – $* 8$ then $\div 8$ (anywhere in the process) – $1\,500\,000 \div 1024 \div 1024 // 1\,500\,000 \div 1\,048\,576$ – $= 1.43$ MB 	3
4(b)(ii)	<p>Four from:</p> <ul style="list-style-type: none"> – Rollers are used to move the paper through the printer – Nozzles spray/drop/jet ink onto the paper – Ink jets/print head/nozzles are moved across the paper (to distribute the ink) – Different colour inks are mixed to create required colours – Technology could be piezoelectric – Technology could be thermal bubble – Ink is heated – ... and expands/evaporates into a bubble – Bubble is pushed through the nozzle on to the paper – ... then the bubble collapses – Electrical current is applied to a crystal – ... which makes it vibrate – ... which forces a droplet of ink through the nozzle 	4

Question	Answer	Marks
5	<ul style="list-style-type: none"> – Password protection – Password is released on the release date – Encryption – Encryption key is released on the release date 	4

Question	Answer	Marks																		
6(a)	<p>Structure</p> <ul style="list-style-type: none"> – This is the layout of the web page – e.g. placing an image alongside some text // example of tag, such as <div> <p>Presentation</p> <ul style="list-style-type: none"> – This is the formatting/style of the web page – e.g. the colour that is applied to some text // example of tag, such as <font-color> 	4																		
6(b)	<p>1 mark per each correct row.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Statement</th> <th style="text-align: center;">True (✓)</th> <th style="text-align: center;">False (✗)</th> </tr> </thead> <tbody> <tr> <td>Cookies can be used to store a customer's credit card details</td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td>Cookies can be used to track the items a customer has viewed on a website</td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td>Cookies will corrupt the data on a customer's computer</td> <td></td> <td style="text-align: center;">✓</td> </tr> <tr> <td>Cookies are downloaded onto a customer's computer</td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td>Cookies can be deleted from a customer's computer</td> <td style="text-align: center;">✓</td> <td></td> </tr> </tbody> </table>	Statement	True (✓)	False (✗)	Cookies can be used to store a customer's credit card details	✓		Cookies can be used to track the items a customer has viewed on a website	✓		Cookies will corrupt the data on a customer's computer		✓	Cookies are downloaded onto a customer's computer	✓		Cookies can be deleted from a customer's computer	✓		5
Statement	True (✓)	False (✗)																		
Cookies can be used to store a customer's credit card details	✓																			
Cookies can be used to track the items a customer has viewed on a website	✓																			
Cookies will corrupt the data on a customer's computer		✓																		
Cookies are downloaded onto a customer's computer	✓																			
Cookies can be deleted from a customer's computer	✓																			

Question	Answer	Marks
6(c)	<ul style="list-style-type: none"> – Several/multiple bits are transmitted at a time/simultaneously – Several/multiple wires are used – Data is transmitted in both directions ... – ... at the same time/simultaneously 	4
6(d)	One from: <ul style="list-style-type: none"> – Uniform resource locator – The website's address – User friendly version of the IP address 	1
6(e)(i)	Four from: <ul style="list-style-type: none"> – Designed to deny people access to a website – A large number/numerous requests are sent (to a server) ... – ... all at the same time – The server is unable to respond/struggles to respond to all the requests – The server fails/times out as a result 	4
6(e)(ii)	One from: <ul style="list-style-type: none"> – Proxy server – Firewall 	1

Question	Answer	Marks
7(a)	<p>Six from:</p> <ul style="list-style-type: none"> – Motion sensor is used – Sensor sends data/signal to microprocessor – Data/Signal is converted from analogue data to digital data (using ADC) – Value is compared to stored value(s) // – If value is outside range/matches ... – ... microprocessor sends signal to switch lights on – ... actuator used to switch light on/off – ... timer is set for 2 minutes – Every time movement is detected the timer is reset – When timer reaches 0/120/times out microprocessor sends signal to switch lights off – Process is continuous 	6
7(b)	<p>Three from:</p> <ul style="list-style-type: none"> – Read only memory – Non-volatile memory // Contents of memory are retained when power is turned off//permanent storage – Primary storage // directly accessed by the CPU – Holds firmware/boot-up instructions/start-up instructions/BIOS – Cannot be written to 	3

Question	Answer	Marks
8(a)	<p>1 mark per each correct logic gate, with correct input(s)</p> 	6

Question	Answer	Marks																																													
8(b)	<p>4 marks for 8 correct outputs 3 marks for 6/7 correct outputs 2 marks for 4/5 correct outputs 1 mark for 2/3 correct outputs</p> <table border="1"><thead><tr><th>A</th><th>B</th><th>C</th><th>Working space</th><th>X</th></tr></thead><tbody><tr><td>0</td><td>0</td><td>0</td><td></td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td></td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td><td></td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td></td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td></td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td></td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td><td></td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td></td><td>1</td></tr></tbody></table>	A	B	C	Working space	X	0	0	0		0	0	0	1		0	0	1	0		1	0	1	1		0	1	0	0		0	1	0	1		0	1	1	0		1	1	1	1		1	4
A	B	C	Working space	X																																											
0	0	0		0																																											
0	0	1		0																																											
0	1	0		1																																											
0	1	1		0																																											
1	0	0		0																																											
1	0	1		0																																											
1	1	0		1																																											
1	1	1		1																																											

Question	Answer	Marks																												
9	<p>1 mark per each correct parity bit:</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Parity bit</td> </tr> <tr> <td style="text-align: center;">Register A</td> <td style="border: 1px solid black; padding: 2px;">1</td> <td style="border: 1px solid black; padding: 2px;">0</td> <td style="border: 1px solid black; padding: 2px;">1</td> <td style="border: 1px solid black; padding: 2px;">0</td> <td style="border: 1px solid black; padding: 2px;">0</td> <td style="border: 1px solid black; padding: 2px;">1</td> <td style="border: 1px solid black; padding: 2px;">0</td> <td style="border: 1px solid black; padding: 2px;">1</td> </tr> <tr> <td style="text-align: center;">Register B</td> <td style="border: 1px solid black; padding: 2px;">1</td> <td style="border: 1px solid black; padding: 2px;">1</td> <td style="border: 1px solid black; padding: 2px;">0</td> <td style="border: 1px solid black; padding: 2px;">1</td> </tr> <tr> <td style="text-align: center;">Register C</td> <td style="border: 1px solid black; padding: 2px;">1</td> <td style="border: 1px solid black; padding: 2px;">1</td> <td style="border: 1px solid black; padding: 2px;">0</td> <td style="border: 1px solid black; padding: 2px;">1</td> <td style="border: 1px solid black; padding: 2px;">1</td> </tr> </table>	Parity bit	Register A	1	0	1	0	0	1	0	1	Register B	1	1	0	0	0	0	0	1	Register C	1	1	0	0	0	0	1	1	3
Parity bit																														
Register A	1	0	1	0	0	1	0	1																						
Register B	1	1	0	0	0	0	0	1																						
Register C	1	1	0	0	0	0	1	1																						

Question	Answer	Marks
10	<p>Four from:</p> <ul style="list-style-type: none"> – Electrical field/charge is spread across the screen – Sensors are located around the screen // sensors are used to read the electric field – When finger touches screen, the charge/ is transferred to the user – ... as it is affected by the conductivity of another object – Coordinates of touch determined/calculated/measured 	4

CANDIDATE
NAME

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



COMPUTER SCIENCE

0478/13

Paper 1 Theory

May/June 2019

1 hour 45 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

No calculators allowed.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name in the spaces at the top of this page.
Write in dark blue or black pen.

You may use an HB pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer **all** questions.

No marks will be awarded for using brand names of software packages or hardware.

Any businesses described in this paper are entirely fictitious.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

The maximum number of marks is 75.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **11** printed pages and **1** blank page.

- 1 Victoria is building a website for her cake design business.

- (a) She uses the hexadecimal colour code #D2E3F5 as the background colour for her website.

The colour code is stored in two 12-bit binary registers.

Show how the code would be stored in the registers.

D2E	<input type="text"/>										
------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------

3F5	<input type="text"/>										
------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------

[6]

- (b) Victoria uses HTML to create her website.

State what is meant by HTML.

.....
.....

[1]

- (c) The HTML Victoria writes has both structure and presentation.

Five examples are given of structure and presentation.

Tick () to show which example is **Structure** and which is **Presentation**.

Example	Structure (<input checked="" type="checkbox"/>)	Presentation (<input checked="" type="checkbox"/>)
The colour applied to a text heading on a web page		
The font style applied to a paragraph of text on a web page		
The placement of a paragraph of text on a web page		
The size that an image is set to be displayed at on a web page		
The placement of an image next to a paragraph of text on a web page		

[5]

- (d) Customers will use a web browser to access Victoria's website.

Victoria writes a paragraph of text to explain how the website will be displayed on a customer's computer.

Use the list given to complete Victoria's paragraph by inserting the correct **six** missing terms. Not all terms will be used.

- browser
- domain name
- firewall
- hexadecimal
- HTML
- https
- MAC address
- search engine
- Uniform Resource Locator (URL)
- web server

The user enters the website into the address bar.

The protocol that is used is The URL contains the for the website. This is used to look up the IP address of the company. A DNS server stores an index of IP addresses.

The browser sends a request to the as this is where the files for the website are stored. The files are sent back to the as files.

This is interpreted by the browser and the web page is displayed.

[6]

- (e) When customers access Victoria's website they will be given the message:

This website uses cookies. An explanation of their purpose can be found in our cookies policy.

- (i) Explain what is meant by cookies.

.....

 [2]

- (ii) Explain why Victoria would use cookies as part of her website.

.....

 [4]

- 2 (a) A computer can have both a MAC address and an IP address.

Four statements are given about MAC addresses and IP addresses.

Tick (✓) to show whether each statement is **True** or **False**.

Statement	True (✓)	False (✗)
A MAC address is unique to a computer on a network		
Once an IP address has been set it cannot be changed		
A MAC address is made up of the computer's serial number and the IP address		
If a computer does not have an IP address it cannot communicate with another device using the Internet		

[4]

(b) A computer uses the Von Neumann model and the stored program concept.

(i) Explain what is meant by the stored program concept.

.....
.....
.....
.....

[2]

(ii) The Von Neumann model has several components that are used in the fetch-execute cycle.

One component is the Arithmetic Logic Unit (ALU).

Describe the role of the ALU.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

[4]

(c) The computer has an operating system.

(i) A signal causes the operating system to stop and assess what to do next.

Identify the name of this signal.

..... [1]

(ii) State **two** functions of an operating system.

1

2

[2]

- 3 A finance company is concerned that its employees are being distracted by using gaming websites at work.

(a) Explain how a firewall could help prevent this distraction.

.....
.....
.....
.....
.....
.....
.....
..... [4]

(b) The finance company is also worried about the security of the data stored on its servers.

The company has decided to encrypt the data to improve the security.

Describe how the data are encrypted.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
..... [4]

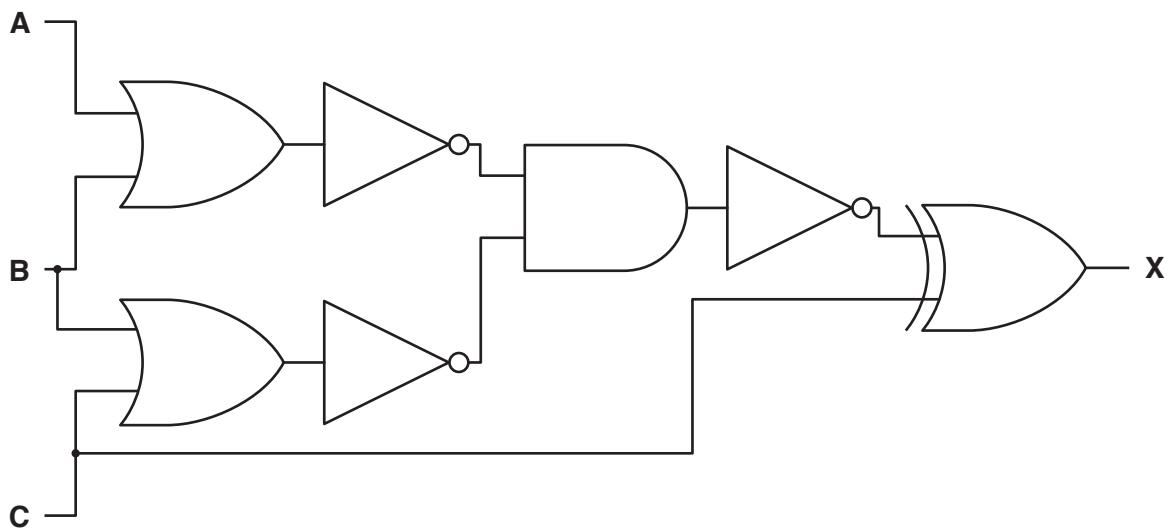
- (c) The finance company realises that its computer systems have been hacked.

The company thinks that spyware was used to obtain a user's password.

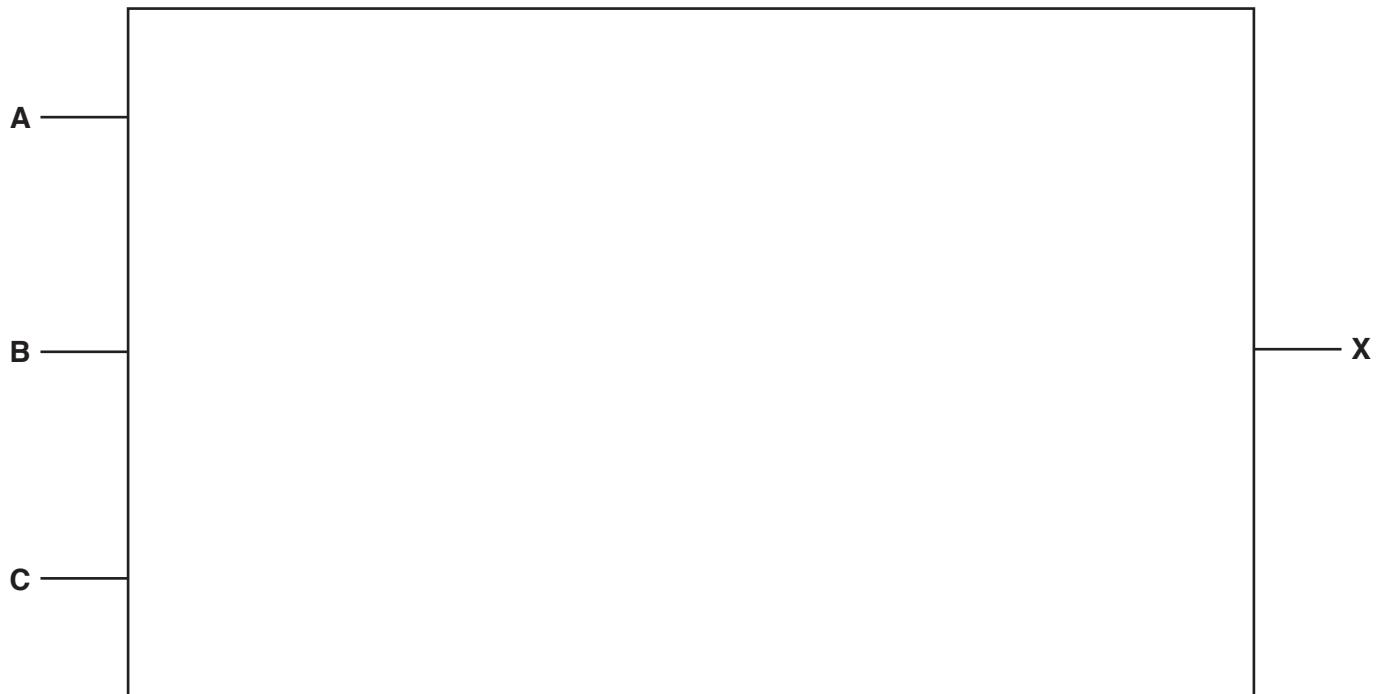
Explain how spyware could have been used to obtain the user's password.

[6]

- 4 Consider the given logic circuit:



- (a) Redraw the logic circuit using only 4 logic gates. Each logic gate used must have a maximum of **two** inputs.



[4]

- (b) Complete the truth table for the **given** logic circuit.

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]

- (c) Describe the purpose of a logic gate in a logic circuit.

.....

.....

.....

.....

[2]

- 5 The three binary numbers in the registers given have been transmitted from one computer to another.

One binary number has been transmitted incorrectly. This can be identified by the use of a **Parity bit**.

Identify the binary number that has been transmitted **incorrectly**. Explain how you identified the incorrect binary number.

	Parity bit							
Register A	1	0	1	1	1	0	0	1
Register B	1	1	1	0	0	1	1	1
Register C	1	0	0	1	1	0	1	1

The binary number that has been transmitted incorrectly is in **Register**

Explanation

.....

.....

.....

.....

.....

[4]

- 6 A museum has an information point.

Visitors to the museum can use the information point to plan their visit to the museum.

The information point allows visitors to access the information using a resistive touch screen.

Visitors can either listen to the information or read it on the screen. They can also select to output a paper copy of the information they require.

- (a) Describe how the resistive touch screen registers the visitor's touch.

.....
.....
.....
.....
.....
.....
.....
.....
..... [4]

- (b) The information point has a screen to allow visitors to read information.

Identify **two** other output devices that are present in the information point.

Output device 1

Output device 2

[2]

- (c) The information point uses both primary and secondary storage.

Explain what is meant by primary and secondary storage.

Primary

.....
.....
.....
.....

Secondary

.....
.....
.....
.....

[4]

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.

COMPUTER SCIENCE

0478/13

Paper 1 Theory

May/June 2019

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 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of 12 printed pages.

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.

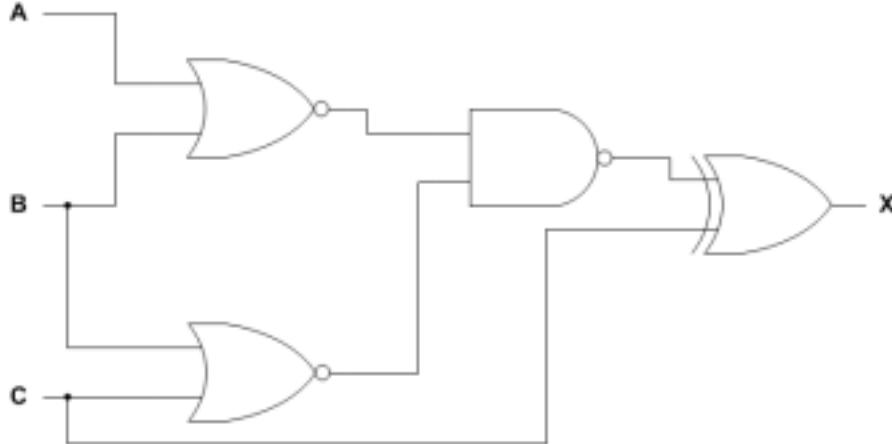
Question	Answer	Marks																		
1(a)	<p>1 mark 1 mark 1 mark</p> <p>1 mark 1 mark 1 mark</p>	6																		
1(b)	<p>One from:</p> <ul style="list-style-type: none"> – Hypertext Mark-up Language – A <u>mark-up</u> language used to create webpages 	1																		
1(c)	<p>1 mark for each correct row:</p> <table border="1"> <thead> <tr> <th>Example</th> <th>Structure (✓)</th> <th>Presentation (✓)</th> </tr> </thead> <tbody> <tr> <td>The colour applied to a text heading on a web page</td> <td></td> <td>✓</td> </tr> <tr> <td>The font style applied to a paragraph of text on a web page</td> <td></td> <td>✓</td> </tr> <tr> <td>The placement of a paragraph of text on a web page</td> <td>✓</td> <td></td> </tr> <tr> <td>The size that an image is set to be displayed at on a web page</td> <td></td> <td>✓</td> </tr> <tr> <td>The placement of an image next to a paragraph of text of a web page</td> <td>✓</td> <td></td> </tr> </tbody> </table>	Example	Structure (✓)	Presentation (✓)	The colour applied to a text heading on a web page		✓	The font style applied to a paragraph of text on a web page		✓	The placement of a paragraph of text on a web page	✓		The size that an image is set to be displayed at on a web page		✓	The placement of an image next to a paragraph of text of a web page	✓		5
Example	Structure (✓)	Presentation (✓)																		
The colour applied to a text heading on a web page		✓																		
The font style applied to a paragraph of text on a web page		✓																		
The placement of a paragraph of text on a web page	✓																			
The size that an image is set to be displayed at on a web page		✓																		
The placement of an image next to a paragraph of text of a web page	✓																			

Question	Answer	Marks
1(d)	1 mark for each correct term, in the correct place: <ul style="list-style-type: none">– URL– https– Domain name– Web server– Browser– HTML	6
1(e)(i)	<ul style="list-style-type: none">– Small packets of data– ... that are stored by the web browser	2
1(e)(ii)	Four from: <ul style="list-style-type: none">– To store a customer's password ...– To store a customer's credit card details ...– ... so they do not need to be re-entered in future– To track what the customer has viewed on the website ...– ... so she can send them adverts that match their preferences	4

Question	Answer	Marks															
2(a)	<p>1 mark for each correct row:</p> <table border="1"> <thead> <tr> <th>Statement</th><th>True (✓)</th><th>False (✗)</th></tr> </thead> <tbody> <tr> <td>A MAC address is unique to a computer on a network</td><td>✓</td><td></td></tr> <tr> <td>Once an IP address has been set it cannot be changed</td><td></td><td>✓</td></tr> <tr> <td>A MAC address is made up of the computer's serial number and the IP address</td><td></td><td>✓</td></tr> <tr> <td>If a computer does not have an IP address it cannot communicate with another device using the Internet</td><td>✓</td><td></td></tr> </tbody> </table>	Statement	True (✓)	False (✗)	A MAC address is unique to a computer on a network	✓		Once an IP address has been set it cannot be changed		✓	A MAC address is made up of the computer's serial number and the IP address		✓	If a computer does not have an IP address it cannot communicate with another device using the Internet	✓		4
Statement	True (✓)	False (✗)															
A MAC address is unique to a computer on a network	✓																
Once an IP address has been set it cannot be changed		✓															
A MAC address is made up of the computer's serial number and the IP address		✓															
If a computer does not have an IP address it cannot communicate with another device using the Internet	✓																
2(b)(i)	<p>Two from:</p> <ul style="list-style-type: none"> <li>– Programs / instructions are stored in memory <li>– Data is stored in memory <li>– Instructions are fetched and executed one after another 	2															
2(b)(ii)	<ul style="list-style-type: none"> <li>– Carries out calculations <li>– Carries out logical operations <li>– Holds temporary / interim values during calculations <li>– ... in a register called the accumulator (ACC) 	4															

Question	Answer	Marks
2(c)(i)	<ul style="list-style-type: none">– Interrupt	1
2(c)(ii)	<p>Two from:</p> <ul style="list-style-type: none">– Provides an interface– Loads / opens / installs / closes software– Manages the hardware // manages peripherals // spooling– Manages the transfer of programs into and out of memory– Divides processing time // processor management– Manages file handling– Manages error handling // interrupt handling– Manages security software– Manages utility software– Manages user accounts– Multitasking– Multiprogramming // time slicing– Batch processing	2

Question	Answer	Marks
3(a)	<p>Four from:</p> <ul style="list-style-type: none"> – The company could use the firewall to set criteria – Gaming websites can be listed as blocked websites // ports can be blocked – The firewall would examine any traffic leaving the network – If it detected traffic requesting a listed website, it will block access to it – Keeps a log of all attempts to access blocked websites 	4
3(b)	<p>Four from:</p> <ul style="list-style-type: none"> – An encryption algorithm is used – ... to scramble data – The original data is called the plain text – A key is used to encrypt the data – The key is applied to the plain text – Plain text is encrypted into cypher text 	4
3(c)	<p>Six from:</p> <ul style="list-style-type: none"> – The user could have been sent an email with an attachment / link containing the spyware – The user could have clicked a link on an untrusted website – When the attachment / link was clicked the spyware was downloaded onto the user's computer – The spyware recorded all the key logs from the user's keyboard – The recorded key logs were sent back to the creator of the spyware – The key logs were analysed – A common pattern / word in the key logs could have allowed a password to be identified 	6

Question	Answer	Marks
4(a)	<p>1 mark for each correct logic gate, with correct inputs:</p> 	4

Question	Answer	Marks																																													
4(b)	<p>4 marks for 8 correct outputs 3 marks for 6/7 correct outputs 2 marks for 4/5 correct outputs 1 mark for 2/3 correct outputs</p> <table border="1"> <thead> <tr> <th>A</th><th>B</th><th>C</th><th>Working space</th><th>X</th></tr> </thead> <tbody> <tr> <td>0</td><td>0</td><td>0</td><td></td><td>0</td></tr> <tr> <td>0</td><td>0</td><td>1</td><td></td><td>0</td></tr> <tr> <td>0</td><td>1</td><td>0</td><td></td><td>1</td></tr> <tr> <td>0</td><td>1</td><td>1</td><td></td><td>0</td></tr> <tr> <td>1</td><td>0</td><td>0</td><td></td><td>1</td></tr> <tr> <td>1</td><td>0</td><td>1</td><td></td><td>0</td></tr> <tr> <td>1</td><td>1</td><td>0</td><td></td><td>1</td></tr> <tr> <td>1</td><td>1</td><td>1</td><td></td><td>0</td></tr> </tbody> </table>	A	B	C	Working space	X	0	0	0		0	0	0	1		0	0	1	0		1	0	1	1		0	1	0	0		1	1	0	1		0	1	1	0		1	1	1	1		0	4
A	B	C	Working space	X																																											
0	0	0		0																																											
0	0	1		0																																											
0	1	0		1																																											
0	1	1		0																																											
1	0	0		1																																											
1	0	1		0																																											
1	1	0		1																																											
1	1	1		0																																											
4(c)	<p>Two from:</p> <ul style="list-style-type: none"> <li>– To carry out a logical operation <li>– To control the flow of electricity through a logic circuit <li>– An input is given and the logic of the gate is applied to give an output // to alter the output from given inputs 	2																																													

Question	Answer	Marks
5	<ul style="list-style-type: none"> – B <p>Three from:</p> <ul style="list-style-type: none"> – Added up the number of 1's / 0's in each register – With the parity bit, two registers have an odd number of 1's / 0's – One register has an even number of 1's / 0's – Odd parity must be the parity used 	4

Question	Answer	Marks
6(a)	<p>Four from:</p> <ul style="list-style-type: none"> – Screen has two / multiple layers – Visitor presses on top layer – Top layer connects to bottom layer – ... creating a circuit – Calculation is carried out on where layers are connected 	4
6(b)	<p>Two from:</p> <ul style="list-style-type: none"> – Speaker – Headphones – Printer 	2

Question	Answer	Marks
6(c)	<p>Four from (max. 2 marks per type):</p> <p>Primary</p> <ul style="list-style-type: none">– Memory that is directly accessed by the CPU– An example is RAM / ROM– RAM stores programs and data that are currently in use and ROM stores boot-up instructions– RAM is volatile and ROM is non volatile <p>Secondary</p> <ul style="list-style-type: none">– Storage that is not directly accessed by the CPU– An example is HDD / SSD– Stores data / files that can be accessed at a later stage– Non volatile	4



Cambridge IGCSE™

CANDIDATE
NAME

--	--	--	--	--

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



COMPUTER SCIENCE

0478/11

Paper 1 Theory

May/June 2020

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. Blank pages are indicated.

- 1 An image of a smartphone is shown.



- (a) Identify **one** input device that is part of the smartphone.

..... [1]

- (b) Identify **two** output devices that are part of the smartphone.

1

2

[2]

- (c) All smartphones have a MAC address.

- (i) State what is meant by the term MAC address.

.....
..... [1]

- (ii) Describe the structure of a MAC address.

.....
.....
.....
.....
.....
..... [3]

- (d) A smartphone needs both RAM and ROM.

State why a smartphone needs RAM and ROM.

RAM

ROM

[2]

- (e) Modern smartphones can be secured with a biometric system that is built into the phone.

- (i) Identify **two** biometric systems that would be suitable for securing a smartphone.

1

2

[2]

- (ii) Explain why modern smartphones are secured with a biometric system.

.....
.....
.....
.....

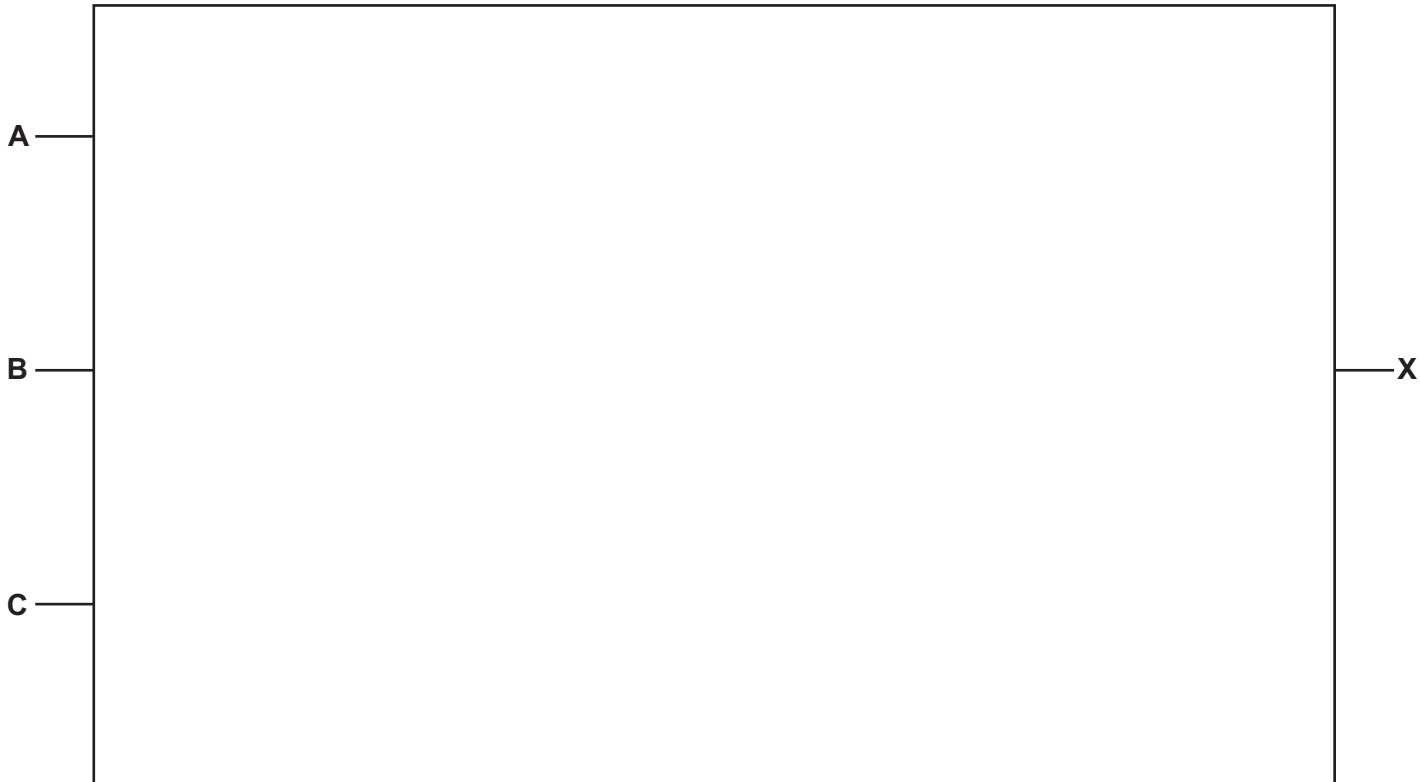
[2]

- 2 Consider the logic statement:

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

- (a) Draw a logic circuit to match the given logic statement.

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



[5]

- (b) Complete the truth table to represent 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]

- 3 Carla's computer has a USB port.

Carla uses the USB port to connect her mobile device to her computer, to transfer her photos.

- (a) Give **three** benefits of using a USB port to connect the mobile device to the computer.

Benefit 1

.....

Benefit 2

.....

Benefit 3

.....

[3]

- (b) State the type of data transmission used when transferring data using a USB port.

..... [1]

- (c) Carla wants to reduce the file size of the photos she has transferred to her computer. She does not want the quality of the photos to be reduced, so she uses lossless compression.

Describe how lossless compression reduces the file size of the photos.

.....

.....

.....

.....

.....

.....

.....

[4]

- 4 Two error detection methods that Allison's computer uses are check digit and checksum.

- (a) Give **two** similarities between the check digit and checksum methods.

1

2

[2]

- (b) Identify **one other** error detection method that Allison's computer could use.

Describe how the method checks for errors.

Method

Description

[4]

5 Six components of a computer are given.

Some are part of the central processing unit (CPU) of the Von Neumann model for a computer system.

Tick (✓) to show if each component is a **CPU component** or is **Not a CPU component**.

Component	CPU component (✓)	Not a CPU component (✓)
Arithmetic logic unit (ALU)		
Hard disk drive (HDD)		
Memory address register (MAR)		
Random access memory (RAM)		
Solid state drive (SSD)		
Control unit (CU)		

[6]

6 Four scenarios are given.

Identify the most suitable sensor for each scenario.

A **different** sensor must be used for each scenario.

Sensor	Scenario
	Detecting when a person is approaching an automatic door system
	Monitoring the pollution level in a river
	Checking if a tropical aquarium is 25 degrees Celsius
	Counting the number of cars that cross a bridge

[4]

- 7 Hans has a website selling comic books. Customers can create an account to buy the comic books.

Customers enter a username and password to log in to their account.

- (a) Customers may worry about keylogging software being used to gain unauthorised access to their account.

- (i) Describe how keylogging software can be used to gain unauthorised access to a customer's account.

.....
.....
.....
.....
.....
.....
.....
.....
.....

[4]

- (ii) Identify a feature that Hans can add to the website to limit the threat of keylogging software.

..... [1]

- (b) Hans makes sure data transmission for his website is secure.

- (i) State how customers can check that the personal details they enter into the website will be transmitted securely.

.....
.....

[1]

- (ii) Explain how a customer's browser checks that the website is secure.

.....
.....
.....
.....
.....
.....
.....
.....
.....

[4]

- 8 Benny is a photographer and prints his photos using an inkjet printer.

- (a) Benny is printing some photos and the paper gets jammed in the printer.

A signal is sent to alert the computer about the paper jam.

State the name of this type of signal.

..... [1]

- (b) Identify **one** benefit and **two** drawbacks of Benny using an inkjet printer, instead of a laser printer, to print his photos.

Benefit

.....

Drawback 1

.....

Drawback 2

.....

[3]

- (c) Four statements are given about printers.

Tick (✓) to show whether the statement applies to an **Inkjet** printer or a **Laser** printer.

Statement	Inkjet (✓)	Laser (✓)
Uses a rotating drum to transfer the image to the paper		
Uses powdered toner		
Uses nozzles to spray droplets on to the paper		
Uses a print head mechanism that moves side to side		

[4]

9 Programs can be written in a low-level language.

(a) Identify **three** features of a low-level language.

Feature 1

Feature 2

Feature 3

[3]

(b) Give **two** examples of a low-level language.

Example 1

Example 2

[2]

(c) Give **one** drawback of writing programs in a low-level language, instead of a high-level language.

.....

..... [1]

(d) A low-level language needs to be converted to binary before it can be processed by a computer.

(i) Give the **8-bit binary** value of the two denary values:

180

201

[2]

Working space

.....

.....

.....

.....

- (ii) Give the **12-bit binary** value of the denary value **250**.

..... [1]

Working space

.....
.....
.....
.....

- (iii) Binary can be represented as hexadecimal to make it easier to read.

Give the **hexadecimal** values of the 8-bit binary values:

10010011

00011101

[2]

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.



Cambridge IGCSE™

COMPUTER SCIENCE

0478/11

Paper 1

May/June 2020

MARK SCHEME

Maximum Mark: 75

Published

Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

Mark schemes should usually be read together with the Principal Examiner Report for Teachers. However, because students did not sit exam papers, there is no Principal Examiner Report for Teachers for the June 2020 series.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the June 2020 series for most Cambridge IGCSE™ and Cambridge International A & AS Level components, and some Cambridge O Level components.

This document consists of **11** printed pages.

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.

Question	Answer	Marks
1(a)	Any one from: – Microphone – Touchscreen – Camera – Button	1
1(b)	Any two from: – Speaker – Touchscreen – Light/flash	2
1(c)(i)	Any one from: – Media access control – Unique address given to each device	1
1(c)(ii)	Any three from: – Uses hexadecimal values – Normally 48/64 bits in length (accept any other reasonable value) – First half is manufacturer number/code/ID – Second half is serial number	3
1(d)	– It needs RAM to store the data and programs currently in use – It needs ROM to permanently store the boot up instructions	2
1(e)(i)	Any two from: – Fingerprint scanner – Voice recognition – Retina/iris recognition – Facial recognition	2
1(e)(ii)	Any two from: – Adds extra level of security – Biometric device requires properties unique to individual – Allows quicker access as no need to input password // don't need to remember password	2

Question	Answer	Marks
2(a)	<p>1 mark for each correct gate.</p>	5

Question	Answer	Marks																																													
2(b)	<table border="1"> <thead> <tr> <th>A</th><th>B</th><th>C</th><th>Working space</th><th>X</th></tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>0</td><td></td><td>1</td></tr> <tr><td>0</td><td>0</td><td>1</td><td></td><td>0</td></tr> <tr><td>0</td><td>1</td><td>0</td><td></td><td>1</td></tr> <tr><td>0</td><td>1</td><td>1</td><td></td><td>0</td></tr> <tr><td>1</td><td>0</td><td>0</td><td></td><td>1</td></tr> <tr><td>1</td><td>0</td><td>1</td><td></td><td>0</td></tr> <tr><td>1</td><td>1</td><td>0</td><td></td><td>1</td></tr> <tr><td>1</td><td>1</td><td>1</td><td></td><td>0</td></tr> </tbody> </table> <p>4 marks for 8 correct outputs</p> <p>3 marks for 6 or 7 correct outputs</p> <p>2 marks for 4 or 5 correct outputs</p> <p>1 mark for 2 or 3 correct outputs</p>	A	B	C	Working space	X	0	0	0		1	0	0	1		0	0	1	0		1	0	1	1		0	1	0	0		1	1	0	1		0	1	1	0		1	1	1	1		0	4
A	B	C	Working space	X																																											
0	0	0		1																																											
0	0	1		0																																											
0	1	0		1																																											
0	1	1		0																																											
1	0	0		1																																											
1	0	1		0																																											
1	1	0		1																																											
1	1	1		0																																											

Question	Answer	Marks
3(a)	<p>Any three from:</p> <ul style="list-style-type: none"> <li>– It is a universal standard <li>– It can't be inserted the wrong way around <li>– Supports different transmission speeds <li>– Automatically detects if correct driver installed <li>– It will charge the mobile device at the same time 	3

Question	Answer	Marks
3(b)	<ul style="list-style-type: none"> – Serial 	1
3(c)	<ul style="list-style-type: none"> – A compression algorithm is used – No data is removed in the compression process – An index/dictionary of pixels is created – The number of times a pixel is repeated in a row is stored 	4

Question	Answer	Marks
4(a)	<p>Any two from:</p> <ul style="list-style-type: none"> – They both calculate a value from the data – They both append the calculated value to the data – They both recalculate the value – ... They both report an error if they don't match 	2
4(b)	<p>One mark for method, three marks for description:</p> <p>Automatic Repeat reQuest</p> <ul style="list-style-type: none"> – Uses acknowledgement / request and time-out – Error control protocol – Check performed on receiving data // error is detected by e.g. parity check, check sum – If error detected, request is sent to resend data // negative acknowledgement is used – Resend request is repeated till data is sent correctly / requests timeout / limit is reached – Send acknowledgement that data is received // positive acknowledgement is used – If acknowledgement not received in set time data is resent <p>Parity Check</p> <ul style="list-style-type: none"> – A parity bit is added (to the parity byte) – Counts / checks number of 1's – Can be even or odd – If parity is incorrect, error is detected 	4

Question	Answer			Marks																			
5	<table border="1"> <thead> <tr> <th>Component</th><th>CPU component (✓)</th><th>Not a CPU component (✓)</th></tr> </thead> <tbody> <tr> <td>Arithmetic logic unit (ALU)</td><td>✓</td><td></td></tr> <tr> <td>Hard disk drive (HDD)</td><td></td><td>✓</td></tr> <tr> <td>Memory address register (MAR)</td><td>✓</td><td></td></tr> <tr> <td>Random access memory (RAM)</td><td></td><td>✓</td></tr> <tr> <td>Solid state drive (SSD)</td><td></td><td>✓</td></tr> <tr> <td>Control unit (CU)</td><td>✓</td><td></td></tr> </tbody> </table> <p>One mark per each correct row</p>	Component	CPU component (✓)	Not a CPU component (✓)	Arithmetic logic unit (ALU)	✓		Hard disk drive (HDD)		✓	Memory address register (MAR)	✓		Random access memory (RAM)		✓	Solid state drive (SSD)		✓	Control unit (CU)	✓		6
Component	CPU component (✓)	Not a CPU component (✓)																					
Arithmetic logic unit (ALU)	✓																						
Hard disk drive (HDD)		✓																					
Memory address register (MAR)	✓																						
Random access memory (RAM)		✓																					
Solid state drive (SSD)		✓																					
Control unit (CU)	✓																						

Question	Answer		Marks									
6	<table border="1"> <thead> <tr> <th>Sensor</th><th>Scenario</th></tr> </thead> <tbody> <tr> <td>Pressure / motion / infra-red</td><td>Detecting when a person is approaching an automatic door system</td></tr> <tr> <td>pH / light</td><td>Monitoring the pollution level in a river</td></tr> <tr> <td>Temperature</td><td>Checking if a tropical aquarium is 25 degrees Celsius</td></tr> <tr> <td>Magnetic field / pressure / motion / infra-red</td><td>Counting the number of cars that cross a bridge</td></tr> </tbody> </table> <p>One mark per each correct sensor (each sensor must be different)</p>	Sensor	Scenario	Pressure / motion / infra-red	Detecting when a person is approaching an automatic door system	pH / light	Monitoring the pollution level in a river	Temperature	Checking if a tropical aquarium is 25 degrees Celsius	Magnetic field / pressure / motion / infra-red	Counting the number of cars that cross a bridge	4
Sensor	Scenario											
Pressure / motion / infra-red	Detecting when a person is approaching an automatic door system											
pH / light	Monitoring the pollution level in a river											
Temperature	Checking if a tropical aquarium is 25 degrees Celsius											
Magnetic field / pressure / motion / infra-red	Counting the number of cars that cross a bridge											

Question	Answer	Marks
7(a)(i)	<p>Any four from:</p> <ul style="list-style-type: none"> – Keylogger is downloaded without knowledge (by example) – Keylogger records key presses – Data is relayed back to third party – Data is analysed // Patterns in data could reveal log-in details ... – ... details can then be used to log into the account 	4
7(a)(ii)	<p>Any one from:</p> <ul style="list-style-type: none"> – Use drop-down boxes for password – Two-step verification (by example) – Partial password requests – Onscreen / virtual keyboard 	1
7(b)(i)	<p>Any one from:</p> <ul style="list-style-type: none"> – Look for locked padlock / green padlock – Check for https 	1
7(b)(ii)	<p>Any four from:</p> <ul style="list-style-type: none"> – requests web server to identify itself // request to view the (SSL) certificate – receives a copy of the (SSL) certificate, sent from the webserver – checks if (SSL) certificate is authentic/trustworthy – sends signal back to webserver that the certificate is authentic/trustworthy 	4

Question	Answer	Marks															
8(a)	– Interrupt	1															
8(b)	<p>One mark for benefit, two marks for drawbacks</p> <p>Benefit:</p> <ul style="list-style-type: none"> – Printing may be higher quality – Can use larger paper sizes – Can print onto different media – No warm-up time <p>Drawbacks:</p> <ul style="list-style-type: none"> – Printing will be slower – Ink is more expensive per page – Ink can be smeared // ink is not smudge proof 	3															
8(c)	<table border="1"> <thead> <tr> <th>Statement</th><th>Inkjet (✓)</th><th>Laser (✓)</th></tr> </thead> <tbody> <tr> <td>Uses a rotating drum to transfer the image to the paper</td><td></td><td>✓</td></tr> <tr> <td>Uses powdered toner</td><td></td><td>✓</td></tr> <tr> <td>Uses nozzles to spray droplets on to the paper</td><td>✓</td><td></td></tr> <tr> <td>Uses a print head mechanism that moves side to side</td><td>✓</td><td></td></tr> </tbody> </table> <p>One mark per each correct row</p>	Statement	Inkjet (✓)	Laser (✓)	Uses a rotating drum to transfer the image to the paper		✓	Uses powdered toner		✓	Uses nozzles to spray droplets on to the paper	✓		Uses a print head mechanism that moves side to side	✓		4
Statement	Inkjet (✓)	Laser (✓)															
Uses a rotating drum to transfer the image to the paper		✓															
Uses powdered toner		✓															
Uses nozzles to spray droplets on to the paper	✓																
Uses a print head mechanism that moves side to side	✓																

Question	Answer	Marks
9(a)	Any three from: <ul style="list-style-type: none"> – Closer to/is machine code – May use mnemonics – May need an assembler to be translated – One line of code represents a single instruction – Machine dependent – Have direct access to memory locations/registers 	3
9(b)	<ul style="list-style-type: none"> – Assembly code – Machine code 	2
9(c)	Any one from: <ul style="list-style-type: none"> – It is more difficult to understand – Error prone – Have to manipulate memory locations – Machine dependent 	1
9(d)(i)	<ul style="list-style-type: none"> – 10110100 – 11001001 	2
9(d)(ii)	<ul style="list-style-type: none"> – 000011111010 (must have leading zeros) 	1
9(d)(iii)	<ul style="list-style-type: none"> – 93 – 1D 	2



Cambridge IGCSE™

CANDIDATE
NAME

--	--	--	--	--

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



COMPUTER SCIENCE

0478/12

Paper 1 Theory

May/June 2020

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. Blank pages are indicated.

- 1 A Von Neumann model for a computer system has a central processing unit (CPU) that makes use of registers.

- (a) Identify **three** registers that may be used.

Register 1

Register 2

Register 3

[3]

- (b) The CPU is responsible for processing instructions.

One stage of processing instructions is the decode stage.

- (i) Identify the **two other** stages of processing instructions.

Stage 1

Stage 2

[2]

- (ii) Identify the component of the CPU that is responsible for decoding instructions.

..... [1]

- 2 Both an interpreter and a compiler can be used when writing a program in a high-level language.

- (a) Explain why a programmer would make use of both an interpreter **and** a compiler.

.....

.....

.....

.....

.....

.....

.....

[4]

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

Reason 1

.....

Reason 2

.....

Reason 3

.....

[3]

- 3 A company collects and stores data about its customers. The data is stored on a server in the company's office.

The data is transmitted to cloud storage to create a back-up.

The data is encrypted using symmetric encryption before it is sent to the cloud storage.

- (a) Describe how the data is encrypted.

.....

.....

.....

.....

.....

.....

.....

[4]

- (b) Give **three other** methods that can be used to secure the data in the office.

Method 1

.....

Method 2

.....

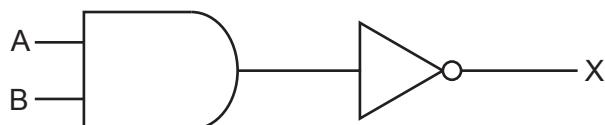
Method 3

.....

[3]

- 4 (a) Identify the name **and** draw the **single** logic gate that can replace the given logic circuits.

(i)

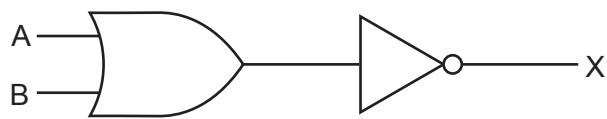


Name of gate:

Drawing of gate:

[2]

(ii)



Name of gate:

Drawing of gate:

[2]

- (b) Complete the truth table for the given logic statement:

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

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]

5 Meena uses a browser to research information for her business.

(a) Give **three** functions of a browser.

1

2

3

[3]

(b) Meena buys products for her business using the Internet.

The Transport Layer Security (TLS) protocol is used for transferring data when she buys products.

One layer of the TLS protocol is the handshake layer.

(i) Describe the purpose of the handshake layer.

.....
.....
.....
..... [2]

(ii) Identify the other layer of the TLS protocol.

..... [1]

(iii) Identify another protocol that can be used to transfer data securely.

..... [1]

(c) Meena visits a website to buy products for her business.

The browser uses a small file to store the details of the products she views. This allows the website to display advertisements for other products she may like.

The small file also stores her log-in details.

Give the name of this type of file.

..... [1]

- 6 Six statements are given about touch screen technology.

Tick (✓) to show if the statement applies to **Capacitive** or **Resistive** touch screen technology.

Statement	Capacitive (✓)	Resistive (✓)
Needs pressure to be applied to create a circuit		
May not register a touch if the user is wearing gloves		
More commonly used in smartphones		
More responsive to a touch		
Needs an electrical field to be changed to register a touch		
Cheaper to manufacture		

[6]

- 7 (a) Give the **denary** value of each of the three 12-bit binary values.

(i) 00000001100

[1]

(ii) 000011000110

[11]

(iii) 010011000001

[11]

Working space

(b) 12-bit binary values can also be represented as hexadecimal values.

Give the **hexadecimal** value of the 12-bit binary value.

000011101001

[3]

- 8 Leonard has a new laser printer to print letters for his business.

Leonard connects his printer to his computer using the USB port.

- (a) Give **three** benefits of using the USB port to connect the printer to the computer.

Benefit 1

.....

Benefit 2

.....

Benefit 3

.....

[3]

- (b) State **two** benefits and **one** drawback of Leonard using a laser printer, instead of an inkjet printer, to print the letters.

Benefit 1

.....

Benefit 2

.....

Drawback

.....

[3]

- (c) An interrupt signal is sent from the printer to the computer.

- (i) Give **two** examples of when a printer would generate an interrupt signal.

Example 1

Example 2

[2]

- (ii) Many devices send interrupt signals.

Identify the software in the computer that will receive and manage all interrupt signals.

..... [1]

- 9 (a) Six statements are given about storage devices.

Tick (✓) to show if the statement applies to hard disk drive (**HDD**) storage or solid state drive (**SSD**) storage.

Some statements can apply to both.

Statement	HDD (✓)	SSD (✓)
It has a limited number of read/write cycles		
It uses magnetic properties to store data		
It has moving parts		
It is non-volatile storage		
It can be used as an external storage device to back up data		
It uses flash memory to store data		

[6]

- (b) Optical storage is another type of storage.

Give **two** examples of optical storage.

Example 1

Example 2

[2]

- 10 Uma is concerned about risks that she may encounter when using the Internet.

Two of the risks she is concerned about are phishing and pharming.

- (a) Give **one** similarity and **two** differences between phishing and pharming.

Similarity

.....
.....

Difference 1

.....
.....

Difference 2

.....
.....

[3]

- (b) Identify **two** other risks that Uma could encounter when using the Internet.

Risk 1

Risk 2

[2]

(c) Uma uses a firewall to secure the data on her computer.

(i) Uma tells her friend that a firewall can only be software-based.

Tick (✓) to show whether Uma is **Correct** or **Incorrect**.

Correct

Incorrect

[1]

(ii) Describe how the firewall helps to keep Uma's data secure.

.....
.....
.....
.....
.....
.....
.....
.....
.....

[4]

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.



Cambridge IGCSE™

COMPUTER SCIENCE

0478/12

Paper 1

May/June 2020

MARK SCHEME

Maximum Mark: 75

Published

Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

Mark schemes should usually be read together with the Principal Examiner Report for Teachers. However, because students did not sit exam papers, there is no Principal Examiner Report for Teachers for the June 2020 series.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the June 2020 series for most Cambridge IGCSE™ and Cambridge International A & AS Level components, and some Cambridge O Level components.

This document consists of **10** printed pages.

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.

Question	Answer	Marks
1(a)	Any three from: – MAR – MDR – PC – ACC – CIR // IR	3
1(b)(i)	– Fetch – Execute	2
1(b)(ii)	– Control unit	1

Question	Answer	Marks
2(a)	Any four from: – To translate the high-level language into low-level language – Interpreter used whilst writing the program – Interpreter used to debug code line by line – Compiler used when program completed – Compiler used to create separate executable file (so compiler no longer needed) – If it runs first time in a compiler there are no syntax errors	4
2(b)	Any three from: – Easier to understand // Don't know assembly code – Easier to debug – Easier to maintain – Portable – Knowledge of manipulating memory locations/registers not required – Can use an IDE – Greater range of languages	3

Question	Answer	Marks
3(a)	<p>Any four from:</p> <ul style="list-style-type: none"> – Encryption key is used – Encryption algorithm is used – Encryption key / algorithm is applied to plain text – ... to convert it into cypher text – Same key is used to encrypt and decrypt the text 	4
3(b)	<p>Any three from:</p> <ul style="list-style-type: none"> – Firewall – Password – Proxy server – Physical methods (by example e.g. CCTV, Locks) 	3

Question	Answer	Marks
4(a)(i)	<p>– NAND</p> 	2
4(a)(ii)	<p>– NOR</p> 	2

Question	Answer	Marks																																													
4(b)	<table border="1"> <thead> <tr> <th>A</th><th>B</th><th>C</th><th>Working space</th><th>X</th></tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>0</td><td></td><td>0</td></tr> <tr><td>0</td><td>0</td><td>1</td><td></td><td>0</td></tr> <tr><td>0</td><td>1</td><td>0</td><td></td><td>1</td></tr> <tr><td>0</td><td>1</td><td>1</td><td></td><td>1</td></tr> <tr><td>1</td><td>0</td><td>0</td><td></td><td>0</td></tr> <tr><td>1</td><td>0</td><td>1</td><td></td><td>0</td></tr> <tr><td>1</td><td>1</td><td>0</td><td></td><td>1</td></tr> <tr><td>1</td><td>1</td><td>1</td><td></td><td>1</td></tr> </tbody> </table> <p>4 marks for 8 correct outputs</p> <p>3 marks for 6 or 7 correct outputs</p> <p>2 marks for 4 or 5 correct outputs</p> <p>1 mark for 2 or 3 correct outputs</p>	A	B	C	Working space	X	0	0	0		0	0	0	1		0	0	1	0		1	0	1	1		1	1	0	0		0	1	0	1		0	1	1	0		1	1	1	1		1	4
A	B	C	Working space	X																																											
0	0	0		0																																											
0	0	1		0																																											
0	1	0		1																																											
0	1	1		1																																											
1	0	0		0																																											
1	0	1		0																																											
1	1	0		1																																											
1	1	1		1																																											

Question	Answer	Marks
5(a)	Any three from: <ul style="list-style-type: none"> <li>– Convert HTML code <li>– Display web pages <li>– Check if a website is secure <li>– Request web pages from a web server <li>– Send URL/domain name <li>– Runs active script <li>– Store history/favourites/bookmarks <li>– Create tabs 	3

Question	Answer	Marks
5(b)(i)	<ul style="list-style-type: none"> – Carries out authentication of server and client – Handles encryption algorithms / keys 	2
5(b)(ii)	<ul style="list-style-type: none"> – Record layer 	1
5(b)(iii)	Any one from: <ul style="list-style-type: none"> – SSL – HTTPS 	1
5(c)	<ul style="list-style-type: none"> – Cookies 	1

Question	Answer	Marks																					
6	<table border="1"> <thead> <tr> <th>Statement</th> <th>Capacitive (✓)</th> <th>Resistive (✓)</th> </tr> </thead> <tbody> <tr> <td>Needs pressure to be applied to create a circuit</td><td></td><td>✓</td></tr> <tr> <td>May not register a touch if the user is wearing gloves</td><td>✓</td><td></td></tr> <tr> <td>More commonly used in smartphones</td><td>✓</td><td></td></tr> <tr> <td>More responsive to a touch</td><td>✓</td><td></td></tr> <tr> <td>Needs an electrical field to be changed to register a touch</td><td>✓</td><td></td></tr> <tr> <td>Cheaper to manufacture</td><td></td><td>✓</td></tr> </tbody> </table> <p>One mark per correct tick</p>	Statement	Capacitive (✓)	Resistive (✓)	Needs pressure to be applied to create a circuit		✓	May not register a touch if the user is wearing gloves	✓		More commonly used in smartphones	✓		More responsive to a touch	✓		Needs an electrical field to be changed to register a touch	✓		Cheaper to manufacture		✓	6
Statement	Capacitive (✓)	Resistive (✓)																					
Needs pressure to be applied to create a circuit		✓																					
May not register a touch if the user is wearing gloves	✓																						
More commonly used in smartphones	✓																						
More responsive to a touch	✓																						
Needs an electrical field to be changed to register a touch	✓																						
Cheaper to manufacture		✓																					

Question	Answer	Marks
7(a)(i)	– 12	1
7(a)(ii)	– 198	1
7(a)(iii)	– 1217	1
7(b)	One mark per each correct hex value in correct order – 0E9	3

Question	Answer	Marks
8(a)	Any three from: – It is a universal standard – It can't be inserted the wrong way around – Supports different transmission speeds – Automatically detects if correct driver installed	3
8(b)	Two marks for benefits, one mark for drawback Benefits: – Faster speed of printing – Can print duplex / on both sides – Many letters can be printed from one toner cartridge – Can print in high volumes Drawback – Toner cartridge more expensive to buy – More time to warm-up – Larger footprint	3

Question	Answer	Marks
8(c)(i)	<p>Any two from:</p> <ul style="list-style-type: none"> – Paper jam – Out of paper – Out of toner/ink – Buffer full – Awaiting input – Print complete – Printer ready <p>Award any other valid example</p>	2
8(c)(ii)	<ul style="list-style-type: none"> – Operating system 	1

Question	Answer	Marks																					
9(a)	<table border="1"> <thead> <tr> <th>Statement</th> <th>HDD (✓)</th> <th>SSD (✓)</th> </tr> </thead> <tbody> <tr> <td>It has a limited number of read/write cycles</td> <td></td> <td>✓</td> </tr> <tr> <td>It uses magnetic properties to store data</td> <td>✓</td> <td></td> </tr> <tr> <td>It has moving parts</td> <td>✓</td> <td></td> </tr> <tr> <td>It is non-volatile storage</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>It can be used as an external storage device to back-up data</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>It uses flash memory to store data</td> <td></td> <td>✓</td> </tr> </tbody> </table>	Statement	HDD (✓)	SSD (✓)	It has a limited number of read/write cycles		✓	It uses magnetic properties to store data	✓		It has moving parts	✓		It is non-volatile storage	✓	✓	It can be used as an external storage device to back-up data	✓	✓	It uses flash memory to store data		✓	6
Statement	HDD (✓)	SSD (✓)																					
It has a limited number of read/write cycles		✓																					
It uses magnetic properties to store data	✓																						
It has moving parts	✓																						
It is non-volatile storage	✓	✓																					
It can be used as an external storage device to back-up data	✓	✓																					
It uses flash memory to store data		✓																					

Question	Answer	Marks
9(b)	Any two from: <ul style="list-style-type: none"> – CD drive – DVD drive – Blu-ray drive 	2

Question	Answer	Marks
10(a)	One mark for similarity, two marks for differences Similarity: <ul style="list-style-type: none"> – Both are designed to steal personal data – They both pose as a real company/person Differences: <ul style="list-style-type: none"> – Pharming uses malicious code installed on hard drive – Phishing is in form of an email – Phishing requires user to follow a link / open an attachment 	3
10(b)	<ul style="list-style-type: none"> – Virus – Malware 	2
10(c)(i)	<ul style="list-style-type: none"> – Incorrect 	1
10(c)(ii)	Any four from: <ul style="list-style-type: none"> – Can help prevent hacking – Can monitor incoming and outgoing traffic – Can set criteria / rules are set for traffic – Can check whether traffic meets / defies criteria rules – Can rejects any traffic that does not meet / defies criteria 	4



Cambridge IGCSE™

CANDIDATE
NAME

--	--	--	--	--

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



COMPUTER SCIENCE

0478/13

Paper 1 Theory

May/June 2020

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. Blank pages are indicated.

1 Pradeep is reading hexadecimal values for a project he is working on.

(a) The first three hexadecimal values he reads are **15**, **102** and **A9**.

Give the **denary** values for the three hexadecimal values.

15

102

A9

[3]

Working space

.....
.....
.....
.....
.....

(b) Pradeep has two 8-bit binary values that he needs to convert to hexadecimal values for his project.

Give the **hexadecimal** values for the two 8-bit binary values.

01010000

00111101

[4]

2 (a) Six hardware devices are shown.

Tick (✓) to show if each hardware device is an **Input**, **Output** or **Storage** device.

Hardware device	Input (✓)	Output (✓)	Storage (✓)
Solid state drive (SSD)			
Sensor			
Headphones			
Microphone			
USB flash drive			
Actuator			

[6]

(b) Genevieve writes a paragraph about a barcode reader.

Using the list given, complete the paragraph. Not all terms in the list need to be used.

- actuators
- binary
- black
- input
- microprocessors
- output
- sensors
- storage
- white

A barcode reader is an device. It shines a light at the barcode and the light is reflected back. The bars in the barcode reflect less light than the bars.

..... are used to capture the amount of reflected light and the different reflections are converted to values.

[5]

- 3 Thomas has an online business that sells homemade furniture. He has a web server that hosts his website for his business.

- (a) Describe the role of a web browser in requesting and displaying the web pages for the website.

.....
.....
.....
.....
.....
..... [3]

- (b) Thomas is worried about a denial of service (DoS) attack on his web server.

Describe what happens in a denial of service attack.

.....
.....
.....
.....
.....
..... [3]

- 4 The table shows **four** definitions.

Complete the table giving the missing **Term** for each definition.

Term	Definition
	A data transmission method that sends data one bit at a time, down a single wire
	An address given to a device on a network. The address is assigned by the network
	The software used to render HTML and display a web page
	An address given to a device at the manufacturing stage that can be used to identify the device on a network

[4]

- 5 (a)** A clothing shop uses a barcode reader at the checkout.

The checkout is linked to a stock control system. The system monitors stock levels and automatically keeps them above a minimum level.

Explain how the stock control system automatically keeps the stock levels above a minimum level.

.....

.....

.....

.....

.....

.....

.....

.....

[4]

- (b) The software for the stock control system is stored on a central computer. The computer uses random access memory (RAM), read only memory (ROM) and a hard disk drive (HDD).

The computer is a Von Neumann model computer system with a central processing unit (CPU).

- (i) State the purpose of the RAM, ROM and HDD in the central computer.

RAM 1024 MB

.....

ROM
.....

.....

[3]

- (ii) Identify **four** components that are part of the CPU.

Component 1

Component 2

Component 3

Component 4

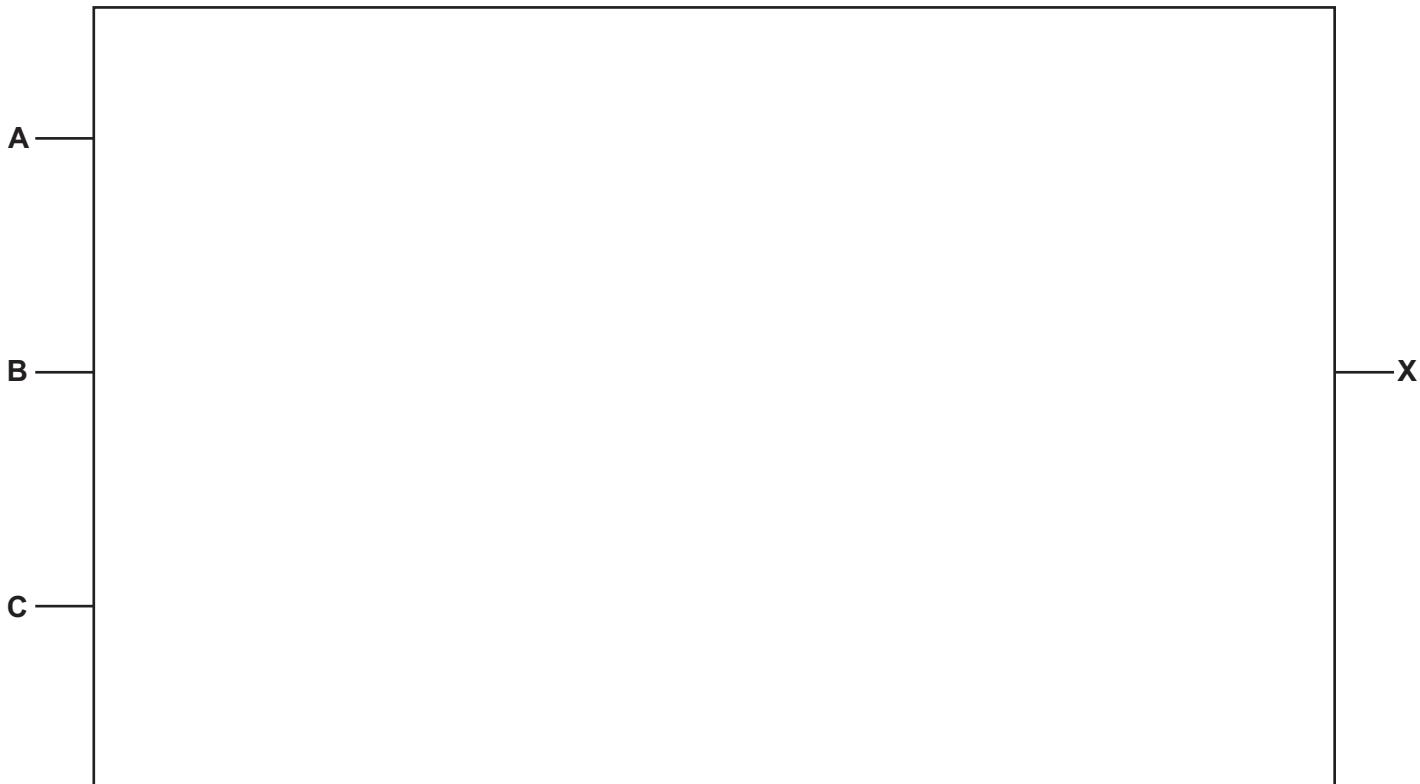
[4]

- 6 Consider the given logic statement:

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

- (a) Draw a logic circuit to match the given logic statement.

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



[4]

- (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]

- 7 Edie uses a firewall to help prevent her children from accessing websites that she does not want them to see.

- (a) Describe how the firewall helps prevent her children from accessing these websites.

.....
.....
.....
.....
.....
.....
.....
.....

[4]

- (b) Edie is concerned that her children may download a virus when accessing websites.

State what is meant by a **virus** and explain what could happen if a virus was downloaded.

.....
.....
.....
.....
.....
.....
.....
.....

[3]

- (c) Edie explains to her children how to identify if a website is secure.

- (i) Give **two** ways that her children can identify if a website is secure.

1

2

[2]

- (ii) Describe how a browser checks that a website is secure.

.....

 [4]

- 8 Six statements are given about printers.

Tick (✓) to show whether the statement applies to a **3D** printer, an **Inkjet** printer or a **Laser** printer.

Some statements apply to more than one printer.

Statement	3D (✓)	Inkjet (✓)	Laser (✓)
Uses a moving print head			
Uses liquid ink			
Produces output using materials such as plastic and resin			
Uses piezoelectric or thermal technology			
Uses a rotating drum to transfer the image to the paper			
Uses layer upon layer of material to create the output			

[6]

- 9 Four 7-bit binary values are being transmitted from one computer to another. An odd parity check is being used to check for errors in the binary values.

Write the correct **Parity bit** for each **7-bit binary value** to make sure it meets **odd** parity.

Parity bit	7-bit binary value
.....	0000011
.....	1000000
.....	0111111
.....	1010101

[4]

- 10 Clive has a laptop computer that he uses for his business. He enters a username and password to log in to his laptop.

Clive is worried about spyware being used to find out his username and password.

- (a) Describe how spyware could be used to find out Clive's username and password.

.....
.....
.....
.....
.....
.....
.....
.....
.....

[4]

- (b) The threat of spyware makes Clive concerned about typing a password to log in to his laptop.

Give an example of how Clive could log in securely without typing a password.

..... [1]

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.



Cambridge IGCSE™

COMPUTER SCIENCE

0478/13

Paper 1

May/June 2020

MARK SCHEME

Maximum Mark: 75

Published

Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

Mark schemes should usually be read together with the Principal Examiner Report for Teachers. However, because students did not sit exam papers, there is no Principal Examiner Report for Teachers for the June 2020 series.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the June 2020 series for most Cambridge IGCSE™ and Cambridge International A & AS Level components, and some Cambridge O Level components.

This document consists of **10** printed pages.

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.

Question	Answer	Marks
1(a)	<ul style="list-style-type: none"> – 21 – 258 – 169 	3
1(b)	1 mark for each correct hex value <ul style="list-style-type: none"> – 50 – 3D 	4

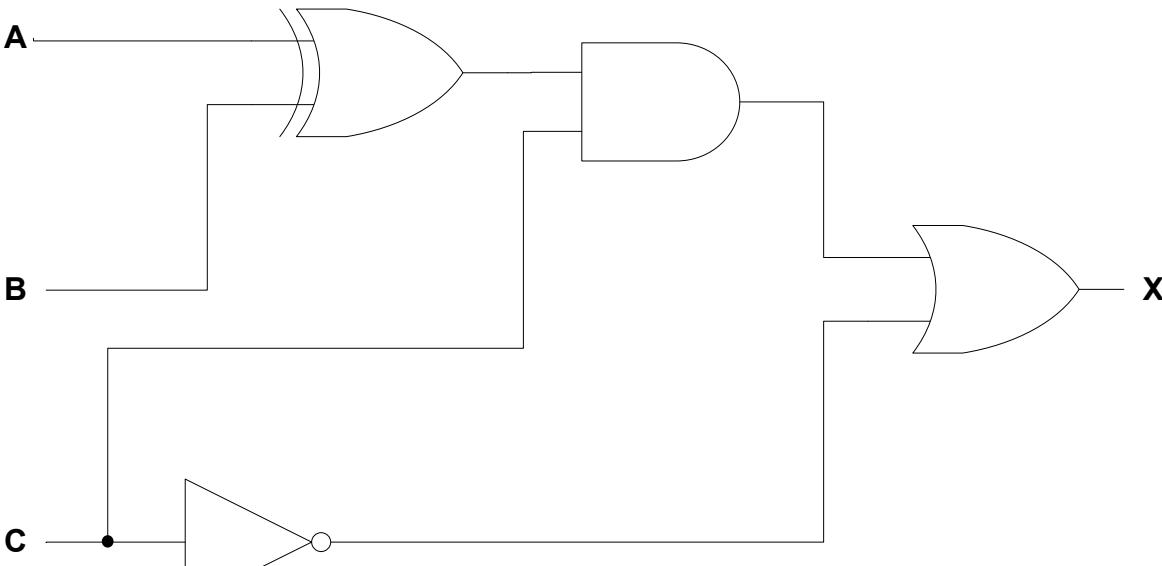
Question	Answer	Marks																												
2(a)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Hardware device</th> <th>Input (✓)</th> <th>Output (✓)</th> <th>Storage (✓)</th> </tr> </thead> <tbody> <tr> <td>Solid state drive (SSD)</td> <td></td> <td></td> <td>✓</td> </tr> <tr> <td>Sensor</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>Headphones</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>Microphone</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>USB flash drive</td> <td></td> <td></td> <td>✓</td> </tr> <tr> <td>Actuator</td> <td></td> <td>✓</td> <td></td> </tr> </tbody> </table> <p>One mark for each correct tick</p>	Hardware device	Input (✓)	Output (✓)	Storage (✓)	Solid state drive (SSD)			✓	Sensor	✓			Headphones		✓		Microphone	✓			USB flash drive			✓	Actuator		✓		6
Hardware device	Input (✓)	Output (✓)	Storage (✓)																											
Solid state drive (SSD)			✓																											
Sensor	✓																													
Headphones		✓																												
Microphone	✓																													
USB flash drive			✓																											
Actuator		✓																												

Question	Answer	Marks
2(b)	<ul style="list-style-type: none"> – Input – Black – White – Sensors – Binary <p>One mark for each correct term in the correct place</p>	5

Question	Answer	Marks
3(a)	<p>Any three from:</p> <ul style="list-style-type: none"> – Sends request to webserver – Receives web pages back from webserver – Converts HTML to display web page – Manages protocols 	3
3(b)	<p>Any three from:</p> <ul style="list-style-type: none"> – Many requests are sent from a computer – Requests are sent to the <u>webserver</u> – The webserver becomes flooded with traffic – The webserver cannot handle the requests / fails – The website can no longer be accessed – Attack maybe distributed 	3

Question	Answer	Marks
4	<ul style="list-style-type: none"> – Serial – IP (address) – Browser – MAC (address) 	4

Question	Answer	Marks
5(a)	<p>Any four from:</p> <ul style="list-style-type: none"> – Stock control system has a database of stock – Each product has a (unique) barcode – Barcode is scanned, and product looked up in database – Stock levels for product are reduced (by 1) – Stock is checked against minimum level – If stock at/below minimum level an order is placed – When stock is re-ordered flag is reset 	4
5(b)	<ul style="list-style-type: none"> – It has RAM to store the data / programs / by example currently in use – It has ROM to permanently store the boot up instructions – It has HDD to store the stock database / software / OS / by example 	3
5(c)	<p>Any four from:</p> <ul style="list-style-type: none"> – MAR – MDR – PC – ALU – CU – ACC – CIR – Buses – Registers 	4

Question	Answer	Marks
6(a)	 <p>One mark for each correct gate.</p>	4

Question	Answer					Marks
6(b)	A	B	C	Working space	X	4
	0	0	0		1	
	0	0	1		0	
	0	1	0		1	
	0	1	1		1	
	1	0	0		1	
	1	0	1		1	
	1	1	0		1	
	1	1	1		0	

Question	Answer	Marks
7(a)	<p>Any four from:</p> <ul style="list-style-type: none"> – Examines outgoing traffic to check what is being requested – Examines incoming traffic to check the content of what is being received – Sets rules/criteria for websites that can/cannot be accessed // creates a blacklist – Check if traffic meets/does not meet rules/criteria 	4
7(b)	<p>Any three from:</p> <ul style="list-style-type: none"> – Software that can replicate itself – It could cause the computer to crash / run slow / generate errors – It could delete/damage files – It could fill up the storage space – It could stop the hardware being able to communicate – It could spread to other devices on the network 	3

Question	Answer	Marks
7(c)(i)	Any two from: – Locked padlock – HTTPS – View the certificate	2
7(c)(ii)	Any four from: – requests web server to identify itself/view the (SSL) certificate – receives a copy of the (SSL) certificate, sent from the webserver – checks if (SSL) certificate is authentic/trustworthy – sends signal back to webserver that the certificate is authentic/trustworthy – starts to transmit data once connection is established as secure	4

Question	Answer	Marks																												
8	<table border="1"> <thead> <tr> <th>Statement</th> <th>3D (✓)</th> <th>Inkjet (✓)</th> <th>Laser (✓)</th> </tr> </thead> <tbody> <tr> <td>Uses a moving print head</td> <td>✓</td> <td>✓</td> <td></td> </tr> <tr> <td>Uses liquid ink</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>Produces output using materials such as plastic and resin</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>Uses piezoelectric or thermal technology</td> <td>(✓)</td> <td>✓</td> <td></td> </tr> <tr> <td>Uses a rotating drum to transfer the image to the paper</td> <td></td> <td></td> <td>✓</td> </tr> <tr> <td>Uses layer upon layer of material to create the output</td> <td>✓</td> <td></td> <td></td> </tr> </tbody> </table> <p>One mark per each correct row.</p>	Statement	3D (✓)	Inkjet (✓)	Laser (✓)	Uses a moving print head	✓	✓		Uses liquid ink		✓		Produces output using materials such as plastic and resin	✓			Uses piezoelectric or thermal technology	(✓)	✓		Uses a rotating drum to transfer the image to the paper			✓	Uses layer upon layer of material to create the output	✓			6
Statement	3D (✓)	Inkjet (✓)	Laser (✓)																											
Uses a moving print head	✓	✓																												
Uses liquid ink		✓																												
Produces output using materials such as plastic and resin	✓																													
Uses piezoelectric or thermal technology	(✓)	✓																												
Uses a rotating drum to transfer the image to the paper			✓																											
Uses layer upon layer of material to create the output	✓																													

Question	Answer	Marks
9	<ul style="list-style-type: none"> – 1 – 0 – 1 – 1 	4

Question	Answer	Marks
10(a)	<p>Any four from:</p> <ul style="list-style-type: none"> – Example of spyware e.g. Keylogger is used – Spyware is downloaded without knowledge (by example) – Spyware records key presses / screen clicks / screen activity – Data is relayed back to third party – Data is analysed // Patterns in data could reveal log-in details ... – ... details can then be used to log into the laptop (remotely) 	4
10(b)	<ul style="list-style-type: none"> – Biometric device 	1



Cambridge IGCSE™

CANDIDATE
NAME

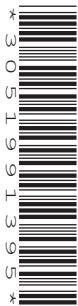
--	--	--	--	--

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.

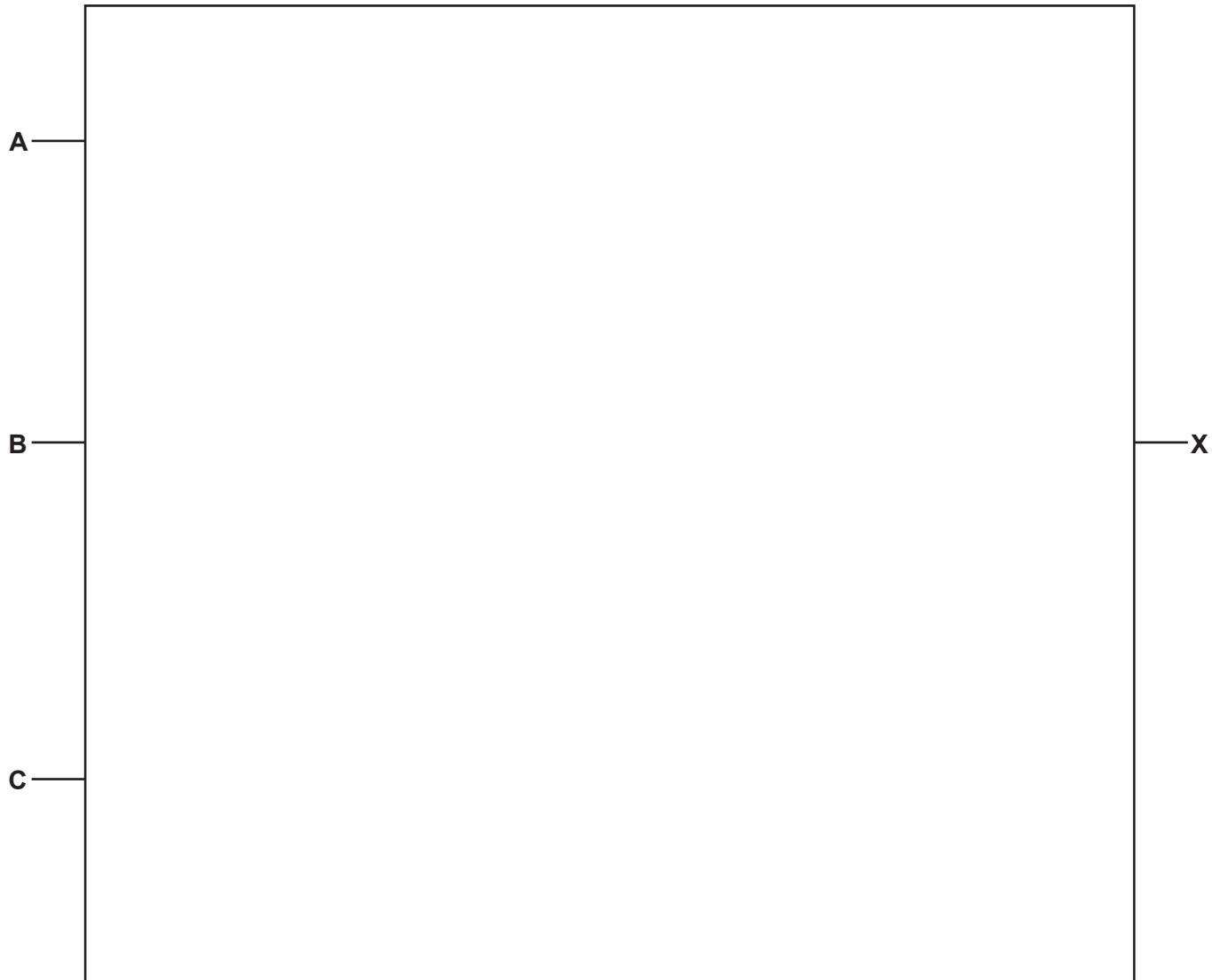
[8]

- 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.



[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]

[1]

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

[1]

[1]

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

[2]

[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.

- (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: The model does not consider the effect of the environment on the system.

[2]

[2]

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.



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)	<p>One mark per each correct register.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td></tr> </table>	1	0	1	0	0	1	1	1	1	1	0	1	0	1	1	0	2
1	0	1	0	0	1	1	1											
1	1	0	1	0	1	1	0											
1(b)(i)	<p>Any one from:</p> <ul style="list-style-type: none"> – 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)	<p>Any two from:</p> <ul style="list-style-type: none"> – 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)	<p>Any three from:</p> <ul style="list-style-type: none"> – 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	✓			
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)	<p>Any three from:</p> <ul style="list-style-type: none"> – Password – Biometrics (device) – Encryption – Physical methods (e.g. locks) – Two-factor authentication // Two-step verification – Anti-viruses 	3

Question	Answer	Marks
4	<p>Any six from:</p> <p>Phishing</p> <ul style="list-style-type: none"> – 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 <p>Pharming</p> <ul style="list-style-type: none"> – 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	<p>Eight from:</p> <ul style="list-style-type: none"> – 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)	<p>One mark per each correct logic gate, with correct input:</p>	6
6(b)	<ul style="list-style-type: none"> – Row 1 – Row 3 – Row 4 – Row 5 	4

Question	Answer	Marks
7(a)(i)	<p>Four from:</p> <ul style="list-style-type: none"> – (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 <p>NOTE: If another lossless method is described, marks can be awarded.</p>	4
7(a)(ii)	<p>Any one from:</p> <ul style="list-style-type: none"> – 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)	<p>Any one from:</p> <ul style="list-style-type: none"> – 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)	<p>Two from:</p> <ul style="list-style-type: none"> – 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)	<p>Any four from:</p> <ul style="list-style-type: none"> – 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)	<p>Two from:</p> <ul style="list-style-type: none"> – 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)	<ul style="list-style-type: none"> – Odd – Odd – Even – Even 	4
8(b)	<p>Any one from:</p> <ul style="list-style-type: none"> – 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)	<p>Four from:</p> <ul style="list-style-type: none"> – 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)	<p>Any two from:</p> <ul style="list-style-type: none"> – Bits may arrive skewed – More expensive to setup/manufacture/purchase cable – Limited distance – More prone to interference/error 	2

Cambridge IGCSE™

CANDIDATE
NAME

For more information about the study, please contact Dr. John Smith at (555) 123-4567 or via email at john.smith@researchinstitute.org.

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



COMPUTER SCIENCE

0478/12

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.

1 A denary value can be converted into hexadecimal and binary.

- (a) Complete the table to show the hexadecimal and 8-bit binary values of the given denary values.

Denary	Hexadecimal	8-bit binary
49		
123		
200		

[6]

Working space

.....

.....

.....

.....

.....

- (b) Give **two** benefits, to users, of converting binary values to hexadecimal.

Benefit 1

.....

Benefit 2

.....

[2]

- (c) Hexadecimal is used to represent Hypertext Markup Language (HTML) colour codes in computer science.

Identify **three** other ways that hexadecimal is used in computer science.

1

2

3

[3]

2 Data storage can be magnetic, solid state or optical.

(a) Six statements are given about data storage.

Tick (✓) to show if the statement applies to magnetic, solid state or optical storage. Some statements may apply to more than one type of storage.

Statement	Magnetic (✓)	Solid state (✓)	Optical (✓)
no moving parts are used to store data			
pits and lands are used to store data			
data is stored on platters			
flash memory is used to store data			
parts are rotated to store data			
data can be stored permanently			

[6]

(b) (i) Give **one** example of magnetic storage.

..... [1]

(ii) Give **one** example of optical storage.

..... [1]

(iii) Identify which type of storage would be the most suitable for use in a web server and justify your choice.

Type of storage

Justification

.....

.....

.....

[3]

(c) Describe the operation of USB flash memory and how it stores data.

.....

.....

.....

.....

.....

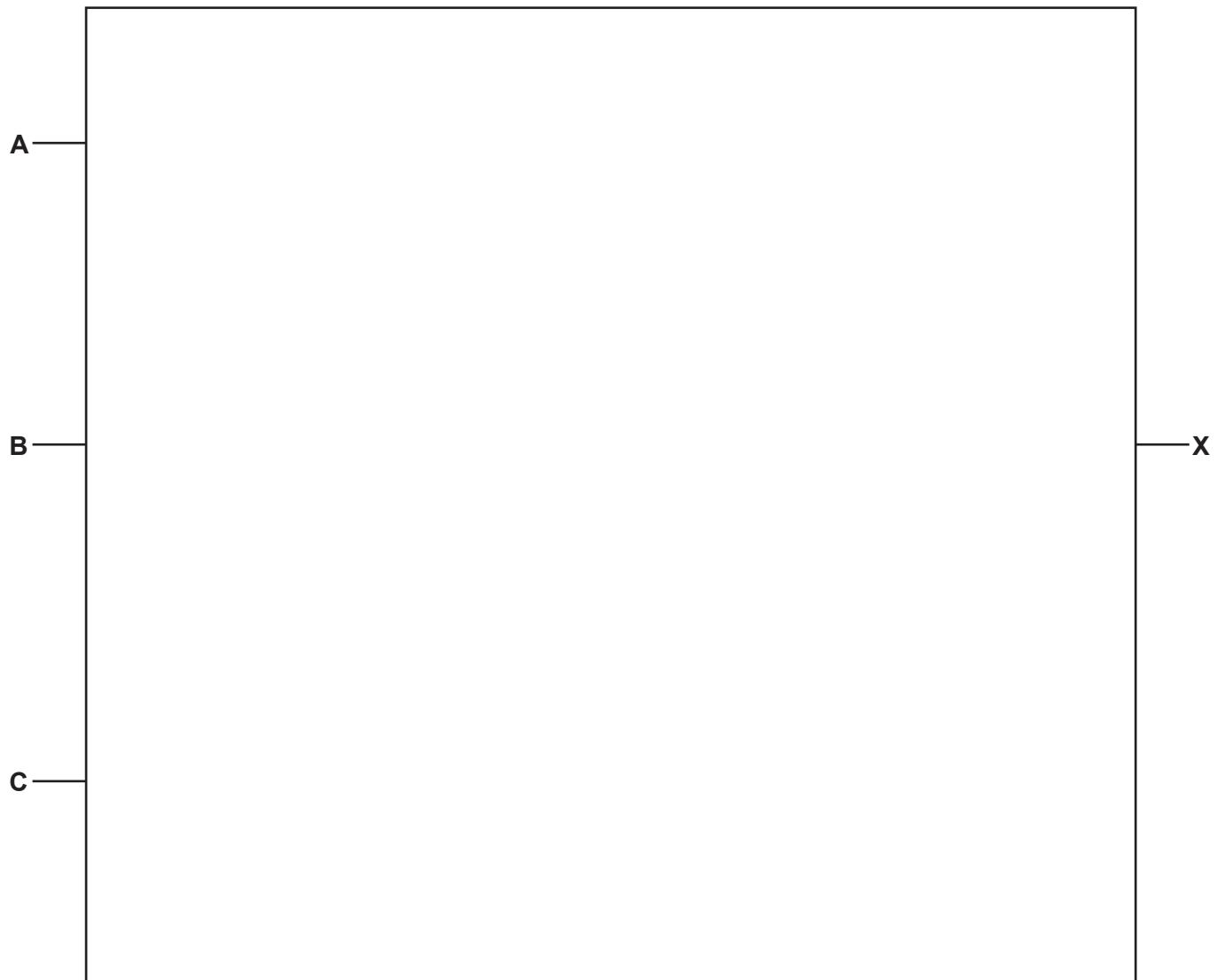
[3]

- 3 Consider the logic statement:

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

- (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.



[6]

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

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

- 4 Three types of Internet security risk are virus, spyware and denial of service (DoS) attack.

- (a) Six statements are given about Internet security risks.

Tick (✓) to show whether the statement applies to virus, spyware or denial of service. Some statements may apply to more than one Internet security risk.

Statement	Virus (✓)	Spyware (✓)	Denial of service (✓)
captures all data entered using a keyboard			
can be installed onto a web server			
prevents access to a website			
is malicious code on a computer			
is self-replicating			
damages the files on a user's hard drive			

[6]

- (b) Identify three other types of Internet security risks.

1

2

3

[3]

- (c) Some Internet security risks can maliciously damage data. Data can also be damaged accidentally.

State three ways that data could be accidentally damaged.

1

2

3

[3]

- 5 A security light system is used by a factory. The light only comes on when it is dark and when movement is detected. The light will stay on for 1 minute before switching off.

Sensors and a microprocessor are used to control the security light system.

- (a) Identify **two** sensors that would be used in the security light system.

Sensor 1

Sensor 2

[2]

- (b) Describe how the sensors and the microprocessor control the security light system.

[8]

6 Cookies can be used to store a user's personal data and online browsing habits.

- (a) A cookie could be used to automatically enter a user's payment details when the user makes a purchase online.

Describe how cookies can be used to store and automatically enter a user's payment details.

.....
.....
.....
.....
.....
..... [3]

- (b) Explain why a user may be concerned about their personal data and online browsing habits being stored in cookies.

.....
.....
.....
.....
.....
.....
.....
.....
..... [4]

7 Jolene uses HTML to create a website. She separates the HTML into structure and presentation.

(a) (i) Give **one** example of HTML structure.

..... [1]

(ii) Give **two** examples of HTML presentation.

1

2

[2]

(b) Explain why Jolene separates the HTML into structure and presentation.

.....
.....
.....
.....

[2]

8 A keyboard is a type of input device that can be used to enter data into a computer.

Complete the paragraph that describes one method of operation for a keyboard, using the most appropriate terms from the given list. **Not** all terms in the list need to be used.

- Binary
- Breaks
- Calculated
- Character
- Circuit
- Current
- Information
- Network
- Press
- Processor
- Signal
- Switch

A keyboard has a key matrix underneath the keys. When a key is pressed, it presses a

..... that completes a This allows

..... to flow. The location of the key pressed is

..... . The location of the key pressed is compared to a

..... map to find the value for the key that
has been pressed.

[6]

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.



Cambridge IGCSE™

COMPUTER SCIENCE

0478/12

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.

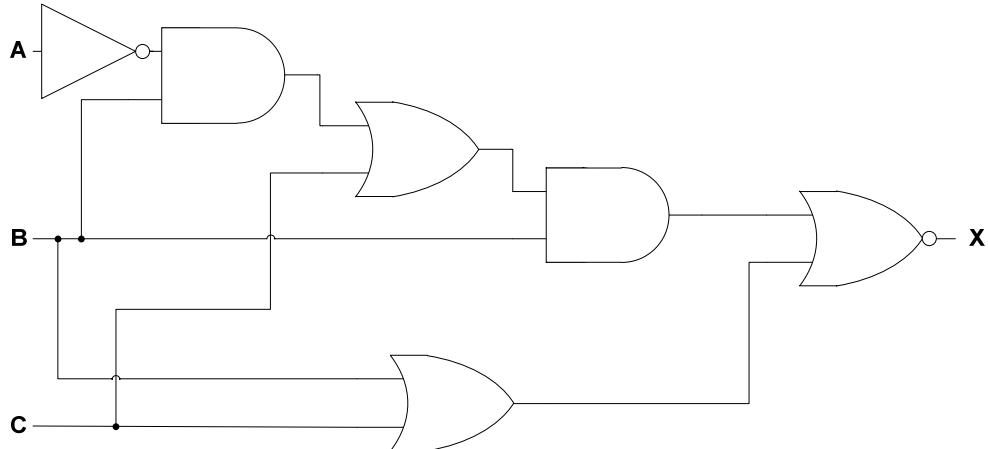
If a word is underlined, this **exact** word must be present.

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 binary value. One mark per each correct hex value.			6												
	<table border="1"> <thead> <tr> <th>Denary</th> <th>Hexadecimal</th> <th>8-bit binary</th> </tr> </thead> <tbody> <tr> <td>49</td> <td>31</td> <td>00110001</td> </tr> <tr> <td>123</td> <td>7B</td> <td>01111011</td> </tr> <tr> <td>200</td> <td>C8</td> <td>11001000</td> </tr> </tbody> </table>	Denary	Hexadecimal	8-bit binary	49	31	00110001	123	7B	01111011	200	C8	11001000			
Denary	Hexadecimal	8-bit binary														
49	31	00110001														
123	7B	01111011														
200	C8	11001000														
1(b)	Any two from: <ul style="list-style-type: none"> – Easier/quicker to read/write/understand – Easier/quicker to identify errors/debug – Takes up less screen/display space – Less chance of making an error 			2												
1(c)	Any three from: <ul style="list-style-type: none"> – MAC address – URL – Assembly language – Error codes // error messages – IP addresses – Locations in memory – Memory dumps 			3												

Question	Answer				Marks																											
2(a)	One mark per each correct row.				6																											
	<table border="1"> <thead> <tr> <th>Statement</th> <th>Magnetic (✓)</th> <th>Solid state (✓)</th> <th>Optical (✓)</th> </tr> </thead> <tbody> <tr> <td>no moving parts are used to store data</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>pits and lands are used to store data</td> <td></td> <td></td> <td>✓</td> </tr> <tr> <td>data is stored on platters</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>flash memory is used to store data</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>parts are rotated to store data</td> <td>✓</td> <td></td> <td>✓</td> </tr> <tr> <td>data can be stored permanently</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> </tbody> </table>	Statement	Magnetic (✓)	Solid state (✓)	Optical (✓)	no moving parts are used to store data		✓		pits and lands are used to store data			✓	data is stored on platters	✓			flash memory is used to store data		✓		parts are rotated to store data	✓		✓	data can be stored permanently	✓	✓	✓			
Statement	Magnetic (✓)	Solid state (✓)	Optical (✓)																													
no moving parts are used to store data		✓																														
pits and lands are used to store data			✓																													
data is stored on platters	✓																															
flash memory is used to store data		✓																														
parts are rotated to store data	✓		✓																													
data can be stored permanently	✓	✓	✓																													
2(b)(i)	Any one from: <ul style="list-style-type: none"> – Hard disk drive // HDD – Magnetic tape 				1																											

Question	Answer	Marks
2(b)(ii)	Any one from: – CD – DVD – Blu-ray disk	1
2(b)(iii)	One for type of storage, two for matching justification from: – Magnetic // HDD – (Web server) is likely to receive many requests a day – (Web server) will likely need to store a lot of data and magnetic is high capacity – Magnetic is cheaper to buy for storage per unit than solid state – Magnetic is capable of more of read/write requests over time // has more longevity // SSD has more limited number of read/write requests (before it is no longer usable) – No requirement for it to be portable, so moving parts does not matter – Solid-state // SSD – (Web server) is likely to receive many requests a day – (Web server) will likely need to store a lot of data and solid-state is high capacity – Solid-state is more energy efficient – Solid-state runs cooler so will not overheat – Solid state has faster read/write speeds to handle volume of traffic	3
2(c)	Any three from: – Data is flashed onto (silicon) chips – Uses NAND/NOR technology // can use flip-flops – Uses transistors/control gates/floating gates ... – ... to control the flow of electrons – It is a type of EEPROM technology – When data is stored the transistor is converted from 1 to 0 / 0 to 1 – Writes (and reads) sequentially	3
3(a)	One mark for each correct logic gate with correct input. 	6

Question	Answer	Marks
3(b)	<p>One mark per each correct row.</p> <ul style="list-style-type: none"> – Row 2 – Row 3 – Row 7 – Row 8 	4

Question	Answer	Marks																												
4(a)	<p>One mark per each correct row.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; padding: 5px;">Statement</th> <th style="text-align: center; padding: 5px;">Virus (✓)</th> <th style="text-align: center; padding: 5px;">Spyware (✓)</th> <th style="text-align: center; padding: 5px;">Denial of service (✓)</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">captures all data entered using a keyboard</td><td style="text-align: center; padding: 5px;">✓</td><td style="text-align: center; padding: 5px;">✓</td><td style="text-align: center; padding: 5px;"></td></tr> <tr> <td style="padding: 5px;">can be installed onto a web server</td><td style="text-align: center; padding: 5px;">✓</td><td style="text-align: center; padding: 5px;">✓</td><td style="text-align: center; padding: 5px;"></td></tr> <tr> <td style="padding: 5px;">prevents access to a website</td><td style="text-align: center; padding: 5px;"></td><td style="text-align: center; padding: 5px;"></td><td style="text-align: center; padding: 5px;">✓</td></tr> <tr> <td style="padding: 5px;">is malicious code on a computer</td><td style="text-align: center; padding: 5px;">✓</td><td style="text-align: center; padding: 5px;">✓</td><td style="text-align: center; padding: 5px;"></td></tr> <tr> <td style="padding: 5px;">is self-replicating</td><td style="text-align: center; padding: 5px;">✓</td><td style="text-align: center; padding: 5px;"></td><td style="text-align: center; padding: 5px;"></td></tr> <tr> <td style="padding: 5px;">damages the files on a user's hard drive</td><td style="text-align: center; padding: 5px;">✓</td><td style="text-align: center; padding: 5px;"></td><td style="text-align: center; padding: 5px;"></td></tr> </tbody> </table>	Statement	Virus (✓)	Spyware (✓)	Denial of service (✓)	captures all data entered using a keyboard	✓	✓		can be installed onto a web server	✓	✓		prevents access to a website			✓	is malicious code on a computer	✓	✓		is self-replicating	✓			damages the files on a user's hard drive	✓			6
Statement	Virus (✓)	Spyware (✓)	Denial of service (✓)																											
captures all data entered using a keyboard	✓	✓																												
can be installed onto a web server	✓	✓																												
prevents access to a website			✓																											
is malicious code on a computer	✓	✓																												
is self-replicating	✓																													
damages the files on a user's hard drive	✓																													
4(b)	<p>Any three from:</p> <ul style="list-style-type: none"> – Phishing – Pharming – Hacking // cracking 	3																												
4(c)	<p>Any three from:</p> <ul style="list-style-type: none"> – Human error – Power failure/surge – Hardware failure – Software failure – Fire – Flood 	3																												
5(a)	<ul style="list-style-type: none"> – Light sensor – Motion sensor // infra-red sensor 	2																												

Question	Answer	Marks
5(b)	<p>Eight from:</p> <ul style="list-style-type: none"> – Sensors send data to microprocessor – Data is converted to digital (using ADC) – Microprocessor compares data to stored value(s) ... – ... if one value or neither values are within range/out of range/match no action is taken – ... If both values are out of range/in range/match microprocessor sends signal to switch light on ... – ... 1-minute timer is started – Actuator used to switch on/off light – When timer reaches 1 minute, microprocessor sends signal to switch light off – Whole process is continuous 	8
6(a)	<p>Any three from:</p> <ul style="list-style-type: none"> – Webserver sends (cookie) file to user's browser – User's payment details stored in encrypted text file // data is encrypted to be stored – Cookie file is stored by browser/on user's HDD/SSD – When user revisits website, webserver requests cookie file // webserver can access the data stored in the cookie file (to automatically enter details) – ... and browser sends cookie file back to webserver (to automatically enter the details) 	3
6(b)	<p>Four from:</p> <ul style="list-style-type: none"> – User does not see what information is stored // might collect data that user does not know about ... – ... so, user may feel their privacy is affected – A profile could be built about the user ... – ... that could expose a user's identity // lead to identity theft – Sensitive information stored in cookies could be intercepted in transmission ... – Other websites could gain access to the cookies stored on a user's computer ... – Computer could be hacked to obtain data stored in cookies ... – ... so, payment information could be stolen and used by a third party 	4

Question	Answer	Marks
7(a)(i)	<p>Any one from:</p> <ul style="list-style-type: none"> – Placement of text/image – Margins – Line break – Padding <p>NOTE: Any relevant example of structure can be awarded</p>	1

Question	Answer	Marks
7(a)(ii)	<p>Any two from:</p> <ul style="list-style-type: none"> – Font colour – Font style – Font size – Background colour – Image size – Border properties <p>NOTE: Any relevant example of presentation can be awarded</p>	2
7(b)	<p>Any two from:</p> <ul style="list-style-type: none"> – Can easily change/edit the style of the webpage – So, CSS can be used to create a template/style sheet – Can add new content and apply the same style easily – Can re-use the presentation/style for other websites 	2
8	<p>One mark for each correct term in the correct order</p> <ul style="list-style-type: none"> – Switch – Circuit – Current – Calculated – Character – Binary 	6



Cambridge IGCSE™

CANDIDATE
NAME

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



COMPUTER SCIENCE

0478/13

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 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]

[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

.....
.....
..... [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

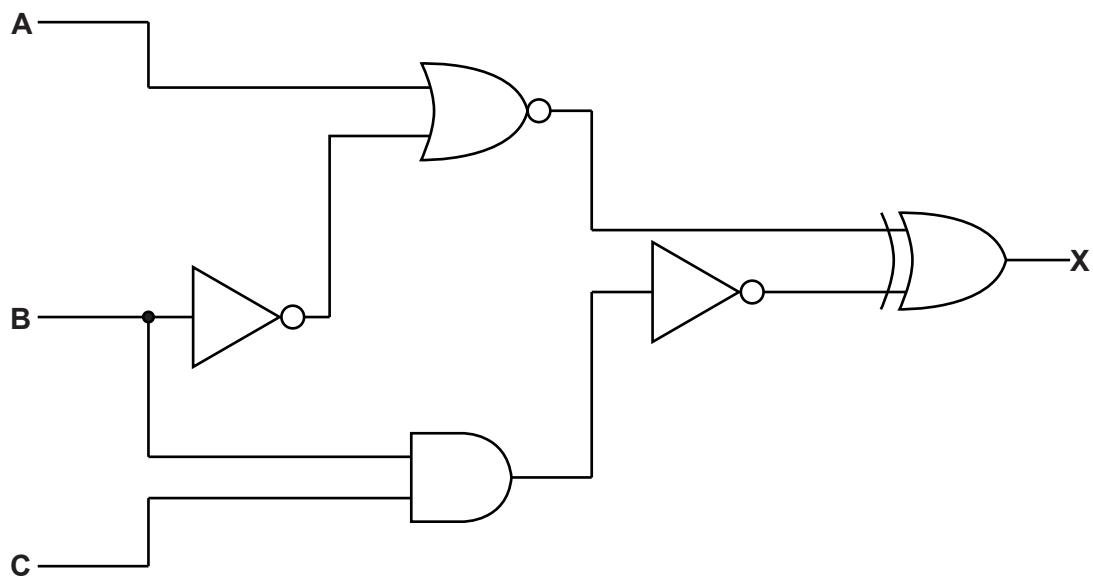
.....

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]

- 9** An underground car park has a system that checks the height of vehicles. A vehicle can be no higher than 1.8 metres to enter the car park.

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.

Each parking space has a red and a green light above it. If a car is parked in the parking space only the red light is on, otherwise only the green light is on.

Sensors and a microprocessor are used to control the system.

- (a) Complete the table to identify a suitable sensor for each part of 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	

[3]

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

[6]

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

Statement	ALU (\checkmark)	CU (\checkmark)	RAM (\checkmark)
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]

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.



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)	<ul style="list-style-type: none"> – manufacturer 	1
1(a)(ii)	<p>One mark per each correct binary value.</p> <ul style="list-style-type: none"> – 00010100 – 10100000 – 11001001 	3
1a(iii)	<p>One mark per each correct denary value.</p> <ul style="list-style-type: none"> – 41 – 200 	2
1(b)(i)	<ul style="list-style-type: none"> – Magnetic – Solid state – Optical 	3
1(b)(ii)	<p>Any four from:</p> <ul style="list-style-type: none"> – 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)	<p>Any three from:</p> <ul style="list-style-type: none"> – 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)	<p>Any two from:</p> <ul style="list-style-type: none"> – 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)	<p>One mark per each correct term, in the correct place.</p> <ul style="list-style-type: none"> – LED – Photoelectric – Lens – Magnifies – Microswitch – USB 	6
3(b)	<p>Any two from:</p> <ul style="list-style-type: none"> – Keyboard – Microphone – 2D/3D Scanner – Sensor – Touchscreen – Keypad – Webcam – Joystick 	2

Question	Answer	Marks
4(a)	<ul style="list-style-type: none"> – 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)	<p>Any two from:</p> <ul style="list-style-type: none"> – Pharming – Spyware – Hacking/cracking 	2

Question	Answer				Marks
5	One mark per each correct row				6
	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	✓			

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 <table border="1"> <thead> <tr> <th>Task</th> <th>Sensor</th> </tr> </thead> <tbody> <tr> <td>Check if a vehicle is too high</td> <td>Infrared/light</td> </tr> <tr> <td>Count the vehicles entering the car park</td> <td>Magnetic field // pressure</td> </tr> <tr> <td>Check if a vehicle is parked in a parking space</td> <td>Pressure // magnetic field // infrared/light</td> </tr> </tbody> </table>	Task	Sensor	Check if a vehicle is too high	Infrared/light	Count the vehicles entering the car park	Magnetic field // pressure	Check if a vehicle is parked in a parking space	Pressure // magnetic field // infrared/light	3
Task	Sensor									
Check if a vehicle is too high	Infrared/light									
Count the vehicles entering the car park	Magnetic field // pressure									
Check if a vehicle is parked in a parking space	Pressure // magnetic field // infrared/light									

Question	Answer	Marks
9(b)	<p>Six from:</p> <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)	<p>One mark per each correct row</p> <table border="1"> <thead> <tr> <th>Statement</th> <th>ALU (✓)</th> <th>CU (✓)</th> <th>RAM (✓)</th> </tr> </thead> <tbody> <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> </tbody> </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
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	✓																													
10(b)	<p>Any two from:</p> <ul style="list-style-type: none"> – MAR – MDR // MBR – PC – CIR // IR 	2																												

CANDIDATE
NAME

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



COMPUTER SCIENCE

0478/11

Paper 1 Theory

October/November 2018

1 hour 45 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

No calculators allowed.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of this page.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer **all** questions.

No marks will be awarded for using brand names of software packages or hardware.

Any businesses described in this paper are entirely fictitious.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

The maximum number of marks is 75.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **11** printed pages and **1** blank page.

- 1 (a) Computer files can be saved in different file formats.

Four file formats and four file types are given.

Draw a line to match each file format to the most suitable file type.

File format	File type
.jpeg	Text file
.mp3	Image file
.mp4	Audio file
.txt	Video file

[3]

- (b) Jamelia wants to store an image file. The image has an 8-bit resolution and is 150 pixels by 100 pixels in size.

Calculate the file size of the image. Give your answer in kilobytes (kB). Show all of your working.

.....
.....
.....
.....
.....
.....
.....
.....

File size kB

[3]

- (c) Large files can be compressed to reduce their file size.

Two types of compression that can be used are lossy and lossless.

Explain how a file is compressed using lossless compression.

.....
.....
.....
.....
.....
..... [3]

- (d) The table contains **four** different file formats that use compression.

Tick (✓) to show whether each file format uses **lossy** or **lossless** compression.

File format	Lossy (✓)	Lossless (✓)
.jpeg		
.mp3		
.mp4		
.zip		

[4]

- 2 (a) Six binary or hexadecimal numbers and six denary conversions are given.

Draw a line to connect each binary or hexadecimal number to the correct denary conversion.

Binary or hexadecimal	Denary
01001011	75
4E	78
11011010	157
10011101	167
A7	25
19	218

[5]

- (b) Hexadecimal is often used by computer programmers to represent binary values.

Explain why computer programmers may choose to use hexadecimal.

.....

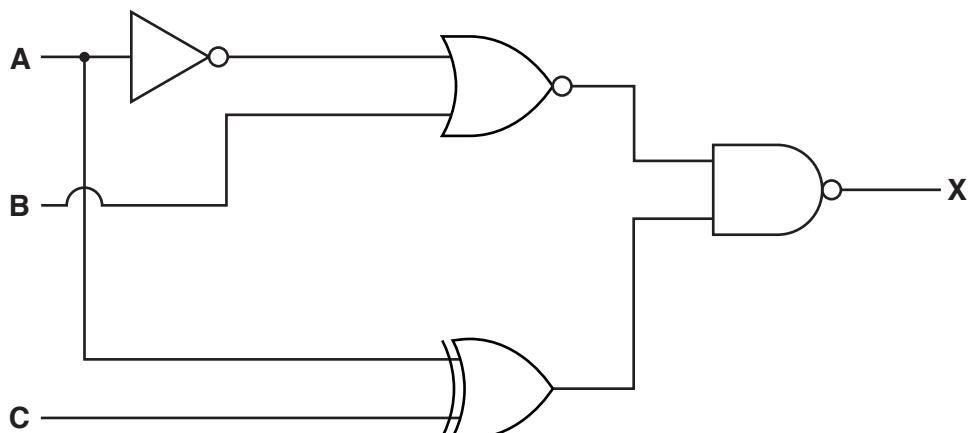
.....

.....

.....

[2]

- 3 A logic circuit is shown:



- (a) Complete the truth table for the given logic circuit.

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]

- (b) Explain the difference between the functions of an AND gate and an OR gate.

.....

.....

.....

.....

.....

.....

.....

[3]

- 4 Phishing and pharming are two examples of online security threats to a computer system.

- (a) Explain what is meant by phishing and pharming.

Phishing

.....

.....

Pharming

.....

.....

[4]

- (b) Identify **two** other online security threats to a computer system.

Security threat 1

Security threat 2

[2]

- (c) Give **two** security measures that can help to protect a computer system from online security threats.

Security measure 1

Security measure 2

[2]

- 5 (a)** Five storage devices or media are listed in the table.

Tick (✓) to show whether each storage device or media is an example of **primary**, **secondary** or **off-line** storage.

Storage device or media	Primary (✓)	Secondary (✓)	Off-line (✓)
External HDD			
RAM			
Internal SSD			
ROM			
DVD			

[5]

- (b)** Users can store their data on optical storage media.

Explain how data is written to optical storage media.

[4]

- (c) A sports events company uses a digital camera attached to a drone (small flying system), to video their events from the sky.

The video is stored as it is captured, on a device that is attached to the drone.

- (i) Circle the most suitable type of storage to store the video.

Optical

Magnetic

Solid state

[1]

- (ii) Explain the reasons for your choice in part (c)(i).

.....
.....
.....
.....

[2]

- 6 Two examples of output devices are a 3D printer and a 3D cutter.

- (a) The table contains **four** statements about 3D printers and 3D cutters.

Tick (✓) to show which statements apply to each output device, some statements may apply to both output devices.

Statement	3D printer (✓)	3D cutter (✓)
Outputs a physical 3D product		
Uses a high powered laser to create the output		
Creates 3D prototypes		
Uses layers of material to create the output		

[4]

- (b) Identify the software used to create the computerised designs for 3D printing.

..... [1]

- (c) A Digital Light Projector (DLP) is another example of an output device.

Describe how a DLP displays an image.

.....
.....
.....
.....
.....

[3]

- 7 Computers can use different methods of transmission to send data from one computer to another.

Parallel data transmission is one method that can be used.

- (a) Explain what is meant by parallel data transmission.

.....
.....
.....
.....
.....

[2]

- (b) Give **one** benefit and **one** drawback of parallel data transmission, compared to serial data transmission, over short distances.

Benefit

.....
.....
.....

Drawback

.....
.....
.....

[2]

- (c) Give **one** example where parallel data transmission is used.

.....

[1]

- 8 Kamil correctly answers an examination question about a number of internet terms.

Six different terms have been removed from Kamil's answer.

Complete the sentences in Kamil's answer, using the list given. Not all terms in the list need to be used.

- browser
- connection
- domain name server (DNS)
- Internet
- Internet Service Provider (ISP)
- IP address
- MAC address
- network
- protocol
- uniform resource locator (URL)
- webpages
- hypertext mark-up language (HTML)

A is a program that allows a user to view

An is a company that provides a connection to access the

The main that governs the transmission of data using the Internet is http.

The is provided by the network, and given to each device on the network.

[6]

- 9 A sports stadium uses a pressure sensor and a microprocessor to monitor the number of people entering the sports stadium. For the counter to increment the weight on the pressure sensor must exceed 5 kg.

Explain how the system uses the pressure sensor and the microprocessor to monitor the number of people entering.

[5]

[5]

- 10** Personal computers (PCs) use an operating system.

Explain why this type of computer needs an operating system.

.....

.....

.....

.....

.....

.....

.....

.....

[4]

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

COMPUTER SCIENCE

0478/11

Paper 1

October/November 2018

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 2018 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of 12 printed pages.

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.

Question	Answer	Marks										
1(a)	<p>1 mark for each correct line (to a maximum of 3)</p> <p>File format</p> <table border="1"> <tr> <td><code>.jpeg</code></td> <td>File type</td> </tr> <tr> <td><code>.mp3</code></td> <td>Text file</td> </tr> <tr> <td><code>.mp4</code></td> <td>Image file</td> </tr> <tr> <td><code>.txt</code></td> <td>Audio file</td> </tr> <tr> <td></td> <td>Video file</td> </tr> </table>	<code>.jpeg</code>	File type	<code>.mp3</code>	Text file	<code>.mp4</code>	Image file	<code>.txt</code>	Audio file		Video file	3
<code>.jpeg</code>	File type											
<code>.mp3</code>	Text file											
<code>.mp4</code>	Image file											
<code>.txt</code>	Audio file											
	Video file											
1(b)	<p>2 marks for working, 1 mark for correct answer</p> <ul style="list-style-type: none"> • $150 \times 100 = 15\,000$ • $15\,000 / 1024$ • 14.65kB 	3										
1(c)	<p>Three from:</p> <ul style="list-style-type: none"> • a compression algorithm is used • no data is lost in the process • repeated words/patterns can be indexed // repeated sections of words/patterns can be indexed // given by example • The indexed words/patterns can be replaced with numerical values // given by example 	3										

Question	Answer	Marks															
1(d)	<p>1 mark for each correct tick (✓)</p> <table border="1"><thead><tr><th>File format</th><th>Lossy (✓)</th><th>Lossless (✓)</th></tr></thead><tbody><tr><td>.jpeg</td><td>✓</td><td></td></tr><tr><td>.mp3</td><td>✓</td><td></td></tr><tr><td>.mp4</td><td>✓</td><td></td></tr><tr><td>.zip</td><td></td><td>✓</td></tr></tbody></table>	File format	Lossy (✓)	Lossless (✓)	.jpeg	✓		.mp3	✓		.mp4	✓		.zip		✓	4
File format	Lossy (✓)	Lossless (✓)															
.jpeg	✓																
.mp3	✓																
.mp4	✓																
.zip		✓															

Question	Answer	Marks														
2(a)	<p>1 mark for each correct line (to a maximum of 5)</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; width: 50%;">Binary or hexadecimal</th> <th style="text-align: center; width: 50%;">Denary</th> </tr> </thead> <tbody> <tr> <td style="border: 1px solid black; padding: 5px;">01001011</td> <td style="border: 1px solid black; padding: 5px; text-align: center;">75</td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">4E</td> <td style="border: 1px solid black; padding: 5px; text-align: center;">78</td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">11011010</td> <td style="border: 1px solid black; padding: 5px; text-align: center;">157</td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">10011101</td> <td style="border: 1px solid black; padding: 5px; text-align: center;">167</td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">A7</td> <td style="border: 1px solid black; padding: 5px; text-align: center;">25</td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">19</td> <td style="border: 1px solid black; padding: 5px; text-align: center;">218</td> </tr> </tbody> </table>	Binary or hexadecimal	Denary	01001011	75	4E	78	11011010	157	10011101	167	A7	25	19	218	5
Binary or hexadecimal	Denary															
01001011	75															
4E	78															
11011010	157															
10011101	167															
A7	25															
19	218															
2(b)	<p>Two from:</p> <ul style="list-style-type: none"> • It makes the values easier to read/write/understand/debug • It is a shorter way to represent the values 	2														

Question	Answer	Marks																																													
3(a)	<ul style="list-style-type: none"> • 4 marks for 8 correct outputs • 3 marks for 6 or 7 correct outputs • 2 marks for 4 or 5 correct outputs • 1 mark for 2 or 3 correct outputs <table border="1"> <thead> <tr> <th>A</th><th>B</th><th>C</th><th>Working space</th><th>X</th></tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>0</td><td></td><td>1</td></tr> <tr><td>0</td><td>0</td><td>1</td><td></td><td>1</td></tr> <tr><td>0</td><td>1</td><td>0</td><td></td><td>1</td></tr> <tr><td>0</td><td>1</td><td>1</td><td></td><td>1</td></tr> <tr><td>1</td><td>0</td><td>0</td><td></td><td>0</td></tr> <tr><td>1</td><td>0</td><td>1</td><td></td><td>1</td></tr> <tr><td>1</td><td>1</td><td>0</td><td></td><td>1</td></tr> <tr><td>1</td><td>1</td><td>1</td><td></td><td>1</td></tr> </tbody> </table>	A	B	C	Working space	X	0	0	0		1	0	0	1		1	0	1	0		1	0	1	1		1	1	0	0		0	1	0	1		1	1	1	0		1	1	1	1		1	4
A	B	C	Working space	X																																											
0	0	0		1																																											
0	0	1		1																																											
0	1	0		1																																											
0	1	1		1																																											
1	0	0		0																																											
1	0	1		1																																											
1	1	0		1																																											
1	1	1		1																																											
3(b)	<p>Three from:</p> <ul style="list-style-type: none"> • output of AND is 1 if both inputs are 1 • output of AND is 0 if either or both inputs are 0 • output of OR is 1 if either input is 1 • output of OR is 0 if both inputs are 0 • correct example of AND truth table • correct example of OR truth table 	3																																													

Question	Answer	Marks
4(a)	<p>Four from:</p> <p>Phishing:</p> <ul style="list-style-type: none"> • A legitimate looking email is sent to a user • The email will encourage the user to click a link/open an attachment • The link will redirect a user to a legitimate looking webpage (to steal personal data) <p>Pharming:</p> <ul style="list-style-type: none"> • A malicious code is installed on a user's hard drive/server • The code will cause a redirection to a legitimate looking webpage (to steal personal data) 	4
4(b)	<p>Two from:</p> <ul style="list-style-type: none"> • Hacking • Cracking • Virus • Denial of service • Malware • Spyware 	2
4(c)	<p>Two from:</p> <ul style="list-style-type: none"> • Firewall • Proxy server • Anti-virus • Anti-malware • Anti-spyware • Username and password 	2

Question	Answer	Marks																								
5(a)	<p>1 mark for the correct tick for each storage</p> <table border="1"> <thead> <tr> <th>Storage device or media</th><th>Primary (✓)</th><th>Secondary (✓)</th><th>Off-line (✓)</th></tr> </thead> <tbody> <tr> <td>External HDD</td><td></td><td></td><td>✓</td></tr> <tr> <td>RAM</td><td>✓</td><td></td><td></td></tr> <tr> <td>Internal SSD</td><td></td><td>✓</td><td></td></tr> <tr> <td>ROM</td><td>✓</td><td></td><td></td></tr> <tr> <td>DVD</td><td></td><td></td><td>✓</td></tr> </tbody> </table>	Storage device or media	Primary (✓)	Secondary (✓)	Off-line (✓)	External HDD			✓	RAM	✓			Internal SSD		✓		ROM	✓			DVD			✓	5
Storage device or media	Primary (✓)	Secondary (✓)	Off-line (✓)																							
External HDD			✓																							
RAM	✓																									
Internal SSD		✓																								
ROM	✓																									
DVD			✓																							
5(b)	<p>Four from:</p> <ul style="list-style-type: none"> • The disc is rotated/spun • Laser beam is used • The laser beam makes indentations on the surface of the disc/pits and lands • The data is written in a spiral/concentric tracks • The pits and lands represent binary values/1s and 0s • It is called burning data to the disc 	4																								
5(c)(i)	Solid state	1																								
5(c)(ii)	<p>Two from:</p> <ul style="list-style-type: none"> • It has no moving parts so will be durable • It is small/compact so it can be easily fit onto the device • It is light so it will not be difficult to lift for the drone • It can hold the large amount of data needed for the video/film footage • Uses less power so drone battery will last longer 	2																								

Question	Answer	Marks															
6(a)	<p>1 mark for the correct ticks (✓) for each statement</p> <table border="1"> <thead> <tr> <th>Statement</th><th>3D printer (✓)</th><th>3D cutter (✓)</th></tr> </thead> <tbody> <tr> <td>Outputs a physical 3D product</td><td>✓</td><td>✓</td></tr> <tr> <td>Uses a high powered laser to create the output</td><td></td><td>✓</td></tr> <tr> <td>Creates 3D prototypes</td><td>✓</td><td>✓</td></tr> <tr> <td>Uses layers of material to create the output</td><td>✓</td><td></td></tr> </tbody> </table>	Statement	3D printer (✓)	3D cutter (✓)	Outputs a physical 3D product	✓	✓	Uses a high powered laser to create the output		✓	Creates 3D prototypes	✓	✓	Uses layers of material to create the output	✓		4
Statement	3D printer (✓)	3D cutter (✓)															
Outputs a physical 3D product	✓	✓															
Uses a high powered laser to create the output		✓															
Creates 3D prototypes	✓	✓															
Uses layers of material to create the output	✓																
6(b)	Computer Aided Design/CAD	1															
6(c)	<p>Three from:</p> <ul style="list-style-type: none"> <li>• Uses a large number of tiny mirrors <li>• Mirrors are laid out in a grid/matrix <li>• Each mirror creates a pixel in the image <li>• Mirrors can tilt toward or away from light source <li>• The mirrors reflect light toward a (projection) lens <li>• Colour is produced using a colour wheel // Light passes through colour wheel // filters light into red/green/blue <li>• Can be used to display an image on a wall/screen 	3															

Question	Answer	Marks
7(a)	1 mark for each correct answer: <ul style="list-style-type: none">• uses several/multiple wires• transmits multiple bits at a time	2
7(b)	Benefit 1 mark for: <ul style="list-style-type: none">• quicker/faster data transfer Drawback One from: <ul style="list-style-type: none">• More chance of data being skewed due to bits being sent simultaneously/out of order // less safe transmission as bits are sent simultaneously/out of order• More expensive as requires more/several/multiple wires• More chance of interference as more/several/multiple wires are used (than can create crosstalk)	2
7(c)	One from: <ul style="list-style-type: none">• Used in integrated circuits• Used in RAM• Used in connections to peripheral devices (e.g. printer)	1

Question	Answer	Marks
8	1 mark for each correct answer, in the given order: <ul style="list-style-type: none">• browser• webpages• Internet Service Provider (ISP)• Internet• protocol• IP address	6

Question	Answer	Marks
9	<p>Five from:</p> <ul style="list-style-type: none"> • The data is sent to the microprocessor • The analogue data is converted to digital (using ADC) • The microprocessor compares the data to a stored value of 5 kg ... <ul style="list-style-type: none"> – ... If the value is greater than 5 kg ... – ... a counter is added to/incremented • The process is continuous 	5

Question	Answer	Marks
10	<p>Four from:</p> <ul style="list-style-type: none"> • It performs a number of basic tasks, including controlling hardware/file handling (any other suitable examples) • It allows the user to communicate with the computer using hardware // without it the user would not be able to communicate with the computer using hardware • It provides the user with a user interface // without it the user would not have a user interface to use • PC's are often used to perform many complex tasks at a time ... <ul style="list-style-type: none"> – ... the OS is needed to handle this multitasking – ... therefore, it provides the ability to handle interrupts 	4

CANDIDATE
NAME

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



COMPUTER SCIENCE

0478/12

Paper 1 Theory

October/November 2018

1 hour 45 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

No calculators allowed.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of this page.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer **all** questions.

No marks will be awarded for using brand names of software packages or hardware.

Any businesses described in this paper are entirely fictitious.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

The maximum number of marks is 75.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **11** printed pages and **1** blank page.

- 1 Computers use a character set to convert text into binary.

One character set that can be used is ASCII.

Each letter in ASCII can also be represented as a denary value.

- (a) The word BUS has the denary values:

B	U	S
66	85	83

Convert the denary values into 8-bit binary.

66

--	--	--	--	--	--	--	--

85

--	--	--	--	--	--	--	--

83

--	--	--	--	--	--	--	--

[3]

- (b) Each letter in ASCII can also be represented as a hexadecimal value.

The word KEY has the 8-bit binary values:

K	E	Y
01001011	01000101	01011001

- (i) Convert the three 8-bit binary values into hexadecimal.

01001011

01000101

01011001

[3]

- (ii) Give **three** other uses of hexadecimal notation in computer science.

1

2

3

[3]

- (iii) State **two** benefits of using hexadecimal notation to represent binary values.

Benefit 1

.....

Benefit 2

.....

[2]

- 2 A computer uses RAM and ROM to store data.

- (a) The table contains three statements about RAM or ROM.

Tick () to show whether each statement describes **RAM** or **ROM**.

Statement	RAM (<input checked="" type="checkbox"/>)	ROM (<input checked="" type="checkbox"/>)
Stores the programs and data that are currently in use		
Used to boot up the computer when power is turned on		
Contents are retained when power is turned off		

[3]

- (b) Circle the storage category that includes both RAM and ROM.

Primary

Secondary

Off-line

[1]

- (c) Explain what is meant by off-line storage.

.....

.....

.....

.....

.....

[2]

- 3 A greenhouse uses a system to monitor the conditions that plants need to grow.

The inputs to the system are:

Input	Binary value	Condition
W	1	Window is open
	0	Window is closed
T	1	Temperature $\geq 26^{\circ}\text{C}$
	0	Temperature $< 26^{\circ}\text{C}$
H	1	Humidity $\geq 50\%$
	0	Humidity $< 50\%$

The system will sound an alarm when certain conditions are detected.

Alarm (X) will sound (=1) when:

window is closed and temperature $\geq 26^{\circ}\text{C}$

or

temperature $< 26^{\circ}\text{C}$ and humidity $\geq 50\%$

Draw a logic circuit to represent the system.



[5]

- 4 (a) Identify **three** security issues that can put a computer system at risk.

Security issue 1

Security issue 2

Security issue 3

[3]

- (b)** Explain how a firewall can help to protect a computer system from security issues.

.....

.....

.....

.....

.....

.....

- [4]

- 5 (a) Karina is taking her Computer Science examination. She has **three** questions to answer about output devices.

- (i) For the first question she writes the answer:

"It is a high powered laser that cuts materials such as thin metals or wood."

Identify the output device that Karina is describing.

- (ii) For the second question she writes the answer:

“The screen is made up of blocks of red, green and blue pixels. The screen uses layers of different types of liquid.”

Identify the output device that Karina is describing.

- (iii) For the third question she writes the answer:

“It is responsible for powering and moving a motor in machinery, such as a robot arm in a factory.”

Identify the output device that Karina is describing.

(b) Karina correctly answers another examination question about some more output devices.

Five different terms have been removed from her answer.

Complete the sentences in Karina's answer, using the list given. Not all terms in the list need to be used.

- 3D
- digital light projector
- inkjet
- interactive whiteboard
- laser
- rotating
- scanning
- sliding
- speaker
- thermal bubble

An allows a user to write on a surface using a pen, the text and drawings can then be captured and stored for later use.

An printer produces a hard copy of a document using and piezoelectric technology. A printer uses a drum, and positive and negative charges, to produce a hard copy of a document.

[5]

- 6 (a) Many programmers write computer programs in high-level languages. The programs need to be translated into machine code to be read by the computer.

State **two** types of translator that can be used.

Translator 1

Translator 2
[2]

- (b) Explain **two** reasons why a computer programmer may choose to write a program in a high-level language, rather than a low-level language.

Reason 1

.....
.....
.....

Reason 2

.....
.....
.....

[4]

- (c) Three examples of computer code are given in the table.

Tick (✓) to show whether each example of computer code is **High-level language**, **Assembly language** or **Machine code**.

Computer code	High-level language (✓)	Assembly language (✓)	Machine code (✓)
10110111 11001100 01011100			
FOR X = 1 TO 10 PRINT X NEXT X			
INP X STA X LDA Y			

[3]

- 7 Six internet terms and six definitions are listed.

Draw a line to connect each term to a correct definition.

Internet term	Definition
Browser	A program that allows a user to view webpages
Internet Service Provider (ISP)	The main protocol that governs the transmission of data using the Internet
Hyper Text Transfer Protocol (HTTP)	The website address that is typed into the address bar
Uniform Resource Locator (URL)	An address given to each device on a network. It is provided by the network
MAC address	A unique address given to a device on a network. It is provided by the manufacturer
IP address	A company that provides a connection to access the Internet

[5]

- 8 Describe the purpose of an interrupt in a computer system.

.....

.....

.....

.....

.....

.....

.....

.....

.....

[4]

- 9 (a) Computers can transmit data using different methods.

Describe the **three** data transmission methods given.

- (i) Serial data transmission

.....
.....
.....
.....

[2]

- (ii) Parallel data transmission

.....
.....
.....
.....

[2]

- (iii) Duplex data transmission

.....
.....
.....
.....

[2]

- (b) Data can sometimes be corrupted when it is transmitted from one computer to another, causing errors to be present in the data.

Identify and describe **three** methods of error detection that could be used to see if an error has occurred.

Error detection method 1

Description

.....

.....

Error detection method 2

Description

.....

.....

Error detection method 3

Description

.....

.....

[9]

- 10** A system uses pH sensors and a microprocessor to help monitor pollution in a river.

The pH of the water should be between 6 and 8. The system outputs an alert if the pH of the water is not in this range.

Explain how the system uses the pH sensors and the microprocessor to help monitor the pollution.

[5]

.[5]

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

COMPUTER SCIENCE

0478/12

Paper 1

October/November 2018

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 2018 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of 12 printed pages.

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:

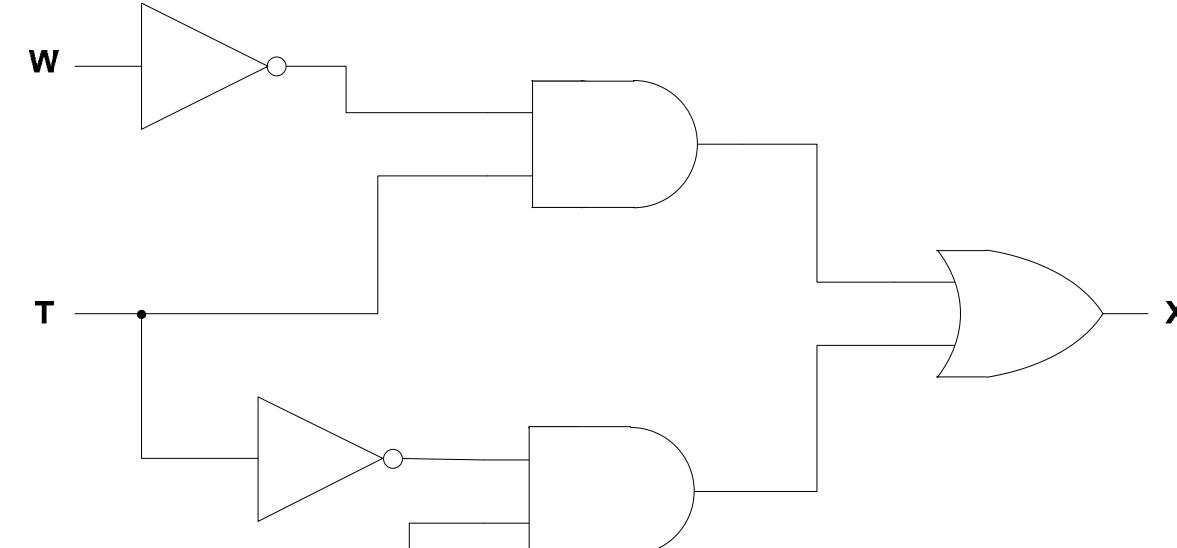
Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

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.

Question	Answer	Marks																								
1(a)	<p>1 mark for each correct 8-bit binary number</p> <p>66 <table border="1"><tr><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td></tr></table></p> <p>85 <table border="1"><tr><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td></tr></table></p> <p>83 <table border="1"><tr><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td></tr></table></p>	0	1	0	0	0	0	1	0	0	1	0	1	0	1	0	1	0	1	0	1	0	0	1	1	3
0	1	0	0	0	0	1	0																			
0	1	0	1	0	1	0	1																			
0	1	0	1	0	0	1	1																			
1(b)(i)	<p>1 mark for each correct hexadecimal number</p> <p>4B</p> <p>45</p> <p>59</p>	3																								
1(b)(ii)	<p>Three from:</p> <ul style="list-style-type: none"> • (HTML) colour codes • Error messages • MAC addresses • IP addresses • Assembly language • Memory dump • Locations in memory 	3																								
1(b)(iii)	<p>Two from:</p> <ul style="list-style-type: none"> • Easier to read/write/understand (for humans) • Easier to remember (for humans) • Short way to represent binary // Uses less screen/display space • Fewer errors made (in data transcription) • Easier to debug (for humans) 	2																								

Question	Answer	Marks												
2(a)	<p>1 mark for each correct tick (✓)</p> <table border="1"> <thead> <tr> <th>Statement</th><th>RAM (✓)</th><th>ROM (✓)</th></tr> </thead> <tbody> <tr> <td>Stores the programs and data that are currently in use</td><td>✓</td><td></td></tr> <tr> <td>Used to boot up the computer when power is turned on</td><td></td><td>✓</td></tr> <tr> <td>Contents are retained when power is turned off</td><td></td><td>✓</td></tr> </tbody> </table>	Statement	RAM (✓)	ROM (✓)	Stores the programs and data that are currently in use	✓		Used to boot up the computer when power is turned on		✓	Contents are retained when power is turned off		✓	3
Statement	RAM (✓)	ROM (✓)												
Stores the programs and data that are currently in use	✓													
Used to boot up the computer when power is turned on		✓												
Contents are retained when power is turned off		✓												
2(b)	Primary	1												
2(c)	<p>Two from:</p> <ul style="list-style-type: none"> <li>• Non-volatile storage <li>• Storage that can be disconnected/removed from the computer <li>• Any suitable example <li>• Must be (physically) connected to computer to obtain stored data <li>• Used to store files as a backup 	2												

Question	Answer	Marks
3	<p>1 mark for each correct logic gate, with correct inputs.</p>  <p>The circuit diagram shows three logic gates. The first is an inverter with input W and output connected to one input of a two-input AND gate. The second is an inverter with input T and output connected to one input of another two-input AND gate. The third is an OR gate with inputs from the outputs of the first two AND gates and output X. The inputs W, T, and H are shown with pulse waveforms. The output X is also shown with a pulse waveform.</p>	5

Question	Answer	Marks
4(a)	<p>Three from:</p> <ul style="list-style-type: none"> • Malware • Virus // No antivirus • Denial of service • Spyware // No antispyware • Phishing // opening unknown links/emails • Pharming // opening unknown links/emails (only award once for this alternative) • Hacking/cracking/unauthorised access // No/weak password // No/weak firewall • Downloading/Using unknown software • Not updating software • Physical issue e.g. computer/door left unlocked 	3
4(b)	<p>Four from:</p> <ul style="list-style-type: none"> • It examines/monitors/filters traffic into and out of a computer • It allows a user to set criteria/rules for the traffic • It checks whether the traffic meets the criteria/rules • It blocks any traffic that does not meet the criteria/rules // Blocks unauthorised access • It warns a user of any unauthorised software/access/unauthorised outgoing traffic • It keeps a log of all traffic (that can be examined) 	4

Question	Answer	Marks
5(a)(i)	<u>2D/3D</u> cutter	1
5(a)(ii)	Liquid crystal display // LCD	1
5(a)(iii)	Actuator	1
5(b)	<p>1 mark for each correct missing word, in the given order:</p> <ul style="list-style-type: none"> • interactive whiteboard • inkjet • thermal bubble • laser • rotating 	5

Question	Answer	Marks
6(a)	<ul style="list-style-type: none">• Compiler• Interpreter	2
6(b)	<p>Four from:</p> <ul style="list-style-type: none">• Closer to human language/English ...• ... so it is easier/quicker to read/write/understand• ... so it is easier/quicker to debug the program• ... therefore, less likely to make errors • The program can be used on many different platforms ...• ... because it is written in source code• ... because it is compiled into object code • They have built-in functions/libraries ...• ... this saves time when writing the program • Do not need to manipulate memory addresses directly ...• ... therefore, specialist knowledge of this is not required • Only need to learn a single language ...• ... as this can be used on many different computers	4

Question	Answer				Marks													
6(c)	1 mark for each correct tick (✓) <table border="1"><thead><tr><th>Computer code</th><th>High-level language (✓)</th><th>Assembly language (✓)</th><th>Machine code (✓)</th></tr></thead><tbody><tr><td>10110111 11001100 01011100</td><td></td><td></td><td>✓</td></tr><tr><td>FOR X = 1 TO 10 PRINT X NEXT X</td><td>✓</td><td></td><td></td></tr><tr><td>INP X STA X LDA Y</td><td></td><td>✓</td><td></td></tr></tbody></table>	Computer code	High-level language (✓)	Assembly language (✓)	Machine code (✓)	10110111 11001100 01011100			✓	FOR X = 1 TO 10 PRINT X NEXT X	✓			INP X STA X LDA Y		✓		3
Computer code	High-level language (✓)	Assembly language (✓)	Machine code (✓)															
10110111 11001100 01011100			✓															
FOR X = 1 TO 10 PRINT X NEXT X	✓																	
INP X STA X LDA Y		✓																

Question	Answer	Marks
7 <p>1 mark for each correct line (to a maximum of 5)</p> <p>Browser</p> <p>Internet Service Provider (ISP)</p> <p>Hypertext Transfer Protocol (HTTP)</p> <p>Uniform Resource Locator (URL)</p> <p>MAC address</p> <p>IP address</p> <p>A program that allows a user to view webpages</p> <p>The main protocol that governs the transmission of data using the Internet</p> <p>The website address that is typed into the address bar</p> <p>An address given to each device on a network. It is provided by the network</p> <p>A unique address given to a device on a network. It is provided by the manufacturer</p> <p>A company that provides a connection to access the Internet</p>	5	

Question	Answer	Marks
8	<p>Four from:</p> <ul style="list-style-type: none"> • Used to attend to certain tasks/issues • Used to make sure that vital tasks are dealt with immediately • The interrupt/signal tells the CPU/processor (that its attention is required) • A signal that can be sent from a device (attached to the computer) • A signal that can be sent from software (installed on the computer) • The interrupt will cause the OS/current process to pause • The OS/CPU/ISR will service/handle the interrupt • They have different levels of priority • After the interrupt is serviced, the (previous) process is continued • It enables multi-tasking to be carried out on a computer • A valid example of an interrupt e.g. ‘out of paper’ message for a printer 	4

Question	Answer	Marks
9(a)(i)	<p>Two from:</p> <ul style="list-style-type: none"> • Data is transmitted one bit at a time • Data is transmitted using a single wire • Bits arrive in order/sequence 	2
9(a)(ii)	<p>Two from:</p> <ul style="list-style-type: none"> • Data is transmitted multiple bits at a time/simultaneously • Data is transmitted using multiple wires • Bits may arrive out of sequence/skewed (and are reordered) 	2
9(a)(iii)	<p>1 mark for each:</p> <ul style="list-style-type: none"> • Data is transmitted in both directions • ... at the same time/simultaneously 	2

Question	Answer	Marks
9(b)	<p>Maximum of three marks per error detection method. 1 mark for naming the method, 2 marks for describing it.</p> <p>Parity (check)</p> <ul style="list-style-type: none"> • Odd or even parity can be used • Bits are added together // 1 bits are counted • Parity bit added (depending on parity set) • Parity checked on receipt • If parity bit is incorrect an error is detected <p>Checksum</p> <ul style="list-style-type: none"> • Calculation performed on data (to get the checksum) • Checksum sent with data • Checksum recalculated after transmission • Comparison made between checksum before and checksum after transmission • Error detected if checksums are different <p>Automatic repeat request (ARQ)</p> <ul style="list-style-type: none"> • Uses acknowledgement and timeout • Request is sent (with data) requiring acknowledgement • If no response/acknowledgment within certain time frame data package is resent • When data received contains an error a request is sent (automatically) to resend the data • The resend request is repeatedly sent until packet is received error free/limit is reached/acknowledgement received 	9

Question	Answer	Marks
10	<p>Five from:</p> <ul style="list-style-type: none"> • The sensor sends data to the microprocessor • The analogue data is converted to digital (using ADC) • The microprocessor compares the reading to the set range/stored values/stored data (6 to 8) ... <ul style="list-style-type: none"> – ... If the reading is >8 or <6 / outside range ... <ul style="list-style-type: none"> ○ ... the microprocessor sends a signal to output the alert • The process is continuous/repeated 	5

CANDIDATE
NAME

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



COMPUTER SCIENCE

0478/13

Paper 1 Theory

October/November 2018

1 hour 45 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

No calculators allowed.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of this page.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer **all** questions.

No marks will be awarded for using brand names of software packages or hardware.

Any businesses described in this paper are entirely fictitious.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

The maximum number of marks is 75.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **11** printed pages and **1** blank page.

- 1 There are **six** output devices and **six** descriptions shown.

Draw a line to connect each output device to the most appropriate description.

Device	Description
Laser Printer	Uses a high-intensity beam of light shone through three layers of changing pixels
LCD Projector	Uses millions of micro mirrors to reflect light through a lens
Digital Light Projector (DLP)	Uses plastic, resin or powdered metal to generate a physical output
Inkjet Printer	Uses a static electric charge on a rotating drum to generate a physical output
3D Printer	Uses liquid ink to generate a physical output
2D Cutter	Uses a high-power laser to generate a physical output

[5]

- 2** Parity checks and Automatic Repeat reQuests (ARQ) can be used to check for errors during data transmission and storage.

- (a) A system uses **even parity**. Write the appropriate parity bit for each byte.

Parity Bit	1	0	1	0	0	1	1
	1	0	1	1	1	1	1
	1	0	1	0	0	0	1

[2]

- (b)** Explain how Automatic Repeat reQuests (ARQ) are used in data transmission and storage.

[2]

. [2]

- (c) State **one** other method that could be used to check for transmission errors.

- 3** An elevator (lift) has a maximum weight limit of 2400kg. The weight carried is monitored by a sensor and a microprocessor.

Describe how the sensor and the microprocessor are used to make sure the maximum weight limit is not exceeded.

.[6]

- 4 The MAC address of a device is represented using hexadecimal.

A section of a MAC address is shown. Each pair of hexadecimal digits is stored using 8-bit binary.

- (a) Complete the table to show the 8-bit binary equivalents for the section of MAC address. The first number has already been converted.

6A	FF	08	93
01101010			

[3]

- (b) Explain why data is stored as binary in computers.

.....
.....
.....
.....

[2]

- 5 Data can be transferred using half-duplex serial transmission.

- (a) Describe serial transmission.

.....
.....
.....
.....

[2]

- (b) Give **one** application of serial data transmission.

.....
.....

[1]

- (c) Describe half-duplex data transmission.

.....
.....
.....
.....

[2]

- 6 Sarah stores data electronically.

Describe **three** methods that she could use to avoid loss of stored data.

Method 1

.....
.....
.....

Method 2

.....
.....
.....

Method 3

.....
.....
.....

[6]

- 7 David is writing a program using a high-level language. The program will be published and sold for profit.

- (a) David uses an interpreter when creating the computer program.

State **three** features of an interpreter.

Feature 1

.....
Feature 2

.....
Feature 3

[3]

- (b) David compiles the program when he has completed it.

Explain **two** benefits of compiling the program.

Benefit 1

.....
.....
.....

Benefit 2

.....
.....
.....

[4]

- (c) David needs to send a large section of the programming code as an email attachment.

He uses lossless compression to reduce the file size.

Explain how the file size is reduced.

.....
.....
.....
.....
.....
.....

[3]

- 8 Alice enters a URL into a web browser to access a webpage.

(a) State what URL represents.

U R L [1]

(b) Explain how the web browser uses the URL to access the webpage.

.[4]

- 9 Describe **two** differences between Read Only Memory (ROM) and Random Access Memory (RAM).

Difference 1.....

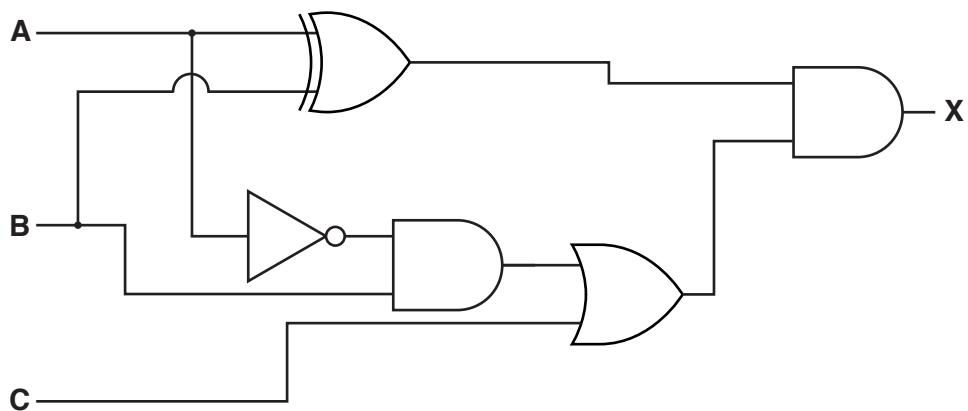
.....

Difference 2

54

[4]

10 A logic circuit is shown:



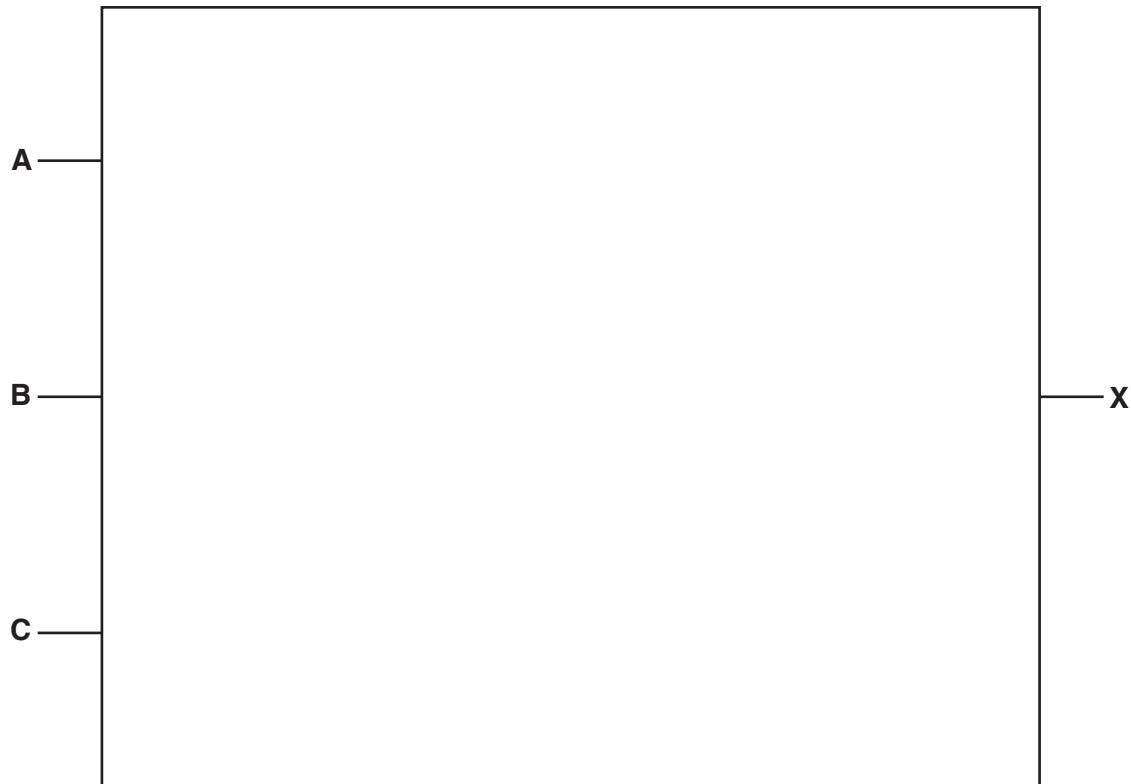
- (a) Complete the truth table for the given logic circuit.

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]

- (b) Draw a logic circuit corresponding to the logic statement:

$X = 1$ if $((A \text{ is } 1 \text{ AND } B \text{ is } 1) \text{ AND } (A \text{ is } 1 \text{ OR } C \text{ is NOT } 1)) \text{ OR } (B \text{ is } 1 \text{ AND } C \text{ is NOT } 1)$



[6]

- 11 The fetch-execute cycle make use of registers.

- (a) Describe the role of the Program Counter (PC).

.....
.....
.....
.....

[2]

- (b) Describe the role of the Memory Data Register (MDR).

.....
.....
.....
.....

[2]

- 12 Explain the difference between a Musical Instrument Digital Interface (MIDI) file and a MP3 file.

.....
.....
.....
.....
.....
.....
.....
.....

[4]

- 13 State which types of storage device or media would be most suitable for these scenarios.

For each device or media, justify your choice.

- (a) Creating a backup of 150 GB of data.

.....
.....
Justification

[2]

- (b) Storing applications on a tablet device.

.....
.....
Justification

[2]

- (c) Storing a 1200 MB high-definition promotional movie about a new car. The movie is to be given to people who are interested in buying a new car.

.....
.....
Justification

[2]

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

COMPUTER SCIENCE

0478/13

Paper 1

October/November 2018

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 2018 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of 13 printed pages.

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.

Question	Answer	Marks														
1 1 mark for each correct line, maximum 5 marks	<table border="0"> <thead> <tr> <th>Device</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Laser Printer</td> <td>Uses a high-intensity beam of light shone through three layers of changing pixels</td> </tr> <tr> <td>LCD Projector</td> <td>Uses millions of micro mirrors to reflect light through a lens</td> </tr> <tr> <td>Digital Light Projector (DLP)</td> <td>Uses plastic, resin or powdered metal to generate a physical output</td> </tr> <tr> <td>Inkjet Printer</td> <td>Uses a static electric charge on a rotating drum to generate a physical output</td> </tr> <tr> <td>3D Printer</td> <td>Uses liquid ink to generate a physical output</td> </tr> <tr> <td>2D Cutter</td> <td>Uses a high-power laser to generate a physical output</td> </tr> </tbody> </table>	Device	Description	Laser Printer	Uses a high-intensity beam of light shone through three layers of changing pixels	LCD Projector	Uses millions of micro mirrors to reflect light through a lens	Digital Light Projector (DLP)	Uses plastic, resin or powdered metal to generate a physical output	Inkjet Printer	Uses a static electric charge on a rotating drum to generate a physical output	3D Printer	Uses liquid ink to generate a physical output	2D Cutter	Uses a high-power laser to generate a physical output	5
Device	Description															
Laser Printer	Uses a high-intensity beam of light shone through three layers of changing pixels															
LCD Projector	Uses millions of micro mirrors to reflect light through a lens															
Digital Light Projector (DLP)	Uses plastic, resin or powdered metal to generate a physical output															
Inkjet Printer	Uses a static electric charge on a rotating drum to generate a physical output															
3D Printer	Uses liquid ink to generate a physical output															
2D Cutter	Uses a high-power laser to generate a physical output															

Question	Answer	Marks																																
2(a)	2 marks for 3 correct bits, 1 mark for 2 correct bits <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Parity Bit</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>1</td> <td>0</td> <td>0</td> <td>1</td> <td>1</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> </tr> <tr> <td>1</td> <td>1</td> <td>0</td> <td>1</td> <td>0</td> <td>0</td> <td>0</td> <td>1</td> </tr> </table>	Parity Bit								0	1	0	1	0	0	1	1	0	1	0	1	1	1	1	1	1	1	0	1	0	0	0	1	2
Parity Bit																																		
0	1	0	1	0	0	1	1																											
0	1	0	1	1	1	1	1																											
1	1	0	1	0	0	0	1																											
2(b)	Two from: <ul style="list-style-type: none"> Set of rules for controlling error checking/detection // it's an error detection method // used to detect errors Uses acknowledgement and timeout Request is sent (with data) requiring acknowledgement If no response/acknowledgment within certain time frame data package is resent When data received contains an error a request is sent (automatically) to resend the data The resend request is repeatedly sent until packet is received error free/limit is reached/acknowledgement received 	2																																
2(c)	Checksum	1																																

Question	Answer	Marks
3	Six from: <ul style="list-style-type: none"> A <u>pressure sensor</u> is used The sensor sends data/signals to the microprocessor Data is <u>converted to digital</u> format Microprocessor compares data value against set value If value <u><= 2400 Kg/under weight limit</u> lift is permitted to operate If value <u>> 2400 Kg/over weight limit</u> signal is sent from the microprocessor to deliver warning message to passengers If value <u>> 2400 Kg</u> signal is sent from the microprocessor to lift mechanism to stop lift operating Weight continuously monitored 	6

Question	Answer				Marks				
4(a)	1 mark for each correct conversion <table border="1" style="width: 100%;"><tr><td style="text-align: center;">01101010</td><td style="text-align: center;">11111111</td><td style="text-align: center;">00001000</td><td style="text-align: center;">10010011</td></tr></table>				01101010	11111111	00001000	10010011	3
01101010	11111111	00001000	10010011						
4(b)	<ul style="list-style-type: none"> • Computers use switches / logic gates • Only uses 2 states / On or Off / 1 or 0 				2				

Question	Answer	Marks
5(a)	<ul style="list-style-type: none"> • Bits sent one at a time • Uses a single wire 	2
5(b)	USB / SATA / Wifi /PCI <u>Express</u> / Any appropriate serial device	1
5(c)	<ul style="list-style-type: none"> • Data is transferred in two directions • Data is sent in only one direction at a time 	2

Question	Answer	Marks
6	<p>1 mark for method name, 1 mark for description e.g.</p> <p>Backups</p> <ul style="list-style-type: none"> • Make a copy of the data • Copy stored away from main computer • Data can be restored from backup <p>Anti-virus</p> <ul style="list-style-type: none"> • Scans computer for viruses • Software to detect/remove viruses • Can prevent data being corrupted by viruses <p>Firewall</p> <ul style="list-style-type: none"> • Hardware or software that monitors network traffic • To help prevent hackers gaining access / deleting data <p>Password/Biometrics</p> <ul style="list-style-type: none"> • To help protect files / computer from unauthorised access <p>Restricted access</p> <ul style="list-style-type: none"> • To stop users downloading/installing software that could harm <p>Verification</p> <ul style="list-style-type: none"> • Message e.g. to ask if definitely want to delete <p>Physical methods</p> <ul style="list-style-type: none"> • Locks/alarms/CCTV to alert/deter unauthorised access 	6

Question	Answer	Marks
7(a)	<p>Three from:</p> <ul style="list-style-type: none"> • It is a translator • Translates (high level language) to low level language • Executes one line at a time • Translates source code line by line • Runs error diagnostic • Produces error messages to tell user location of error • Stops execution when encounters errors • Continues translating when an error is fixed 	3
7(b)	<p>Four from (Max three per benefit):</p> <ul style="list-style-type: none"> • Produces executable file ... • ... this creates a smaller file size • ... more saleable • Program will be machine independent / portable ... • ... this means it can be used on any hardware • No need for compiler to run executable file ... • ... this means it will be quicker to run • ... customers can just execute the program • Source code cannot be accessed ... • ... therefore, code cannot be stolen / plagiarised 	4
7(c)	<p>Three from:</p> <ul style="list-style-type: none"> • Uses compression algorithm / by example e.g. RLE • Repeating words / phrases / patterns identified... • ... replaced with value • File / dictionary / index of phrases created • Index will store word/phrase with value 	3

Question	Answer	Marks
8(a)	Uniform Resource Locator	1
8(b)	Four from: <ul style="list-style-type: none"> • The web browser sends URL to DNS • DNS stores an index of URL and matching IP address • DNS searches for URL to obtain the IP address • IP address sent to web browser, (if found) • Web browser sends request to IP of webserver • Webserver sends web page to web browser • Web browser interprets HTML to display web page • If URL not found DNS returns error 	4

Question	Answer	Marks
9	Four from: <ul style="list-style-type: none"> • ROM is permanent ... • ... RAM is temporary • ROM is non-volatile • ... RAM is volatile ... • ROM is read only ... • ... RAM can have read/write operations • ROM holds instructions for boot up ... • ... RAM holds files / instructions in use 	4

Question	Answer	Marks																																				
10(a) 4 marks for 8 correct outputs 3 marks for 6 or 7 correct outputs 2 marks for 4 or 5 correct outputs 1 mark for 2 or 3 correct outputs	<table border="1"><thead><tr><th>A</th><th>B</th><th>C</th><th>X</th></tr></thead><tbody><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td></tr></tbody></table>	A	B	C	X	0	0	0	0	0	0	1	0	0	1	0	1	0	1	1	1	1	0	0	0	1	0	1	1	1	1	0	0	1	1	1	0	4
A	B	C	X																																			
0	0	0	0																																			
0	0	1	0																																			
0	1	0	1																																			
0	1	1	1																																			
1	0	0	0																																			
1	0	1	1																																			
1	1	0	0																																			
1	1	1	0																																			

Question	Answer	Marks
10(b)	<p>1 mark per correct gate with correct inputs.</p>	6

Question	Answer	Marks
11(a)	<ul style="list-style-type: none"> • Holds address of next/current instruction ... • ... to be fetched/processed/executed 	2
11(b)	<ul style="list-style-type: none"> • Stores data/instruction that is in use ... • ... from address in MAR 	2

Question	Answer	Marks
12	<p>Four from (Max three from each):</p> <p>MP3</p> <ul style="list-style-type: none"> • Digital recording of sound • Produced by recording software / microphone • Used when distributing sound files • Compressed file format <p>MIDI</p> <ul style="list-style-type: none"> • Instructions of how to make sound • Non-audio recording • File created using digital musical instruments • Produced by synthesizer • Used when composing music • Individual notes/instruments can be changed 	4

Question	Answer	Marks
13(a)	<p>1 mark for storage, 1 mark for justification</p> <ul style="list-style-type: none"> • External/Removable HDD // External/Removable SSD // Large capacity USB Flash Drive • Backups must be stored separately • Will hold sufficient data • Faster write abilities (SSD/USB drive only) 	2

Question	Answer	Marks
13(b)	<p>1 mark for storage, 1 mark for justification</p> <ul style="list-style-type: none">• SSD // SD card // Flash memory• Small physical size• Lightweight• Low heat production• Low power consumption• It's quiet• Fast read/write times	2
13(c)	<p>1 mark for storage, 1 mark for justification</p> <ul style="list-style-type: none">• DVD // Blu-ray // USB Flash Drive // SD card• Easy to distribute• Small in size• Cheap to buy• Universal storage therefore compatible with many devices	2

CANDIDATE
NAME

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



COMPUTER SCIENCE

0478/11

Paper 1 Theory

October/November 2019

1 hour 45 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

No calculators allowed.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name in the spaces at the top of this page.
Write in dark blue or black pen.

You may use an HB pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer **all** questions.

No marks will be awarded for using brand names of software packages or hardware.

Any businesses described in this paper are entirely fictitious.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

The maximum number of marks is 75.

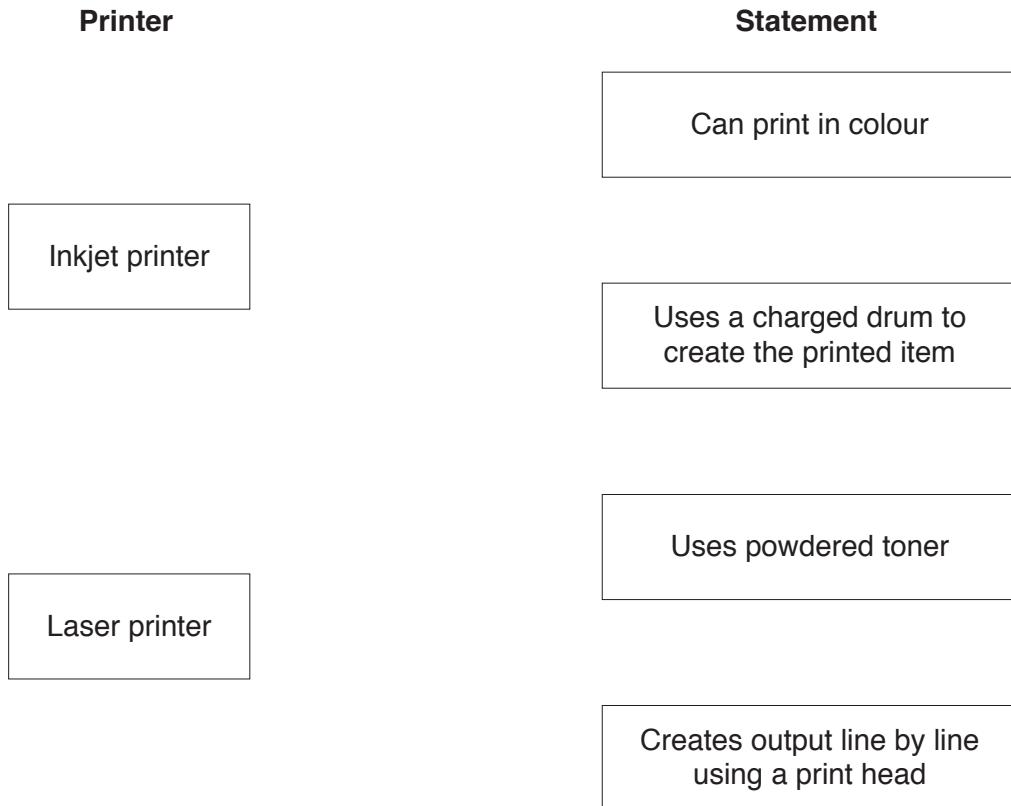
This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **12** printed pages.

- 1 Andrew wants to produce advertising material for his company.

- (a) Andrew can use an **Inkjet printer** or a **Laser printer**.

Draw lines to connect each printer to a correct statement. More than one line may be used to connect to each printer or statement.



[2]

- (b) Andrew wants to print a single page A4 leaflet. He wants to print 10 000 copies.

State whether he should use an inkjet or a laser printer.

..... [1]

- (c) Andrew wants to produce small 3D models of the company logo.

Explain how a 3D cutter could be used to produce the models.

.....

 [2]

- 2 An electronic guessing game compares denary integer values input by a user with pre-stored values. The pre-stored values are held in 10-bit binary format.

- (a) Convert the binary values in the table to denary.

Binary	Denary
0001001110	
0110110111	
1000000001	

[3]

- (b) When planning the game, the designer decided to use hexadecimal notation to represent the binary values.

Explain why the designer used hexadecimal notation.

.....
.....
.....
..... [2]

- (c) State the hexadecimal equivalent of the binary value 1010110101

..... [3]

- 3 A company has several offices. It uses the Internet to transfer data between offices. The company also makes payments to staff and suppliers using online banking.

The company are concerned about spyware and other security aspects of using the Internet.

- (a) Explain what is meant by spyware **and** how it is used to obtain data.
-
.....
.....
.....
..... [3]

- (b) The company uses a web page to log on to the online bank.

Identify **one** method that could be used by the online bank to reduce the impact of spyware when logging on.

State **how** the method prevents the use of spyware.

.....
.....
.....
..... [2]

- (c) The company has installed a firewall as part of its data security.

Describe how a firewall can help protect against unauthorised access to data.

.....
.....
.....
.....
.....
.....
.....
.....
.....
..... [4]

- (d) State **two** other methods the company could use to help prevent unauthorised access to data.

Method 1

Method 2

[2]

4 A zoo has an information point.

- Visitors use a menu to select information about animals.
- The menu includes 500 different animals.
- The information is provided only using high definition video with an audio track.

(a) State **one** input device that could be used for the information point.

..... [1]

(b) The output is shown on a monitor.

State **one** other output device that could be used for the information point.

..... [1]

(c) The video files are stored at the information point.

State **one** secondary storage device that could be used.

..... [1]

(d) The zoo decides to introduce Quick Response codes in different places in the zoo. These provide further information about the animals.

Describe how customers obtain the information from the Quick Response codes.

.....
.....
.....
.....
.....
.....
.....
.....
.....

[4]

- 5 Sonia shares files with her friends. The method of data transmission she uses is half-duplex serial transmission.

- (a) Describe how data is transmitted using half-duplex serial data transmission.

.....
.....
.....
.....
.....
.....
.....
.....

[4]

- (b) The system uses parity bits to check for errors during data transmission.

The outcome of four bytes after transmission is:

Byte 1	Byte 2	Byte 3	Byte 4
00110011	01010100	10110100	01110111

One of the bytes has been transmitted incorrectly.

Identify the byte that was transmitted incorrectly.

Byte

Explain how you identified the byte that was transmitted incorrectly.

.....
.....
.....
.....
.....

[4]

- 6** Ishan is a member of a software community that develops computer games. He has programmed a new feature for one of the community's existing games.

- (a) Ishan compiles the program before he issues it to the community.

[1]

- (ii) Explain **one** drawback of Ishan compiling the program.

[1]

- (b)** Ishan shares the program with community members over the Internet, using Secure Socket Layer (SSL).

- (i) Explain how Ishan will know he is on a secure website.

[1]

- (ii) Describe how an SSL connection is established

[5]

- (c) The community publishes completed games on the Internet as freeware.

Describe what is meant by freeware.

.....
.....
.....
.....
.....
.....
.....
.....

[4]

- (d) The program files for the games are compressed before they are published on the Internet.

- (i) Describe **one** benefit of compressing the program files.

.....
.....
.....
.....
.....

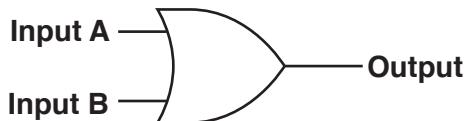
[2]

- (ii) State whether **lossy** or **lossless** compression should be used.

..... [1]

- 7 A factory manufactures plastic pipes. It uses logic circuits to control the manufacturing process.

- (a) Consider the logic gate:



Complete the truth table for this logic gate.

Input A	Input B	Output
0	0	
0	1	
1	0	
1	1	

[1]

- (b) Consider the truth table:

Input A	Input B	Output
0	0	0
0	1	1
1	0	1
1	1	0

State the **single** logic gate that produces the given output.

..... [1]

- (c) Plastic pipes of various sizes are manufactured by heating the plastic and using pressure.

The manufacturing system uses sensors to measure the pressure (P), temperature (T) and speed (S) of production.

The inputs to the manufacturing system are:

Input	Binary value	Condition
P	1	pressure is > 5 bar
	0	pressure is \leq 5 bar
T	1	temperature is > 200 degrees Celsius
	0	temperature is \leq 200 degrees Celsius
S	1	speed is > 1 metre per second
	0	speed is \leq 1 metre per second

The system will sound an alarm (X) when certain conditions are detected.

The alarm will sound when:

Temperature is > 200 degrees Celsius and the pressure is \leq 5 bar

or

Speed is > 1 metre per second and Temperature is \leq 200 degrees Celsius

Draw a logic circuit to represent the above alarm system.

Logic gates used must have a maximum of **two** inputs.



[5]

- (d) Give two benefits of using sensors to monitor the manufacture of plastic pipes.

1

[2]

[2]

- 8** Explain how an instruction is fetched in a Von Neumann model computer.

[6]

- 9 HTML can be used to create the structure and the presentation of web pages.

- (a) Describe what is meant by HTML structure.

[2]

[2]

- (b) Gloria writes a paragraph as an answer to an examination question about accessing a website.

Use the list given to complete Gloria's answer by inserting the correct **four** missing terms. Not all terms will be used.

- browser
- cookies
- Hypertext Markup Language (HTML)
- hypertext transfer protocol (http)
- hypertext transfer protocol secure (https)
- Internet Protocol address (IP address)
- Media Access Control address (MAC address)
- web server

The user enters the URL of the website. The uses the DNS server to look up the of the website.

The browser sends a request to the to obtain the website files. The website files are sent as that is interpreted by the browser.

[4]

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.

COMPUTER SCIENCE

0478/11

Paper 1

October/November 2019

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 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of 12 printed pages.

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.

Question	Answer	Marks										
1(a)	<p>Printer</p> <table border="0"> <thead> <tr> <th>Inkjet printer</th> <th>Statement</th> </tr> </thead> <tbody> <tr> <td></td> <td>Can print in colour</td> </tr> <tr> <td></td> <td>Uses a charged drum to create the printed item</td> </tr> <tr> <td>Laser printer</td> <td>Uses powdered toner</td> </tr> <tr> <td></td> <td>Creates output line by line using a print head</td> </tr> </tbody> </table> <p>One mark for correct lines from inkjet One mark for correct lines from laser</p>	Inkjet printer	Statement		Can print in colour		Uses a charged drum to create the printed item	Laser printer	Uses powdered toner		Creates output line by line using a print head	2
Inkjet printer	Statement											
	Can print in colour											
	Uses a charged drum to create the printed item											
Laser printer	Uses powdered toner											
	Creates output line by line using a print head											
1(b)	<ul style="list-style-type: none"> <li>• Laser 	1										
1(c)	<p>Two from:</p> <ul style="list-style-type: none"> <li>• Design is created on the computer / software / CAD <li>• Material is loaded to cutter <li>• Different types of material can be used <li>• Uses lasers to cut material ... <li>• ... that use infra-red <li>• ... that produces extreme heat <li>• ... that is focussed using a special lens <li>• Can work on both the x,y and z axis 	2										

Question	Answer	Marks								
2(a)	<p>One mark for each correct denary value</p> <table border="1"> <thead> <tr> <th>Binary</th><th>Denary</th></tr> </thead> <tbody> <tr> <td>0001001110</td><td>78</td></tr> <tr> <td>0110110111</td><td>439</td></tr> <tr> <td>1000000001</td><td>513</td></tr> </tbody> </table>	Binary	Denary	0001001110	78	0110110111	439	1000000001	513	3
Binary	Denary									
0001001110	78									
0110110111	439									
1000000001	513									
2(b)	<p>Two from:</p> <ul style="list-style-type: none"> • Uses fewer characters // shorter • Easier to read / write / understand • Less likely to make mistakes // less error prone • Easier to debug 	2								
2(c)	<p>One mark for each correct hexadecimal value in correct order</p> <p>2 B 5</p>	3								

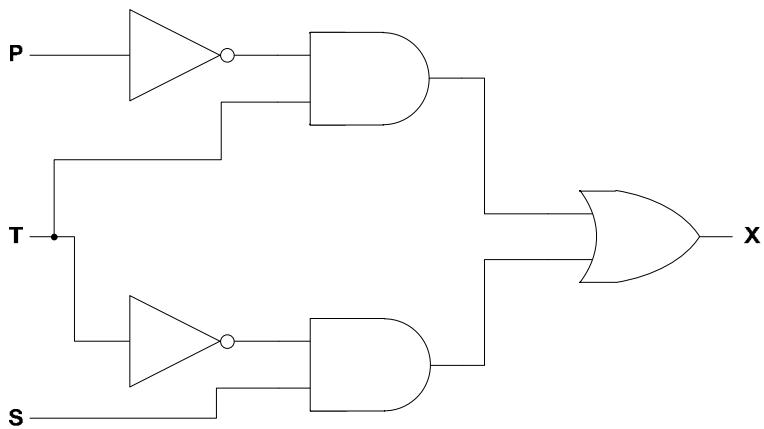
Question	Answer	Marks
3(a)	<p>Three from:</p> <ul style="list-style-type: none"> • Malicious software // type of malware • Tracks / records keypresses // keylogger • Sends data to third party • Collected data is analysed to obtain data 	3
3(b)	<p>One mark for identified method, one mark for how it prevents spyware:</p> <p>Drop-down boxes // onscreen / virtual keyboard</p> <ul style="list-style-type: none"> • Means key logger cannot collect data <p>Only requires part of the password</p> <ul style="list-style-type: none"> • Hacker doesn't get the full password <p>Two-step verification // Two-factor authentication</p> <ul style="list-style-type: none"> • Extra data is sent to device making it more difficult for hacker to obtain it • Data has to be entered into the same system // if attempted from a remote location, it will not be accepted <p>Use a biometric device</p> <ul style="list-style-type: none"> • The person's biological data (e.g. their fingerprint) is also required 	2
3(c)	<p>Four from:</p> <ul style="list-style-type: none"> • Monitors traffic coming into and out of the computer system • Checks that the traffic meets any criteria / rules set • Blocks any traffic that does not meet the criteria / rules set • Allows a set blacklist / whitelist // can block certain IP addresses • Can close certain ports 	4
3(d)	<p>Two from:</p> <ul style="list-style-type: none"> • Passwords // biometrics • Levels of access • Proxy servers • Physical security methods – e.g. PC's in locked rooms, etc. 	2

Question	Answer	Marks
4(a)	One from: <ul style="list-style-type: none">• Touch screen• Keyboard• Microphone• Mouse	1
4(b)	One from: <ul style="list-style-type: none">• Headphones• Speakers• Printer• Light / LED	1
4(c)	One from: <ul style="list-style-type: none">• HDD• SSD• USB drive	1
4(d)	Four from: <ul style="list-style-type: none">• QR code is scanned using a <u>camera</u> on a mobile device ...• ... and read / decoded using an application / software• Illuminator shone on code• Squares reflect light differently• Corners of code are used for orientation• Opens document with information // Directs to website with information• QR code can be saved for future reference	4

Question	Answer	Marks
5(a)	<ul style="list-style-type: none">• Data is sent down a single wire ...• ... one bit at a time• Data is sent in both directions ...• ... but only one direction at a time	4
5(b)	<p>One mark for correct byte (Byte) 2 // 01010100</p> <p>Three from:</p> <ul style="list-style-type: none">• Added up / counted the 1s / 0s• Even parity used // 3 bytes are even• Byte 2 uses odd parity // 1 byte is odd	4

Question	Answer	Marks
6(a)(i)	One from: <ul style="list-style-type: none"> • Code will run without the need of an interpreter • (Object) Code is platform independent • Source code not available / cannot be modified 	1
6(a)(ii)	One from: <ul style="list-style-type: none"> • Source code not available / cannot be modified • Comments, etc. not visible • Future changes will require code to be recompiled 	1
6(b)(i)	One from: <ul style="list-style-type: none"> • Protocol is HTTPS • Padlock icon is locked • Can view website certificate 	1
6(b)(ii)	Five from: <ul style="list-style-type: none"> • Browser / client sends request to webserver to request identification • Web server sends its digital / security certificate • Browser authenticates certificate ... • ... if authentic connection, is established • Any data sent is encrypted ... • ... using public and private keys 	5
6(c)	Four from: <ul style="list-style-type: none"> • A type of software licence • Free of charge • Normally distributed without the source code • Can legally share / copy • Cannot legally modify code • Cannot resell 	4

Question	Answer	Marks
6(d)(i)	Two from: <ul style="list-style-type: none">• File size is reduced ...• ... so it uses less storage space• ... so faster transmission• ... so quicker to download	2
6(d)(ii)	<ul style="list-style-type: none">• Lossless	1

Question	Answer	Marks															
7(a)	<table border="1"> <thead> <tr> <th>Input A</th><th>Input B</th><th>Output</th></tr> </thead> <tbody> <tr> <td>0</td><td>0</td><td>0</td></tr> <tr> <td>0</td><td>1</td><td>1</td></tr> <tr> <td>1</td><td>0</td><td>1</td></tr> <tr> <td>1</td><td>1</td><td>1</td></tr> </tbody> </table>	Input A	Input B	Output	0	0	0	0	1	1	1	0	1	1	1	1	1
Input A	Input B	Output															
0	0	0															
0	1	1															
1	0	1															
1	1	1															
7(b)	<ul style="list-style-type: none"> <li>• Exclusive OR / XOR / EOR 	1															
7(c)	<p>One mark for each correct logic gate with correct inputs</p> 	5															
7(d)	<p>Two from:</p> <ul style="list-style-type: none"> <li>• Can work continuously <li>• Avoids human error <li>• It could be a dangerous environment and will avoid human risk <li>• Detect errors instantly <li>• Maintain consistent and correct conditions 	2															

Question	Answer	Marks
8	<p>Six from:</p> <ul style="list-style-type: none"> • PC holds address of the instruction • The address held in PC is sent to MAR ... • ... using address bus • MAR goes to location in memory where instruction is stored • Instruction sent to MDR ... • ... using data bus • Instruction sent to CIR • Control unit sends signals to manage the process ... • ... using the control bus 	6
9(a)	<p>Two from:</p> <ul style="list-style-type: none"> • Layout of the webpage • e.g. where a paragraph is placed • Defined using tags 	2
9(b)	<p>One mark for each correct term in the correct order:</p> <ul style="list-style-type: none"> • browser • IP address • web server • HTML 	4

CANDIDATE
NAME

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



COMPUTER SCIENCE

0478/12

Paper 1 Theory

October/November 2019

1 hour 45 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

No calculators allowed.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name in the spaces at the top of this page.
Write in dark blue or black pen.

You may use an HB pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer **all** questions.

No marks will be awarded for using brand names of software packages or hardware.

Any businesses described in this paper are entirely fictitious.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

The maximum number of marks is 75.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **10** printed pages and **2** blank pages.

- 1 Computer memory size is measured in multiples of bytes.

Four statements about computer memory sizes are given in the table.

Tick (✓) to show if the statement is **True** or **False**.

Statement	True (✓)	False (✗)
25 kB is larger than 100 MB		
999 MB is larger than 50 GB		
3500 kB is smaller than 2 GB		
2350 bytes is smaller than 2 kB		

[4]

- 2 The Von Neumann model for a computer system uses several components in the fetch-execute cycle. One component that is used is the Control Unit (CU).

Identify **four** other components that are used in the Von Neumann model for a computer system.

- 1
- 2
- 3
- 4

[4]

- 3 The data from a sensor must be converted from analogue to digital to be processed by a computer.

- (a) State what is meant by analogue data.

.....

[1]

- (b) State what is meant by digital data.

.....

[1]

- 4 An 8-bit binary register contains the value:

0	0	1	1	0	1	0	0
---	---	---	---	---	---	---	---

- (a) Convert the binary value to denary.

..... [1]

- (b) The contents of the register shifted one place to the right would give the result:

0	0	0	1	1	0	1	0
---	---	---	---	---	---	---	---

The contents of the register shown at the start of question 4 are shifted two places to the left.

Show the contents of the register after this shift has taken place.

--	--	--	--	--	--	--	--

[1]

- (c) State the effect this shift has on the denary value in **part (a)**.

..... [1]

- 5 Audrey wants to send a sound file to Nico using email.

The file is too large to attach to an email so Audrey decides to compress the file.

She uses lossy compression to reduce the size of the sound file.

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

.....

 [4]

(b) Nico asks Audrey why she used lossy compression rather than lossless.

- (i) State **one** advantage Audrey could give of using lossy rather than lossless to compress the sound file.

.....
.....

[1]

- (ii) State **one** disadvantage Nico could give of using lossy rather than lossless to compress the sound file.

.....

[1]

(c) Audrey sometimes records MIDI files.

- (i) Explain what is meant by a MIDI file.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

[4]

- (ii) MIDI uses serial data transmission.

Explain **two** advantages of using serial transmission rather than parallel transmission.

Advantage 1

.....
.....
.....

Advantage 2

.....
.....
.....
.....

[4]

- 6** Touch screen technologies can be described as resistive or capacitive.

Six statements are given about resistive and capacitive technology.

Tick (✓) to show if the statement applies to Resistive or Capacitive technology.

Statement	Resistive (✓)	Capacitive (✓)
This touch screen has multi-touch capabilities		
This touch screen cannot be used whilst wearing gloves		
This touch screen is made up of two layers with a small space in between		
This touch screen uses the electrical properties of the human body		
This touch screen is normally cheaper to manufacture		
This touch screen has a quicker response time		

[6]

- 7 Gerald uses a keyboard to enter a website address into the address bar of his browser.

- (a) Describe how Gerald's key presses on his keyboard are processed by the computer.

.....

.....

.....

.....

.....

.....

[4]

(b) State **three** functions of a browser.

1

3

[3]

(c) The website Gerald visits uses https.

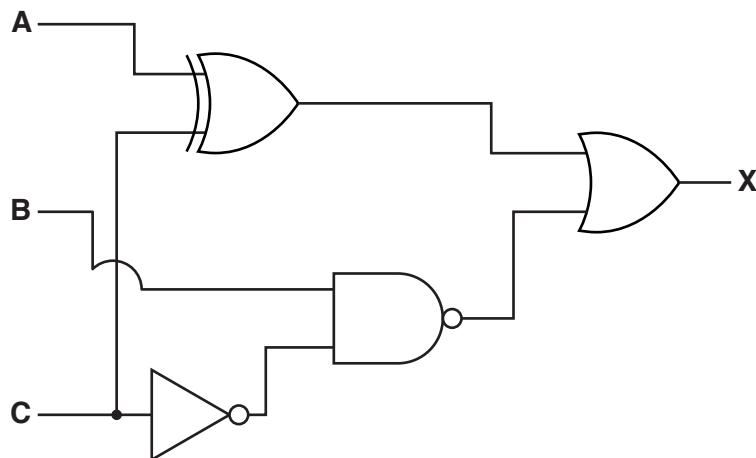
Explain what is meant by https.

[View Details](#) | [Edit](#) | [Delete](#)

.....

[3]

- 8 Consider the logic circuit:



- (a) Write a logic statement to match the given logic circuit.

..... [3]

- (b) Complete the truth table for the given logic circuit.

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]

- 9 Maisey purchases a new router and attaches it to her computer. The connection she sets up uses duplex data transmission.

- (a) Five statements are given about duplex data transmission.

Tick (✓) to show if the statement is **True** or **False**.

Statement	True (✓)	False (✓)
Duplex data transmission can be either serial or parallel		
Duplex data transmission is when data is transmitted both ways, but only one way at a time		
Duplex data transmission is always used to connect a device to a computer		
Duplex data transmission is when data is transmitted both ways at the same time		
Duplex data transmission automatically detects any errors in data		

[5]

- (b) Maisey's computer uses an integrated circuit (IC) for data transmission that sends multiple bits at the same time.

State whether the IC uses **serial** or **parallel** data transmission.

..... [1]

- (c) Maisey purchases a new printer and connects it to her computer using the USB port.

Explain **two** benefits of using a USB connection.

Benefit 1

.....

.....

Benefit 2

.....

.....

[4]

10 Data is valuable to a company.

- (a) Companies use error detection methods to make sure that data is accurate.

One error detection method is the use of a check digit.

Explain what is meant by a check digit and how it is used to detect errors.

.....
.....
.....
.....
.....
.....
.....
.....
.....
..... [4]

- (b) Companies can use a range of security methods to keep their data secure.

Identify **two** security methods that a company can use to keep their data secure **and** explain how each method can keep the data secure.

Security method 1

.....
.....
.....
.....
.....
.....
.....
.....

Security method 2

.....
.....
.....
.....
.....
.....
.....
.....

[6]

11 Robert has a mobile device that uses RAM, ROM and an SSD.

- (a) State what the RAM, ROM and SSD are used for.

RAM

ROM

SSD

[3]

- (b) Give **two** reasons why an SSD, rather than a HDD, is used in the mobile device.

Reason 1

.....

Reason 2

[2]

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.

COMPUTER SCIENCE

0478/12

Paper 1

October/November 2019

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 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **15** 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.

Question	Answer			Marks															
1	<p>One mark for each correct tick</p> <table border="1"><thead><tr><th>Statement</th><th>True (✓)</th><th>False (✗)</th></tr></thead><tbody><tr><td>25 kB is larger than 100 MB</td><td></td><td>✓</td></tr><tr><td>999 MB is larger than 50 GB</td><td></td><td>✓</td></tr><tr><td>3500 kB is smaller than 2 GB</td><td>✓</td><td></td></tr><tr><td>2350 bytes is smaller than 2 kB</td><td></td><td>✓</td></tr></tbody></table>	Statement	True (✓)	False (✗)	25 kB is larger than 100 MB		✓	999 MB is larger than 50 GB		✓	3500 kB is smaller than 2 GB	✓		2350 bytes is smaller than 2 kB		✓			4
Statement	True (✓)	False (✗)																	
25 kB is larger than 100 MB		✓																	
999 MB is larger than 50 GB		✓																	
3500 kB is smaller than 2 GB	✓																		
2350 bytes is smaller than 2 kB		✓																	

Question	Answer	Marks
2	<p>Four from:</p> <ul style="list-style-type: none"> • Arithmetic and logic unit (ALU) • Memory address register (MAR) • Memory data register (MDR) // Memory buffer register (MBR) • Accumulator (ACC) • Immediate Access Store (IAS) • Main memory // RAM • Program counter (PC) • Current instruction register (CIR) • Address bus • Data bus • Control bus • Input device • Output device • Secondary storage device 	4

Question	Answer	Marks
3(a)	<p>One from:</p> <ul style="list-style-type: none"> • Continuous data // by description • Non-discrete data // by description • By example, e.g. data such as a sound wave 	1
3(b)	<p>One from:</p> <ul style="list-style-type: none"> • <u>Discrete</u> data that has only two values • By example, e.g. binary data / 1's and 0's 	1

Question	Answer	Marks								
4(a)	<ul style="list-style-type: none"> • 52 	1								
4(b)	<table border="1" style="width: 100%; text-align: center;"> <tr> <td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td> </tr> </table>	1	1	0	1	0	0	0	0	1
1	1	0	1	0	0	0	0			
4(c)	<ul style="list-style-type: none"> • It is multiplied by 4 	1								

Question	Answer	Marks
5(a)	<p>Four from:</p> <ul style="list-style-type: none"> • A compression algorithm is used • Discards any unnecessary sounds ... • ... using perceptual musical shaping • ... such as removing background noise / sounds humans can't hear // or other suitable example • Reduces sample size / resolution // by example • Reduces sample rate // by example • Sound is clipped • The data is permanently removed 	4
5(b)(i)	<p>One from:</p> <ul style="list-style-type: none"> • The file size will be smaller than lossless • Requires less storage space • Requires less time to transmit 	1
5(b)(ii)	<p>One from:</p> <ul style="list-style-type: none"> • The quality of the sound will be reduced • The original file cannot be restored 	1

Question	Answer	Marks
5(c)(i)	<p>Four from:</p> <ul style="list-style-type: none"> • Musical Instrument Digital Interface file • Stores a set of commands / instructions for how the sound should be played • Does not store the actual sounds • Data in the file has been recorded using digital instruments • Specifies pitch of the note // specifies the note to be played • Specifies when each note plays and stops playing // Specifies key on/off • Specifies duration of the note • Specifies volume of the note • Specifies the tempo • Specifies the type of instrument 	4
5(c)(ii)	<p>Four from:</p> <ul style="list-style-type: none"> • It uses a single wire ... • ... therefore, it is cheaper to manufacture / buy / install • ... therefore, less likely to have interference // no crosstalk • ... therefore, can be used over longer distances • Data is sent a bit at a time ... • ... therefore, less chance of data being skewed // data is received in order • Transmission can be synchronised ... • ... can reduce rate of errors 	4

Question	Answer			Marks																			
6	<p>One mark for each correct tick</p> <table border="1"><thead><tr><th>Statement</th><th>Resistive (✓)</th><th>Capacitive (✓)</th></tr></thead><tbody><tr><td>This touch screen has multi-touch capabilities</td><td></td><td>✓</td></tr><tr><td>This touch screen cannot be used whilst wearing gloves</td><td></td><td>✓</td></tr><tr><td>This touch screen is made up of two layers with a small space in between</td><td>✓</td><td></td></tr><tr><td>This touch screen uses the electrical properties of the human body</td><td></td><td>✓</td></tr><tr><td>This touch screen is normally cheaper to manufacture</td><td>✓</td><td></td></tr><tr><td>This touch screen has a quicker response time</td><td></td><td>✓</td></tr></tbody></table>	Statement	Resistive (✓)	Capacitive (✓)	This touch screen has multi-touch capabilities		✓	This touch screen cannot be used whilst wearing gloves		✓	This touch screen is made up of two layers with a small space in between	✓		This touch screen uses the electrical properties of the human body		✓	This touch screen is normally cheaper to manufacture	✓		This touch screen has a quicker response time		✓	6
Statement	Resistive (✓)	Capacitive (✓)																					
This touch screen has multi-touch capabilities		✓																					
This touch screen cannot be used whilst wearing gloves		✓																					
This touch screen is made up of two layers with a small space in between	✓																						
This touch screen uses the electrical properties of the human body		✓																					
This touch screen is normally cheaper to manufacture	✓																						
This touch screen has a quicker response time		✓																					

Question	Answer	Marks
7(a)	<p>Four from:</p> <ul style="list-style-type: none"> • Membrane / matrix / circuit board present at base of keys • A key is pressed that presses a switch • When a key is pressed it completes a circuit // changes the current in a circuit • The location of the keypress is calculated • An index of characters is searched to find the corresponding keypress • Each character has an ASCII / Unicode value • The ASCII / Unicode value has a binary value • Keypress generates an interrupt • Each character / keypress is added to a buffer to wait to be processed • The binary can then be processed by the CPU to action the key press 	4
7(b)	<p>Three from:</p> <ul style="list-style-type: none"> • Display a web page • Sends a request to the web server • Receives data from web server • Translates HTML files • Processes client-side script, e.g. JavaScript • Store favourites • Store history • Navigation forward and backward • Check security • Store / access cookies • Find specific text within a web page • Downloading file from the web • Allows a homepage • Allows multiple tabs / web pages to be opened • Stores data in its cache 	3

Question	Answer	Marks
7(c)	<p>Three from:</p> <ul style="list-style-type: none"> • Hypertext Transfer Protocol Secure // It is a protocol ... • ... that is a set of rules/standards • Secure version of <u>HTTP</u> • Secure website // secures data • Uses TLS / SSL • Uses encryption 	3

Question	Answer	Marks
8(a)	<ul style="list-style-type: none"> • $X = 1$ if (A is 1 XOR C is 1) OR (B is 1 NAND C is NOT 1) • $X = (A \text{ XOR } C) \text{ OR } (B \text{ NAND } \text{NOT } C)$ <p>One mark for each bullet:</p> <ul style="list-style-type: none"> • (A XOR C) • OR • (B NAND NOTC) 	3

Question	Answer	Marks																																													
8(b)	<p>Four marks for 8 correct outputs Three marks for 6 or 7 correct outputs Two marks for 4 or 5 correct outputs One mark for 2 or 3 correct outputs</p> <table border="1"><thead><tr><th>A</th><th>B</th><th>C</th><th>Working space</th><th>X</th></tr></thead><tbody><tr><td>0</td><td>0</td><td>0</td><td></td><td>1</td></tr><tr><td>0</td><td>0</td><td>1</td><td></td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td></td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td></td><td>1</td></tr><tr><td>1</td><td>0</td><td>0</td><td></td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td><td></td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td></td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td></td><td>1</td></tr></tbody></table>	A	B	C	Working space	X	0	0	0		1	0	0	1		1	0	1	0		0	0	1	1		1	1	0	0		1	1	0	1		1	1	1	0		1	1	1	1		1	4
A	B	C	Working space	X																																											
0	0	0		1																																											
0	0	1		1																																											
0	1	0		0																																											
0	1	1		1																																											
1	0	0		1																																											
1	0	1		1																																											
1	1	0		1																																											
1	1	1		1																																											

Question	Answer	Marks																		
9(a)	<p>One mark per each correct tick</p> <table border="1"> <thead> <tr> <th>Statement</th><th>True (✓)</th><th>False (✗)</th></tr> </thead> <tbody> <tr> <td>Duplex data transmission can be either serial or parallel</td><td>✓</td><td></td></tr> <tr> <td>Duplex data transmission is when data is transmitted both ways, but only one way at a time</td><td></td><td>✓</td></tr> <tr> <td>Duplex data transmission is always used to connect a device to a computer</td><td></td><td>✓</td></tr> <tr> <td>Duplex data transmission is when data is transmitted both ways at the same time</td><td>✓</td><td></td></tr> <tr> <td>Duplex data transmission automatically detects any errors in data</td><td></td><td>✓</td></tr> </tbody> </table>	Statement	True (✓)	False (✗)	Duplex data transmission can be either serial or parallel	✓		Duplex data transmission is when data is transmitted both ways, but only one way at a time		✓	Duplex data transmission is always used to connect a device to a computer		✓	Duplex data transmission is when data is transmitted both ways at the same time	✓		Duplex data transmission automatically detects any errors in data		✓	5
Statement	True (✓)	False (✗)																		
Duplex data transmission can be either serial or parallel	✓																			
Duplex data transmission is when data is transmitted both ways, but only one way at a time		✓																		
Duplex data transmission is always used to connect a device to a computer		✓																		
Duplex data transmission is when data is transmitted both ways at the same time	✓																			
Duplex data transmission automatically detects any errors in data		✓																		
9(b)	<ul style="list-style-type: none"> • Parallel data transmission 	1																		

Question	Answer	Marks
9(c)	<p>Four from (maximum two marks per benefit):</p> <ul style="list-style-type: none"> • It is a universal standard ... • ... so it is likely to be compatible with the computer • It can only be inserted one way ... • ... so there is less chance of connecting a device incorrectly • It is a high-speed connection ... • ... so data will be transmitted quicker • It uses serial transmission ... • ... so it is cheaper to manufacture/buy • ... less chance of skewing / errors • It doesn't require a (wireless) network ... • ... therefore, can be used if a network is down • It is backwards compatible ... • ... so no additional technology is needed • It can power the device ... • ... therefore no separate source of power is needed • Drivers are automatically downloaded // device is automatically identified ... • ... so no need to find them online / install them manually 	4

Question	Answer	Marks
10(a)	<p>Four from:</p> <ul style="list-style-type: none"> • Validation method • Used to check data entry • Digit is calculated from data // by example • Digit is appended / added to data • Digit is recalculated when data has been input • Digits are compared • If digits are different, error is detected // If digits match, no error is detected 	4
10(b)	<p>Six from (maximum three marks per security method):</p> <ul style="list-style-type: none"> • Firewall ... • ... Monitors the traffic • ... Blocks any traffic that doesn't meet the criteria / rules • (Strong) password // biometric ... • ... Data cannot be accessed without the use of the password / bio data • ... Prevent brute force attacks • Encryption ... • ... Data will be scrambled • ... Key is required to decrypt the data • ... If data is stolen it will be meaningless • Physical security methods ... • ... The physical security will need to be overcome • ... This can help deter theft of the data • Antispyware ... • ... will remove any spyware from system • ... will prevent data being relayed to a third party 	6

Question	Answer	Marks
11(a)	RAM <ul style="list-style-type: none">• To store the data / instructions / parts of OS that are currently in use ROM <ul style="list-style-type: none">• To store the firmware / bootup instructions / BIOS SSD <ul style="list-style-type: none">• To store files / software // by example	3
11(b)	Two from: <ul style="list-style-type: none">• It is more durable // it has no moving parts• It has a faster read / write / access speed• It is more compact / light weight / smaller / portable• It uses less energy // battery will last longer• It is quieter• Not affected by magnetic forces• It runs at a cooler temperature• Less latency // takes less time to warm up	2

CANDIDATE
NAME

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



COMPUTER SCIENCE

0478/13

Paper 1 Theory

October/November 2019

1 hour 45 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

No calculators allowed.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name in the spaces at the top of this page.
Write in dark blue or black pen.

You may use an HB pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer **all** questions.

No marks will be awarded for using brand names of software packages or hardware.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

The maximum number of marks is 75.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **12** printed pages.

- 1 A library has a system that allows customers to check out the books that they want to borrow.

Each book has a barcode that can be used to identify the book.

- (a) (i) Identify **two** input devices that may be used in the library's system.

Input device 1

Input device 2

[2]

- (ii) Identify **two** storage devices that may be used in the library's system.

Storage device 1

Storage device 2

[2]

- (iii) Identify **two** output devices that may be used in the library's system.

Output device 1

Output device 2

[2]

- (b) The data stored by the library is archived at the end of each day. The archive is held on a server in the library office.

The data is encrypted with an 8-bit key. As some of the data is confidential, the library wants to make the encryption more secure.

- (i) State how the library could make the encryption more secure.

..... [1]

- (ii) The term used to describe data before it is encrypted is plain text.

State the term used to describe encrypted data.

..... [1]

- (iii) The library's archive system uses an error detection and correction system that combines a parity check with an automatic repeat request (ARQ).

Describe how this system uses the parity check and ARQ.

[6]

[6]

- (c) The library has a website that customers can use to search for a book.

- (i) The website has a background colour with the hexadecimal colour code #F92A10

The colour code is stored in two 12-bit binary registers.

Show how the colour code would be stored in the registers.

E92

[View Details](#) | [Edit](#) | [Delete](#)

A10

[6]

- (ii) Videos on the library website show customers which books the library will soon have in stock.

The library wants the file size of a video to be as small as possible.

Identify **and** describe a method the library could use to reduce the file size of a video as much as possible.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

[4]

- (d) The library often holds events that introduce new authors.

At the events, the library has a Liquid Crystal Display (LCD) screen that displays data, including an image and information about the author.

Describe how an LCD screen operates to display this data.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

[5]

2 A programmer uses a high-level language to write a computer program.

(a) Four statements are given about high-level programming languages.

Tick (✓) to show if each statement is **True** or **False**.

Statement	True (✓)	False (✗)
High-level languages need to be translated into machine code to run on a computer		
High-level languages are written using mnemonic codes		
High-level languages are specific to the computer's hardware		
High-level languages are portable languages		

[4]

(b) Tick (✓) to show which of the following is an example of a high-level language program.

Example program	Tick (✓)
1011100000110000 0000011011100010	
INP STA ONE INP STA TWO ADD ONE	
a = input() b = input() if a == b: print("Correct") else: print("Incorrect")	

[1]

- 3 Blair writes a paragraph about data transmission in her Computer Science examination.

Use the list given to complete Blair's paragraph by inserting the correct **five** missing terms. Not all terms will be used. Terms can be used more than once.

- duplex
- half-duplex
- parallel
- serial
- simplex

..... data transmission is when data is transmitted a single bit at a time. data transmission is when multiple bits of data are sent all at once. If a user wants to transmit data over a long distance, with the highest chance of accuracy, data transmission should be used. If data needs to be transmitted in one direction only, for example from a computer to a printer, data transmission should be used. If a user has a large amount of data to transmit and this needs to be done as quickly as possible data transmission should be used.

[5]

Question 4 starts on page 8.

- 4 A factory that manufactures cleaning products has a system that monitors conditions throughout the manufacturing process.

The inputs to the system are:

Input	Binary value	Condition
A	1	pH > 7
	0	pH \leq 7
T	1	Temperature $<$ 35 °C
	0	Temperature \geq 35 °C
P	1	Pressure \geq 80 %
	0	Pressure $<$ 80 %

- (a) The system will sound an alarm (**X**) when certain conditions are detected.

The alarm will sound when:

- The pressure \geq 80 % and the temperature \geq 35 °C
or
- The temperature $<$ 35 °C and the pH $>$ 7

Draw a logic circuit to represent the alarm system in the factory. Each logic gate must have a maximum of two inputs.



[4]

- (b) Complete the truth table for the given logic problem.

A	T	P	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]

- (c) A sensor and a microprocessor are used to monitor the pH of the cleaning products. The system records each reading that is taken. If the reading is greater than 7 a warning message is displayed on a monitor.

Explain how the sensor and microprocessor are used in the system.

[6]

[6]

- 5 The contents of three binary registers have been transmitted from one computer to another. **Odd parity** has been used as an error detection method.

The outcome after transmission is:

- **Register A** and **Register B** have been transmitted **correctly**.
- **Register C** has been transmitted **incorrectly**.

Write the appropriate **Parity bit** for each register to show the given outcome.

	Parity bit							
Register A	0	1	0	0	0	1	1	
Register B	0	0	0	0	1	1	1	
Register C	0	0	0	0	0	1	1	

[3]

- 6 Jesse is taking his Computer Science examination. He answers **five** questions about ethics.

- (a) For the first question, he writes the answer:

“This type of software can be copied and shared without the permission of the owner.”

State what Jesse is describing.

..... [1]

- (b) For the second question, he writes the answer:

“With this type of software, the owner still retains the copyright for the software, but he gives away copies of it for free.”

State what Jesse is describing.

..... [1]

- (c) For the third question, he writes the answer:

“This type of software is often a trial version of the full software. To use the full version the user normally needs to pay a fee.”

State what Jesse is describing.

..... [1]

- (d) For the fourth question, he writes the answer:

"This is when a person copies another person's computer program and tries to claim it as his own."

State what Jesse is describing.

..... [1]

- (e) For the fifth question, he writes the answer:

"This is the legal protection that a person can obtain, to provide protection against his work being stolen."

State what Jesse is describing.

..... [1]

- 7 The Von Neumann model for a computer system has several components that are used in the fetch-execute cycle.

- (a) One component is main memory.

- (i) Describe what is meant by main memory and how it is used in the Von Neumann model for a computer system.

.....
.....
.....
.....
.....
.....
.....

[3]

- (ii) State **two** other components in the Von Neumann model for a computer system.

1

2

[2]

- (b)** Computer systems often use interrupts.

Five statements are given about interrupts.

Tick (✓) to show if each statement is True or False.

Statement	True (✓)	False (✗)
Interrupts can be hardware based or software based		
Interrupts are handled by the operating system		
Interrupts allow a computer to multitask		
Interrupts work out which program to give priority to		
Interrupts are vital to a computer and it cannot function without them		

[5]

- 8** A company discovers malware on its network.

Explain **two** ways that the malware could have been introduced to the company's network.

[4]

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.

COMPUTER SCIENCE

0478/13

Paper 1

October/November 2019

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 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **14** 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.

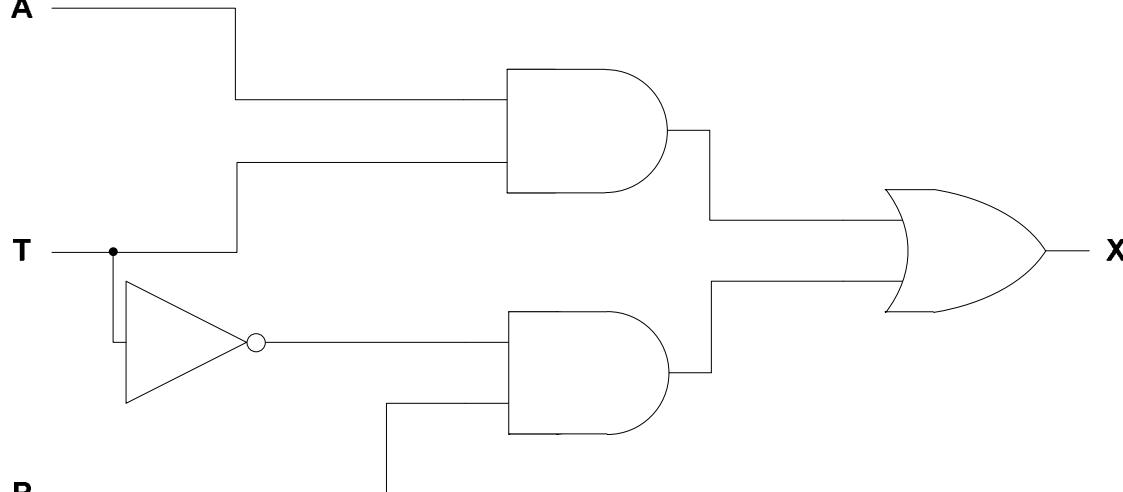
Question	Answer	Marks
1(a)(i)	<p>Two from:</p> <ul style="list-style-type: none"> • 2D scanner • Touchscreen • Keypad/keyboard • Card reader • Mouse • Digital camera 	2
1(a)(ii)	<p>Two from:</p> <ul style="list-style-type: none"> • HDD • SSD • USB flash memory drive • SD card • Any optical 	2
1(a)(iii)	<p>Two from:</p> <ul style="list-style-type: none"> • Monitor/Touch screen • Speaker • Printer • LED // Light 	2
1(b)(i)	<ul style="list-style-type: none"> • Increase the length of the key // make key 12-bit, etc. 	1
1(b)(ii)	<ul style="list-style-type: none"> • Cypher text 	1

Question	Answer	Marks
1(b)(iii)	<p>Six from:</p> <ul style="list-style-type: none"> • The system could use <u>odd</u> or <u>even</u> parity • A parity bit is added • The data is checked to see if it has incorrect/correct parity // by example • If parity is correct no error is found • An acknowledgement is sent that data is received correctly • The next packet of data is transmitted • If incorrect parity is found an error has occurred • A signal is sent back to request the data is resent • The data is resent until data is received correctly/timeout occurs 	6
1(c)(i)	<p>111110010010</p> <p>1 mark 1 mark 1 mark</p> <p>101000010000</p> <p>1 mark 1 mark 1 mark</p>	6

Question	Answer	Marks
1(c)(ii)	<p>One mark for identification:</p> <ul style="list-style-type: none"> • Compression <p>Three from e.g.:</p> <ul style="list-style-type: none"> • Best compression would be lossy • Use compression algorithm • This would remove all the unnecessary data from the file // removes detail/sound that the human eye/ear may not see/hear • Reduce colour palette ... • ... so each pixel requires fewer bits • Reduce resolution • Only store what changes between frames // temporal redundancy 	4
1(d)	<p>Five from:</p> <ul style="list-style-type: none"> • The display is made up of pixels ... • ... that are arranged together as a matrix • Each pixel has three filters, red, blue and green • Shades of colour are achieved by mixing red, blue and green • The screen is backlit • Light is shone through the liquid crystals • The liquid crystals can be made to turn solid or transparent/on or off ... • ... by changing the shape of the crystal 	5

Question	Answer			Marks
2(a)	One mark for each correct row			4
	Statement	True (✓)	False (✗)	
	High-level languages need to be translated into machine code to run on a computer	✓		
	High-level languages are written using mnemonic codes		✓	
	High-level languages are specific to the computer's hardware		✓	
	High-level languages are portable languages	✓		

Question	Answer		Marks								
2(b)	<p>One mark for the correct tick</p> <table border="1"> <thead> <tr> <th>Example program</th><th>Tick (✓)</th></tr> </thead> <tbody> <tr> <td>1011100000110000 0000011011100010</td><td></td></tr> <tr> <td>INP STA ONE INP STA TWO ADD ONE</td><td></td></tr> <tr> <td> <pre>a = input() b = input() if a == b: print("Correct") else: print("Incorrect")</pre> </td><td>✓</td></tr> </tbody> </table>	Example program	Tick (✓)	1011100000110000 0000011011100010		INP STA ONE INP STA TWO ADD ONE		<pre>a = input() b = input() if a == b: print("Correct") else: print("Incorrect")</pre>	✓		
Example program	Tick (✓)										
1011100000110000 0000011011100010											
INP STA ONE INP STA TWO ADD ONE											
<pre>a = input() b = input() if a == b: print("Correct") else: print("Incorrect")</pre>	✓										
3	<p>One mark for each correct term in the correct order</p> <ul style="list-style-type: none"> • Serial • Parallel • Serial • Simplex • Parallel 										

Question	Answer	Marks
4(a)	<p>One mark for each correct logic gate with correct input(s)</p>  <pre>graph LR; A[A] --> NOR1(()); T[T] --> INV1(()); P[P] --> NOR2(()); NOR1 --- INV1; INV1 --- NOR1; NOR1 --- NOR2; NOR2 --- OR((X)); NOR2 --- OR; OR --- X[X]</pre>	4

Question	Answer	Marks																																													
4(b)	<p>Four mark for 8 correct outputs Three marks for 6 or 7 correct outputs Two mark for 4 or 5 correct outputs One mark for 2 or 3 correct outputs</p> <table border="1"> <thead> <tr> <th>A</th><th>T</th><th>P</th><th>Working space</th><th>X</th></tr> </thead> <tbody> <tr> <td>0</td><td>0</td><td>0</td><td></td><td>0</td></tr> <tr> <td>0</td><td>0</td><td>1</td><td></td><td>1</td></tr> <tr> <td>0</td><td>1</td><td>0</td><td></td><td>0</td></tr> <tr> <td>0</td><td>1</td><td>1</td><td></td><td>0</td></tr> <tr> <td>1</td><td>0</td><td>0</td><td></td><td>0</td></tr> <tr> <td>1</td><td>0</td><td>1</td><td></td><td>1</td></tr> <tr> <td>1</td><td>1</td><td>0</td><td></td><td>1</td></tr> <tr> <td>1</td><td>1</td><td>1</td><td></td><td>1</td></tr> </tbody> </table>	A	T	P	Working space	X	0	0	0		0	0	0	1		1	0	1	0		0	0	1	1		0	1	0	0		0	1	0	1		1	1	1	0		1	1	1	1		1	4
A	T	P	Working space	X																																											
0	0	0		0																																											
0	0	1		1																																											
0	1	0		0																																											
0	1	1		0																																											
1	0	0		0																																											
1	0	1		1																																											
1	1	0		1																																											
1	1	1		1																																											
4(c)	<p>Six from:</p> <ul style="list-style-type: none"> • Sensor sends a signal/reading/data to the microprocessor • Signal/reading/data is analogue and is converted to digital using ADC • Reading/data is stored in the system • Microprocessor compares data/reading to the pre-set value of 7 • If value is greater than 7 ... • ... a signal/data is sent by the microprocessor to display a warning message on a monitor • The process is continuous 	6																																													

Question	Answer	Marks																																
5	<p>One mark for each correct parity bit</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Parity bit</td> <td></td> </tr> <tr> <td style="text-align: center;">Register A</td> <td> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">1</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">1</td><td style="padding: 2px;">1</td></tr> </table> </td> </tr> <tr> <td style="text-align: center;">Register B</td> <td> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">1</td><td style="padding: 2px;">1</td><td style="padding: 2px;">1</td></tr> </table> </td> </tr> <tr> <td style="text-align: center;">Register C</td> <td> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">1</td><td style="padding: 2px;">1</td></tr> </table> </td> </tr> </table>	Parity bit		Register A	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">1</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">1</td><td style="padding: 2px;">1</td></tr> </table>	0	0	1	0	0	0	1	1	Register B	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">1</td><td style="padding: 2px;">1</td><td style="padding: 2px;">1</td></tr> </table>	0	0	0	0	0	1	1	1	Register C	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">1</td><td style="padding: 2px;">1</td></tr> </table>	0	0	0	0	0	0	1	1	3
Parity bit																																		
Register A	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">1</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">1</td><td style="padding: 2px;">1</td></tr> </table>	0	0	1	0	0	0	1	1																									
0	0	1	0	0	0	1	1																											
Register B	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">1</td><td style="padding: 2px;">1</td><td style="padding: 2px;">1</td></tr> </table>	0	0	0	0	0	1	1	1																									
0	0	0	0	0	1	1	1																											
Register C	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">0</td><td style="padding: 2px;">1</td><td style="padding: 2px;">1</td></tr> </table>	0	0	0	0	0	0	1	1																									
0	0	0	0	0	0	1	1																											

Question	Answer	Marks
6(a)	<ul style="list-style-type: none"> • Free software 	1
6(b)	<ul style="list-style-type: none"> • Freeware 	1
6(c)	<ul style="list-style-type: none"> • Shareware 	1
6(d)	<ul style="list-style-type: none"> • Plagiarism // Intellectual property theft 	1
6(e)	<ul style="list-style-type: none"> • Copyright 	1

Question	Answer	Marks
7(a)(i)	<p>Three from:</p> <ul style="list-style-type: none"> • RAM • Primary memory • Volatile memory • Holds currently in use data/instructions • Directly accessed by the CPU 	3
7(a)(ii)	<p>Two from:</p> <ul style="list-style-type: none"> • Arithmetic and logic unit (ALU) • Memory address register (MAR) • Memory data register (MDR) // Memory buffer register (MBR) • Accumulator (ACC) • Immediate Access Store (IAS) • Control Unit (CU) • Program counter (PC) • Current instruction register (CIR) • Address bus • Data bus • Control bus • Input device • Output device • Secondary storage device 	2

Question	Answer			Marks
7(b)	One mark for each correct row			5
	Statement	True (✓)	False (✗)	
	Interrupts can be hardware based or software based	✓		
	Interrupts are handled by the operating system	✓		
	Interrupts allow a computer to multitask	✓		
	Interrupts work out which program to give priority to		✓	
	Interrupts are vital to a computer and it cannot function without them	✓		

Question	Answer	Marks
8	<p>Four from:</p> <ul style="list-style-type: none">• A hacker could have hacked the network ...• ... and downloaded the malware onto the network• Clicking a link/attachment/downloaded a file from an email/on a webpage ...• ... the malware could have been embedded into the link/attachment/file• Opening an infected software package ...• ... this would trigger the malware to download onto the network• Inserting an infected portable storage device ...• ... when the drive is accessed the malware is downloaded to the network• Firewall has been turned off ...• ... so malware would not be detected/checked for when entering network• Anti-malware has been turned off ...• ... so malware is not detected/checked for when files are downloaded	4



Cambridge IGCSE™

CANDIDATE
NAME

--	--	--	--	--

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



COMPUTER SCIENCE

0478/11

Paper 1 Theory

October/November 2020

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. Blank pages are indicated.

- 1 Six devices are shown.

Tick (\checkmark) to show if each device is an **Input**, **Output** or **Storage** device.

Device	Input (\checkmark)	Output (\checkmark)	Storage (\checkmark)
Keyboard			
Sensor			
3D cutter			
2D scanner			
Microphone			
Hard disk drive (HDD)			

[6]

- 2 Ron is attending a music concert. He has bought three tickets.

Each ticket number is displayed as a hexadecimal number.

- (a) Complete the table to show the **12-bit binary** values and the **Denary** values for each Hexadecimal ticket number.

Hexadecimal ticket number	12-bit binary value	Denary value
028		
1A9		
20C		

[6]

Working space

.....

.....

.....

.....

.....

- (b)** Each ticket also has a QR code. The QR code is scanned at the entrance to the venue.

A person can only enter the venue with a valid QR code that allows entry.

When a person enters, a count is incremented to show how many people have entered the venue.

Explain how the system scans the QR code, checks if a person can enter and counts how many people have entered.

[7]

- 3 Transport Layer Security (TLS) protocol is used to secure the transmission of data over the Internet.

- (a) Identify the **two** layers in the TLS protocol.

Layer 1

Layer 2

[2]

- (b) The following paragraph explains how data is sent securely using the TLS protocol.

Use the terms to complete the paragraph. Not all terms may need to be used.

- authentic
- binary
- browser
- certificate
- internet service provider
- signal
- web page
- web server
- website

The browser requests the to identify itself by providing its This is sent and a check is performed to see if it is If it is, the sends a back to the web server and data transmission begins.

[5]

- (c) Identify **one** other protocol that can be used to secure data transmission over the Internet.

..... [1]

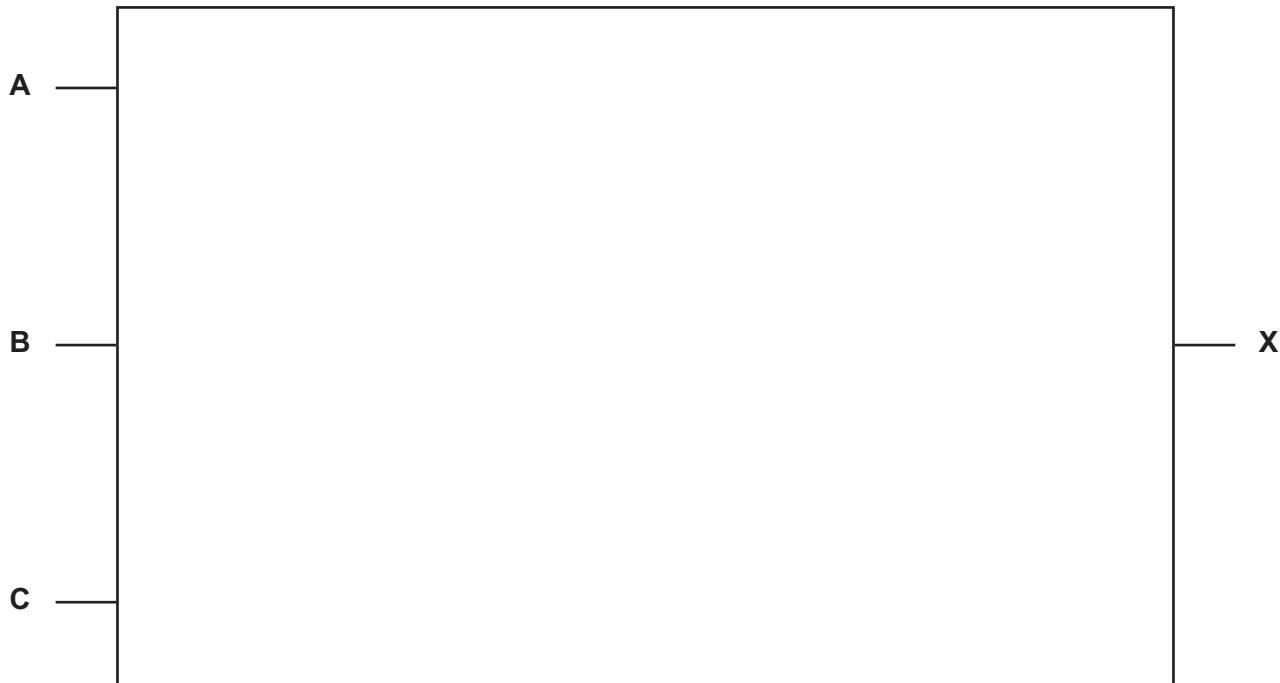
Question 4 starts on page 6.

- 4 Consider the given logic statement:

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

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

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



[4]

- (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]

- (c) The logic statement given has **four** different logic gates.

Identify **two other** logic gates and complete a truth table for each.

Logic gate

.....

Truth table

A	B	X
0	0	
0	1	
1	0	
1	1	

Logic gate

.....

Truth table

A	B	X
0	0	
0	1	
1	0	
1	1	

[4]

- 5 Luke is creating a website for his t-shirt design business.

- (a) He is using HTML to create the website. HTML can be separated into structure and presentation.

- (i) Give **two** examples of HTML structure.

Example 1

Example 2

[2]

- (ii) Give **two** examples of HTML presentation.

Example 1

Example 2

[2]

- (b) Luke is concerned that his web server may be hacked or subjected to a denial of service (DoS) attack.

State **two** security methods that Luke could use to help protect the web server from hacking or a DoS attack.

Method 1

Method 2

[2]

- 6 A Von Neumann model for a computer system contains several integrated circuits (IC).

- (a) Parallel data transmission is used in an IC.

- (i) Describe how data is transmitted using parallel data transmission.

.....
.....
.....
..... [2]

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

.....
..... [1]

- (b) The computer has a central processing unit (CPU).

- (i) Identify the bus that carries signals around the CPU to control the components.

..... [1]

- (ii) Identify the register built into the arithmetic logic unit (ALU).

..... [1]

- (iii) Four statements about a Von Neumann model for a computer system are shown.

Tick (✓) to show if each statement is **True** or **False**.

Statement	True (✓)	False (✗)
Data and instructions are stored in the same memory unit		
The control unit manages operations within the CPU		
Data and instructions can be fetched into the CPU at the same time		
The control unit is responsible for decoding an instruction		

[4]

- 7 Nina is recording some music tracks that she has written. She is researching whether she should record them in MIDI or MP3 format.

Explain what is meant by MIDI and MP3 format.

MIDI

.....

.....

.....

MP3

.....

.....

.....

[4]

- 8 Matthew is buying a new television with a display that uses LED technology.

- (a) Explain what is meant by LED technology.

.....
.....
.....
.....
.....

[3]

- (b) State **three** benefits of LED technology.

Benefit 1

.....
.....

Benefit 2

.....
.....

Benefit 3

.....

[3]

- (c) Identify **one other** technology that could have been used for the display.

..... [1]

- 9 Victoria is entering data into a computer system. The data will be transmitted to cloud storage.

- (a) An even parity check is used to check for errors in the binary values after transmission.

For each of the **7-bit binary values**, write the **Parity bit** that makes sure **even** parity is met.

7-bit binary value

Parity bit

1100010

.....

1001011

.....

0100010

.....

0010111

.....

[4]

- (b) Identify **two** other error checking methods that could be used to check the binary values are correct after transmission.

Method 1

Method 2 [2]

- (c) A check digit is used to check whether data is correct when entered into the system.

Describe how a check digit can be used to make sure the data entered is correct.

.....

.....

.....

.....

.....

.....

.....

.....

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.



Cambridge IGCSE™

COMPUTER SCIENCE

0478/11

Paper 1

October/November 2020

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 2020 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 **11** printed pages.

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.

Question	Answer				Marks
1	One mark per each correct row:				6
	Device	Input (✓)	Output (✓)	Storage (✓)	
	Keyboard	✓			
	Sensor	✓			
	3D Cutter		✓		
	2D Scanner	✓			
	Microphone	✓			
	Hard disk drive (HDD)			✓	
Question	Answer				Marks
2(a)	One mark for each correct binary conversion One mark for each correct denary conversion				6
	Hexadecimal ticket number	12-bit binary value	Denary value		
	028	0000 0010 1000	40		
	1A9	0001 1010 1001	425		
	20C	0010 0000 1100	524		

Question	Answer	Marks
2(b)	<p>Seven from:</p> <ul style="list-style-type: none"> – Camera captures code // Laser/light shone on code – Black squares reflect different light to white – Corner squares are used for alignment – Pattern converted to digital data // by example – (Digital) data sent to microprocessor – There is a database of valid QR codes – Data compared to stored values/valid QR codes ... – ... If data matches entry is granted is raised – ... If data matches count is incremented – ... If data does not match, entry is denied 	7

Question	Answer	Marks
3(a)	<ul style="list-style-type: none"> – Handshake – Record 	2
3(b)	<ul style="list-style-type: none"> – Web server – Certificate – Authentic – Browser – Signal 	5
3(c)	Any one from: <ul style="list-style-type: none"> – SSL – HTTPS 	1

Question	Answer	Marks
4(a)	<p>The circuit diagram shows three inputs: A, B, and C. Input A is connected to one input of a NOR gate. The other input of the NOR gate is connected to the output of a NOT gate. The output of the NOR gate is connected to the output of a NOT gate. The output of the second NOT gate is connected to one input of a NOR gate. The other input of this second NOR gate is connected to input B. The output of this NOR gate is connected to the output of a NOT gate. The output of the third NOT gate is connected to one input of a NOR gate. The other input of this third NOR gate is connected to input C. The final output of this third NOR gate is labeled X.</p> <p>One mark for each correct gate with correct input</p>	4

Question	Answer					Marks																																									
4(b)	<p>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</p> <table border="1"><thead><tr><th>A</th><th>B</th><th>C</th><th>Working space</th><th>X</th></tr></thead><tbody><tr><td>0</td><td>0</td><td>0</td><td></td><td>1</td></tr><tr><td>0</td><td>0</td><td>1</td><td></td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td><td></td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td></td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td></td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td><td></td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td><td></td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td></td><td>1</td></tr></tbody></table>	A	B	C	Working space	X	0	0	0		1	0	0	1		0	0	1	0		0	0	1	1		0	1	0	0		1	1	0	1		0	1	1	0		1	1	1	1		1	4
A	B	C	Working space	X																																											
0	0	0		1																																											
0	0	1		0																																											
0	1	0		0																																											
0	1	1		0																																											
1	0	0		1																																											
1	0	1		0																																											
1	1	0		1																																											
1	1	1		1																																											

Question	Answer	Marks																														
4(c)	<p>One mark for the correct gate and one mark for the correct truth table</p> <ul style="list-style-type: none"> - AND <table border="1"> <tr> <td>A</td> <td>B</td> <td>X</td> </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> - XOR <table border="1"> <tr> <td>A</td> <td>B</td> <td>X</td> </tr> <tr> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> </tr> <tr> <td>1</td> <td>1</td> <td>0</td> </tr> </table> 	A	B	X	0	0	0	0	1	0	1	0	0	1	1	1	A	B	X	0	0	0	0	1	1	1	0	1	1	1	0	4
A	B	X																														
0	0	0																														
0	1	0																														
1	0	0																														
1	1	1																														
A	B	X																														
0	0	0																														
0	1	1																														
1	0	1																														
1	1	0																														

Question	Answer	Marks
5(a)(i)	– Two valid examples of Structure e.g. where text is placed, margins of page	2
5(a)(ii)	– Two valid examples of Presentation e.g. font size, font colour	2
5(b)	<ul style="list-style-type: none"> – Firewall – Proxy server 	2

Question	Answer	Marks															
6(a)(i)	<ul style="list-style-type: none"> – Uses multiple wires – Sends multiple bits of data at a time 	2															
6(a)(ii)	<ul style="list-style-type: none"> – Faster transmission speed 	1															
6(b)(i)	<ul style="list-style-type: none"> – Control (bus) 	1															
6(b)(ii)	<ul style="list-style-type: none"> – Accumulator (ACC) 	1															
6(b)(iii)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Statement</th> <th>True (✓)</th> <th>False (✗)</th> </tr> </thead> <tbody> <tr> <td>Data and instructions are stored in the same memory unit</td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td>The control unit manages operations within the CPU</td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td>Data and instructions can be fetched into the CPU at the same time</td> <td></td> <td style="text-align: center;">✓</td> </tr> <tr> <td>The control unit is responsible for decoding an instruction</td> <td style="text-align: center;">✓</td> <td></td> </tr> </tbody> </table>	Statement	True (✓)	False (✗)	Data and instructions are stored in the same memory unit	✓		The control unit manages operations within the CPU	✓		Data and instructions can be fetched into the CPU at the same time		✓	The control unit is responsible for decoding an instruction	✓		4
Statement	True (✓)	False (✗)															
Data and instructions are stored in the same memory unit	✓																
The control unit manages operations within the CPU	✓																
Data and instructions can be fetched into the CPU at the same time		✓															
The control unit is responsible for decoding an instruction	✓																

Question	Answer	Marks
7	<p>Four from (Max two per format):</p> <p>MIDI</p> <ul style="list-style-type: none"> - Musical Instrument Digital Interface (file) - Stores a set of commands/instructions (for how the sound should be played) - Does not store the actual sounds - Data in the file has been recorded using digital instruments // produced by synthesizer - Specifies pitch of the note // specifies the note to be played - Specifies when each note plays and stops playing // Specifies key on/off - Specifies duration of the note - Specifies volume of the note - Specifies the tempo - Specifies the type of instrument - Individual notes can be edited <p>MP3</p> <ul style="list-style-type: none"> - MP3 is a format for digital audio - MP3 is an actual recording of the sound - MP3 is a (lossy) compression format - Recorded using a microphone 	4

Question	Answer	Marks
8(a)	<p>Any three from:</p> <ul style="list-style-type: none"> - Light emitting diodes (technology) - The display is made up of pixels - ... that are arranged together as a matrix - ... each is formed of three LEDs/filters - Shades of colour are achieved by mixing red, blue and green - The screen can be back-lit/edge-lit <p>NOTE: Use of liquid crystals with LED technology can also be awarded</p>	3

Question	Answer	Marks
8(b)	<p>Any three from:</p> <ul style="list-style-type: none"> – Energy efficient // low power consumption – Long lasting // longevity – Focussed beam // less light strays from beam – Brighter/vivid colours – High resolution – No flicker – Display is thinner – Mercury free technology // environmentally friendly – Fewer pixel failure – Increased viewing in sunlight 	3
8(c)	– LCD	1

Question	Answer	Marks
9(a)	<ul style="list-style-type: none"> – 1 – 0 – 0 – 0 	4
9(b)	<p>Two from:</p> <ul style="list-style-type: none"> – Checksum – Automatic repeat request // ARQ 	2
9(c)	<p>Any four from:</p> <ul style="list-style-type: none"> – Data is input with check digit – A calculation is performed on the (inputted) data // by example – The calculated digit is compared to a stored value – If it matches, the data entered is correct – If it does not match, the data entered is incorrect 	4



Cambridge IGCSE™

CANDIDATE
NAME

--	--	--	--	--

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



COMPUTER SCIENCE

0478/12

Paper 1 Theory

October/November 2020

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. Blank pages are indicated.

- 1 Tina is creating a website for charity events. She uses HTML to create the website.

- (a) State what is meant by HTML.

..... [1]

- (b) She uses the hexadecimal colour code #43B7F0 as the background colour for her website.

- (i) State whether background colour is an example of **structure or presentation**, in the website.

..... [1]

- (ii) The hexadecimal colour code **#43B7F0** is stored in three **8-bit** registers.

Give the **8-bit binary** values for each part of the hexadecimal code.

43	<input type="text"/>							
----	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------

B7	<input type="text"/>							
----	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------

F0	<input type="text"/>							
----	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------

[6]

- (c) Tina uses a microphone to record a welcome message for her website.

- (i) State whether the microphone is an **input** or **output** device.

..... [1]

- (ii) She wants to compress the recording to make sure that the file is as small as possible for the website.

Identify which type of compression she should use and describe how this would compress the file for the website.

Type of compression

Description

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

[4]

- (iii) Give **two** benefits of compressing the file for the website.

Benefit 1

.....

Benefit 2

.....

[2]

- (d) Tina will use the TLS protocol in her website when selling tickets to people for different charity events. This makes sure that their personal data is transmitted securely.

- (i) Identify the **two** layers that are present in the TLS protocol.

Layer 1

Layer 2 [2]

- (ii) Explain how data is sent securely using the TLS protocol.

[6]

- (e) Tina is concerned about security threats to her web server.

- (i) Identify **three** security threats to her web server that Tina might be concerned about.

1

2

3

[3]

- (ii) Tina installs a proxy server to help protect her website from security threats.

Describe how the proxy server will help protect the website.

.....
.....
.....
.....
.....
.....
.....

[4]

- 2** Four 7-bit binary values are transmitted from one computer to another. A parity bit was added to each binary value creating 8-bit binary values. All the binary values have been transmitted correctly.

- (a) Tick () to show whether an **Even** or an **Odd** parity check has been used for each binary value.

8-bit binary value	Even (✓)	Odd (✓)
11111111		
01100110		
01111011		
10000000		

[4]

- (b) The data will also be checked using a checksum.

Describe how a checksum can be used to check that the data has been transmitted correctly.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

[5]

- 3 Alessandro has some important data stored on his computer.

He is concerned about accidental damage to his data.

- (a) (i) Identify **three** ways that the data could be accidentally damaged.

1

2

3

[3]

- (ii) State what Alessandro could do to make sure that he can retrieve his data if it is accidentally damaged.

..... [1]

- (b) Alessandro uses an SSD to store his data.

Describe what is meant by an SSD and how it operates to store data.

.....

 [4]

- (c) Alessandro also uses off-line storage to store his data.

Three examples of off-line storage are Blu-ray, CD and DVD.

Six statements are given about off-line storage.

Tick () to show if each statement applies to **Blu-ray**, **CD**, or **DVD**.

Some statements apply to more than one example of off-line storage.

Statement	Blu-ray (<input checked="" type="checkbox"/>)	CD (<input checked="" type="checkbox"/>)	DVD (<input checked="" type="checkbox"/>)
A type of optical storage			
Has the largest storage capacity			
Can be dual layer			
Read using a red laser			
Has the smallest storage capacity			
Stores data in a spiral track			

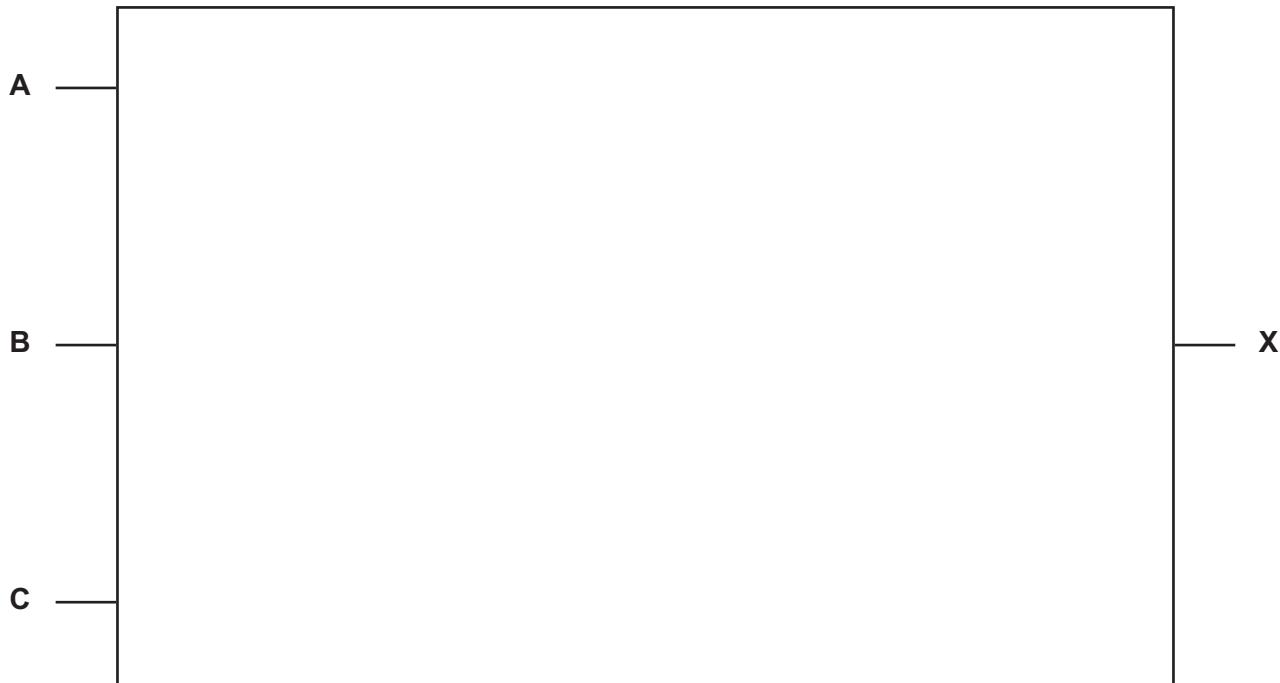
[6]

- 4 Consider the logic statement:

$$X = (((A \text{ NAND } B) \text{ NOR } (B \text{ AND } C)) \text{ OR } C)$$

- (a) Draw a logic circuit to match the given logic statement.

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



[4]

- (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]

- 5 Tammy is buying a new computer that has an LED display.

(a) Five statements about LED displays are given.

Tick (✓) to show if each statement is **True** or **False**.

Statement	True (✓)	False (✗)
It is a flat panel display		
It creates images using red, green and blue diodes		
It is not very energy efficient and gives off heat		
It can be used in mobile devices such as smartphones and tablets		
It is a front-lit display		

[5]

- (b) Tammy connects the computer to her home network. The computer has a MAC address and an IP address.

A paragraph is given about MAC addresses and IP addresses.

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

- compiled
- computer
- control
- dynamic
- identify
- packet
- principal
- protocol
- similar
- unique

A MAC address is a media access address.

A network device has a MAC address that can help the device in the network. An IP address is an Internet address. An IP address can be static or

[5]

- (c) Tammy uses a browser when accessing the Internet.

Describe the role of the browser.

.....
.....
.....
.....
.....
.....
.....
.....
.....

[4]

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.



Cambridge IGCSE™

COMPUTER SCIENCE

0478/12

Paper 1

October/November 2020

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 2020 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 13 printed pages.

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.

Question	Answer	Marks																								
1(a)	Any one from: – Hypertext Mark-up Language – Web authoring language // language used to write/create websites/web pages	1																								
1(b)(i)	– Presentation	1																								
1(b)(ii)	One mark per each nibble: 43 <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td></tr> </table> B7 <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr> </table> F0 <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> </table>	0	1	0	0	0	0	1	1	1	0	1	1	0	1	1	1	1	1	1	1	0	0	0	0	6
0	1	0	0	0	0	1	1																			
1	0	1	1	0	1	1	1																			
1	1	1	1	0	0	0	0																			
1(c)(i)	– Input	1																								

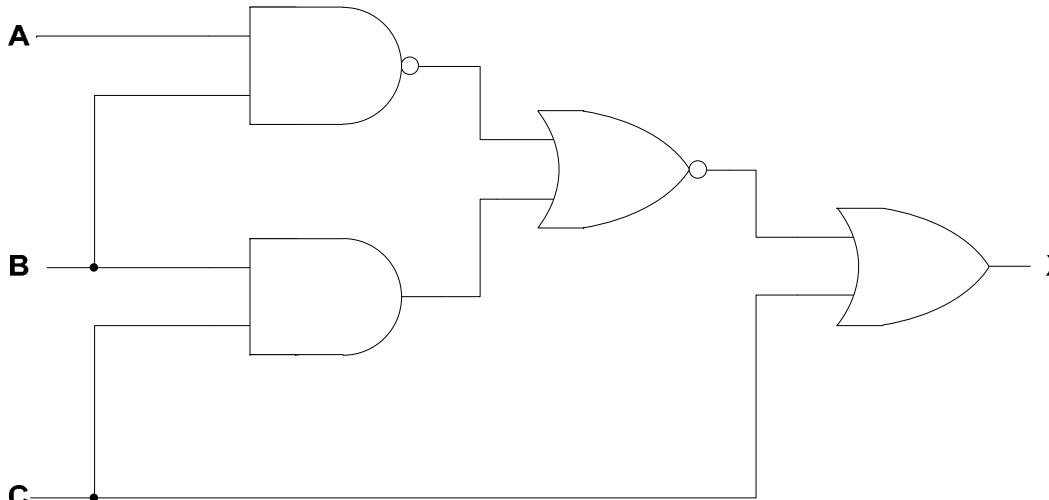
Question	Answer	Marks
1(c)(ii)	<p>One from:</p> <ul style="list-style-type: none"> – Lossy (compression) <p>Any three from:</p> <ul style="list-style-type: none"> – A (compression) algorithm is used – Removes redundant/unnecessary data from the file – Removes sounds that cannot be heard by the human ear/background noise – Reduces sample rate – Reduces sample resolution – Data is permanently removed // original file cannot be re-instated – Perceptual music shaping is used <p>NOTE: If lossless given, marks can be awarded for a correct description of lossless as follow through.</p> <p>Any three from (lossless):</p> <ul style="list-style-type: none"> – A (compression) algorithm is used – Repeating patterns are identified – ... are replaced with a value – ... and indexed – No data is permanently removed // original file can be re-instated – Suitable example of a lossless algorithm 	4
1(c)(iii)	<p>Any two from:</p> <ul style="list-style-type: none"> – Quicker for her to upload – Quicker for users to download – Won't slow website down as much when loading – Takes up less storage space 	2
1(d)(i)	<ul style="list-style-type: none"> – Handshake (layer) – Record (layer) 	2

Question	Answer	Marks
1(d)(ii)	<p>Any six from:</p> <ul style="list-style-type: none"> – Client/browser requests secure connection to server – Client/browser requests the server to identify itself – Server provides a digital certificate – Client/browser validates the certificate – Client/browser send signal back to server (to begin transmission) – Session caching can be used – A session key is generated – Encryption method is agreed // data is encrypted 	6
1(e)(i)	<p>Any three from:</p> <ul style="list-style-type: none"> – Hacking – Denial of service (DoS) attack – Virus – Malware <p>NOTE: Three different type of malware can be awarded</p>	3
1(e)(ii)	<p>Any four from:</p> <ul style="list-style-type: none"> – Acts as a firewall – Monitor/filters/examines incoming and outgoing traffic – Rules/criteria for traffic can be set // blacklist/whitelist set – Blocks any traffic that does not meet criteria ... – ... and can send a warning message to the user – Stop the website failing in a DoS attack // DoS attack hits the proxy server and not the webserver 	4

Question	Answer	Marks															
2(a)	<p>One mark for each correct row:</p> <table border="1"> <thead> <tr> <th>8-bit binary value</th><th>Even (✓)</th><th>Odd (✓)</th></tr> </thead> <tbody> <tr> <td>11111111</td><td>✓</td><td></td></tr> <tr> <td>01100110</td><td>✓</td><td></td></tr> <tr> <td>01111011</td><td>✓</td><td></td></tr> <tr> <td>10000000</td><td></td><td>✓</td></tr> </tbody> </table>	8-bit binary value	Even (✓)	Odd (✓)	11111111	✓		01100110	✓		01111011	✓		10000000		✓	4
8-bit binary value	Even (✓)	Odd (✓)															
11111111	✓																
01100110	✓																
01111011	✓																
10000000		✓															
2(b)	<p>Any five from:</p> <ul style="list-style-type: none"> <li>– A value is calculated from the data <li>– The value is calculated using an algorithm // by example <li>– The value is appended to the data to be transmitted <li>– Value is recalculated after transmission <li>– Values are compared <li>– If the values match the data is correct // if the values do not match the data is incorrect 	5															

Question	Answer	Marks
3(a)(i)	<p>Any three from:</p> <ul style="list-style-type: none"> – Loss of power/electricity – Spillage of liquids – Flood – Fire – Human error – Hardware failure – Software failure <p>NOTE: Three different types of human error can be awarded e.g. accidental deletion, not saving data, incorrect shutdown procedure</p>	3
3(a)(ii)	<ul style="list-style-type: none"> – Create a backup 	1
3(b)	<p>Max three from:</p> <ul style="list-style-type: none"> – Solid state drive – Non-volatile – Secondary storage – Flash memory – Has no mechanical/moving parts – Uses transistors – ... and cells that are laid out in a grid – Uses control gates and floating gates – Can be NAND/NOR (technology) – Use EEPROM technology <p>Max two from:</p> <ul style="list-style-type: none"> – Stores data by flashing it onto the chips – Data stored by controlling the flow of electrons through/using transistors/chips/gates – The electric current reaches the control gate and flows through to the floating gate to be stored – When data is stored the transistor is converted from 1 to 0 	4

Question	Answer				Marks																									
3(c)	<p>One mark for each correct row:</p> <table border="1"><thead><tr><th>Statement</th><th>Blu-ray (✓)</th><th>CD (✓)</th><th>DVD (✓)</th></tr></thead><tbody><tr><td>A type of optical storage</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>Has the largest storage capacity</td><td>✓</td><td></td><td></td></tr><tr><td>Can be dual layer</td><td>✓</td><td></td><td>✓</td></tr><tr><td>Read using a red laser</td><td></td><td>✓</td><td>✓</td></tr><tr><td>Has the smallest storage capacity</td><td></td><td>✓</td><td></td></tr><tr><td>Stores data in a spiral track</td><td>✓</td><td>✓</td><td>✓</td></tr></tbody></table>	Statement	Blu-ray (✓)	CD (✓)	DVD (✓)	A type of optical storage	✓	✓	✓	Has the largest storage capacity	✓			Can be dual layer	✓		✓	Read using a red laser		✓	✓	Has the smallest storage capacity		✓		Stores data in a spiral track	✓	✓	✓	6
Statement	Blu-ray (✓)	CD (✓)	DVD (✓)																											
A type of optical storage	✓	✓	✓																											
Has the largest storage capacity	✓																													
Can be dual layer	✓		✓																											
Read using a red laser		✓	✓																											
Has the smallest storage capacity		✓																												
Stores data in a spiral track	✓	✓	✓																											

Question	Answer	Marks
4(a)	<p>One mark for each correct logic gate with correct input:</p> 	4

Question	Answer					Marks																																									
4(b)	<p>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</p> <table border="1"><thead><tr><th>A</th><th>B</th><th>C</th><th>Working space</th><th>X</th></tr></thead><tbody><tr><td>0</td><td>0</td><td>0</td><td></td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td></td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td></td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td></td><td>1</td></tr><tr><td>1</td><td>0</td><td>0</td><td></td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td></td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td></td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td></td><td>1</td></tr></tbody></table>	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		1	1	1	1		1	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		1																																											
1	1	1		1																																											

Question	Answer	Marks																		
5(a)	<p>One mark for each correct row:</p> <table border="1"> <thead> <tr> <th>Statement</th><th>True (✓)</th><th>False (✗)</th></tr> </thead> <tbody> <tr> <td>It is a flat panel display</td><td>✓</td><td></td></tr> <tr> <td>It creates images using red, green and blue diodes</td><td>✓</td><td></td></tr> <tr> <td>It is not very energy efficient and gives off heat</td><td></td><td>✓</td></tr> <tr> <td>It is also used in mobile devices such as smartphones and tablets</td><td>✓</td><td></td></tr> <tr> <td>It is a front-lit display</td><td></td><td>✓</td></tr> </tbody> </table>	Statement	True (✓)	False (✗)	It is a flat panel display	✓		It creates images using red, green and blue diodes	✓		It is not very energy efficient and gives off heat		✓	It is also used in mobile devices such as smartphones and tablets	✓		It is a front-lit display		✓	5
Statement	True (✓)	False (✗)																		
It is a flat panel display	✓																			
It creates images using red, green and blue diodes	✓																			
It is not very energy efficient and gives off heat		✓																		
It is also used in mobile devices such as smartphones and tablets	✓																			
It is a front-lit display		✓																		
5(b)	<p>One mark for each correct term in the correct place:</p> <ul style="list-style-type: none"> <li>– Control <li>– Unique <li>– Identify <li>– Protocol <li>– Dynamic 	5																		

Question	Answer	Marks
5(c)	<p>Any four from:</p> <ul style="list-style-type: none">– Allows user to view web pages– Renders HTML– Allows user to bookmark/favourite web pages– Provides navigation features– Allows (multiple) tabs– Stores cookies– Records history of pages visited– Has a homepage– Runs active script– Allows files to be downloaded from website/internet– Sends a request to the IP address/web server (to obtain the contents of a web page)– Sends URL to DNS– Manages HTTP/HTTPS protocol	4

Cambridge IGCSE™

CANDIDATE
NAME

For more information about the study, please contact Dr. John Smith at (555) 123-4567 or via email at john.smith@researchinstitute.org.

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



COMPUTER SCIENCE

0478/13

Paper 1 Theory

October/November 2020

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.

- 1 Five hardware devices are given.

Tick (✓) to show if each device is an **Input**, **Output** or **Storage** device.

Device	Input (✓)	Output (✓)	Storage (✓)
Solid state drive (SSD)			
Headphones			
2D cutter			
LCD projector			
Microphone			

[5]

- 2 Paige has a computer that has a central processing unit (CPU) based on the Von Neumann model for a computer system.

- (a) Identify the component within the CPU that controls the flow of data.

..... [1]

- (b) Identify the component within the CPU where calculations are carried out.

..... [1]

- (c) Identify the component within the CPU that stores the address of the next instruction to be processed.

..... [1]

- (d) Identify the register within the CPU that holds an instruction that has been fetched from memory.

..... [1]

- (e) Identify the register within the CPU that holds data that has been fetched from memory.

..... [1]

- 3 (a) Four denary to 8-bit binary conversions are given.

Tick (\checkmark) to show if each denary to 8-bit binary conversion is **Correct** or **Incorrect**.

Denary	Binary Conversion	Correct (\checkmark)	Incorrect (\times)
145	10010001		
179	10110101		
11	00010011		
100	01100010		

[4]

- (b) Convert the **12-bit** binary number into hexadecimal.

1	1	0	0	0	1	0	0	0	0	0	0
---	---	---	---	---	---	---	---	---	---	---	---

..... [3]

- 4 Eugene has a web server that stores his online shopping website.

Customers access the website using a browser.

- (a) Describe how the webpages are requested and displayed on the customer's computer.

.....

 [4]

- (b) State **three** online security threats to Eugene's web server.

Threat 1

Threat 2

Threat 3

[3]

- 5 Arjun uses a scanner to create digital versions of some printed documents.

The scanner is attached to his computer using a USB connection.

- (a) Tick (✓) to show if the USB connection uses **Parallel** or **Serial** data transmission.

Describe your chosen method of data transmission.

Parallel

Serial

Description

.....
.....
.....
.....

[3]

- (b) Give **three** benefits of a USB connection.

Benefit 1

.....

Benefit 2

.....

Benefit 3

.....

[3]

- (c) Arjun uses the Internet to send the digital documents to his friend. He wants to make sure the documents are sent securely.

Identify **two** protocols that can be used to transfer data securely.

Protocol 1

Protocol 2

[2]

- 6 Elsa writes a paragraph in an examination about encryption.

There are several terms missing from the paragraph.

Complete the paragraph using the list of given terms. Not all terms may need to be used.

Some terms may be used more than once.

- algorithm
- alphanumeric
- cookie
- cypher
- key
- padlock
- plain
- word processed

The data is encrypted using a This is an that is used to scramble the data. The data before encryption is known as text. When the data has been encrypted it is known as text. To read the encrypted data it needs to be decrypted using a

[5]

- 7 **Four** 7-bit binary values are transmitted from one computer to another. A parity bit was added to each binary value creating 8-bit binary values. All the binary values have been transmitted correctly.

- (a) Tick (\checkmark) to show whether an **Even** or an **Odd** parity check has been used for each binary value.

8-bit binary value	Even (\checkmark)	Odd (\checkmark)
10000001		
10000010		
00101001		
00101000		

[4]

- (b) A parity check may not always detect errors that have occurred in data transmission.

State why a parity check may not detect data transmission errors.

..... [1]

- (c) Give **one** other error checking method that could be used to check for errors in data transmission.

..... [1]

8 Edith is buying a new computer monitor that displays images using LCD technology.

(a) Explain what is meant by LCD technology.

.....
.....
.....
.....
.....

[3]

(b) State **three** benefits of LCD technology.

Benefit 1

.....

Benefit 2

.....

Benefit 3

.....

[3]

9 Elle uses both CDs and DVDs to store her school projects.

(a) Give **three** similarities between a CD and a DVD.

1

.....

2

.....

3

.....

[3]

(b) State **one** difference between a CD and a DVD.

.....

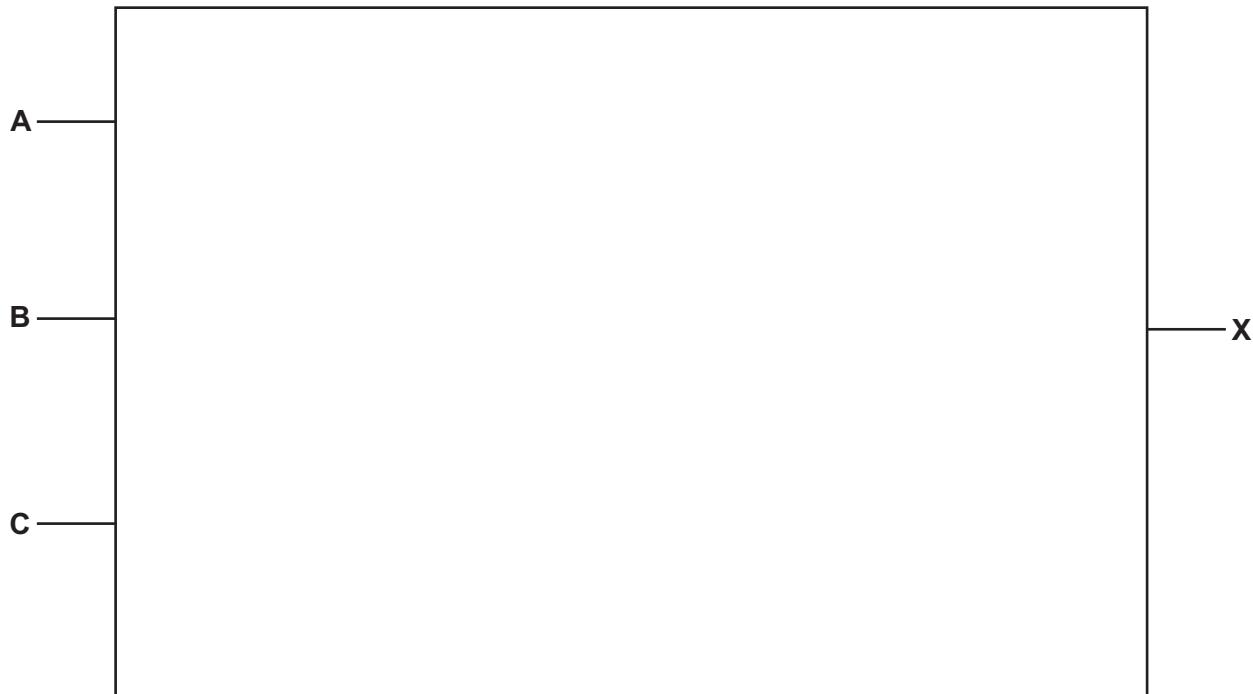
[1]

- 10 Consider the following logic statement:

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

- (a) Draw a logic circuit to match the given logic statement.

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



[4]

- (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]

- 11 A theme park has a game where a player tries to run from the start to the finish without getting wet.

The system for the game uses sensors and a microprocessor to spray water at a player as they run past each sensor.

Describe how the sensors and the microprocessor are used in this system.

[6]

- 12** Warner says that he has a very good Internet Service Provider (ISP) that provides several services.

Five statements about ISPs are given.

Tick (✓) to show if each statement is **True** or **False**.

Statement	True (✓)	False (✓)
Provides access to the Internet for customers		
Can determine the maximum bandwidth available for customers		
Monitors the volume of data downloaded by customers		
Can provide an IP address for the customer		
Stores the content for all web pages available on the Internet		

[5]

13 Phishing and pharming are two security issues a user should be aware of when using the Internet.

- (a) State **one** similarity between phishing and pharming.

..... [1]

- (b) Explain **two** differences between phishing and pharming.

Difference 1

.....

Difference 2

.....

[2]

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.



Cambridge IGCSE™

COMPUTER SCIENCE

0478/13

Paper 1

October/November 2020

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 2020 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 13 printed pages.

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.

Question	Answer				Marks
1	One mark for each correct row:				5
	Device	Input (✓)	Output (✓)	Storage (✓)	
	Solid state drive (SSD)			✓	
	Headphones		✓		
	2D cutter		✓		
	LCD projector		✓		
	Microphone	✓			

Question	Answer	Marks
2(a)	– Control unit // CU	1
2(b)	– Arithmetic logic unit // ALU	1
2(c)	– Program counter // memory address register // PC // MAR	1
2(d)	– Memory data register // current instruction register // MDR // CIR	1
2(e)	– Memory data register // MDR	1

Question	Answer				Marks																				
3(a)	<p>One mark per each correct row:</p> <table border="1"> <thead> <tr> <th>Denary</th> <th>Binary Conversion</th> <th>Correct (✓)</th> <th>Incorrect (✗)</th> </tr> </thead> <tbody> <tr> <td>145</td> <td>10010001</td> <td>✓</td> <td></td> </tr> <tr> <td>179</td> <td>10110101</td> <td></td> <td>✓</td> </tr> <tr> <td>11</td> <td>00010011</td> <td></td> <td>✓</td> </tr> <tr> <td>100</td> <td>01100010</td> <td></td> <td>✓</td> </tr> </tbody> </table>				Denary	Binary Conversion	Correct (✓)	Incorrect (✗)	145	10010001	✓		179	10110101		✓	11	00010011		✓	100	01100010		✓	4
Denary	Binary Conversion	Correct (✓)	Incorrect (✗)																						
145	10010001	✓																							
179	10110101		✓																						
11	00010011		✓																						
100	01100010		✓																						
3(b)	<p>One mark for each correct conversion in the correct order:</p> <ul style="list-style-type: none"> – C – 4 – 0 				3																				

Question	Answer	Marks
4(a)	<p>Any four from:</p> <ul style="list-style-type: none"> – Browsers sends URL to DNS – ... using HTTP – DNS finds matching IP addresses for URL – ... and sends IP address to web browser – Web browser sends request to IP address/web server for web pages – Web pages are sent from web server to browser – Browser renders HTML to display web pages – Any security certificates are exchanged/authenticated // SSL/HTTPS is used to secure the data – ... encrypting any data sent 	4

Question	Answer	Marks
4(b)	<p>Any three from:</p> <ul style="list-style-type: none"> – Hacking – Denial of service (DoS) – Malware – Virus <p>NOTE: three suitable types of malware can be awarded</p>	3

Question	Answer	Marks
5(a)	<p>One mark for correct tick, two marks for description</p> <ul style="list-style-type: none"> – Serial – Bits sent one at a time – Single wire <p>If parallel given, no mark for parallel, but follow through for correct description of parallel:</p> <ul style="list-style-type: none"> – Multiple bits sent at a time – Multiple wires 	3
5(b)	<p>Any three from:</p> <ul style="list-style-type: none"> – Universal connection // industry standard – Can only be inserted one way – Backward compatible – Auto configures // automatically recognised devices – Can power devices – Fast data transfer speed – Inexpensive to purchase/manufacture 	3

Question	Answer	Marks
5(c)	Any two from: – TLS – SSL – HTTPS	2

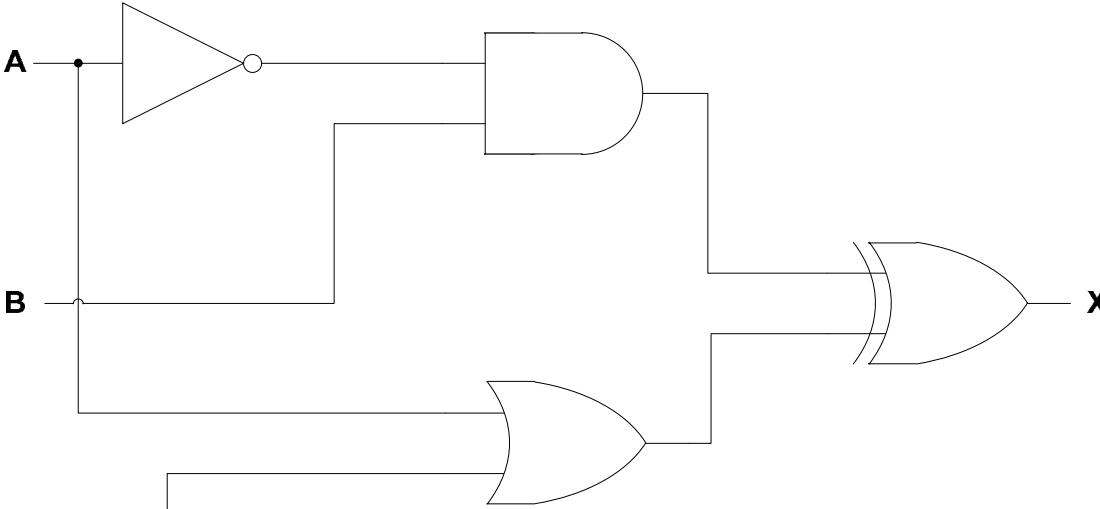
Question	Answer	Marks
6	– Key // Algorithm – Algorithm // Key (must be opposite of first one) – Plain – Cypher – Key // Algorithm	5

Question	Answer	Marks															
7(a)	<p>One mark for each correct row:</p> <table border="1"> <thead> <tr> <th>8-bit binary value</th> <th>Even (✓)</th> <th>Odd (✓)</th> </tr> </thead> <tbody> <tr> <td>10000001</td> <td>✓</td> <td></td> </tr> <tr> <td>10000010</td> <td>✓</td> <td></td> </tr> <tr> <td>00101001</td> <td></td> <td>✓</td> </tr> <tr> <td>00101000</td> <td>✓</td> <td></td> </tr> </tbody> </table>	8-bit binary value	Even (✓)	Odd (✓)	10000001	✓		10000010	✓		00101001		✓	00101000	✓		4
8-bit binary value	Even (✓)	Odd (✓)															
10000001	✓																
10000010	✓																
00101001		✓															
00101000	✓																
7(b)	<p>Any one from:</p> <ul style="list-style-type: none"> – Transposition error – When bits still add up to odd/even number – Even number of incorrect bits 	1															

Question	Answer	Marks
7(c)	Any one from: – ARQ – Checksum	1

Question	Answer	Marks
8(a)	Any three from: – Liquid crystal display – The display is made of pixels – ... arranged in a matrix – Uses a flat panel display – Backlit display – ... with CCFLs/LEDs – Uses light-modulating properties of liquid crystals – Crystals can be turned between opaque and transparent (to allow light to pass) – Colours created using RGB	3
8(b)	Any three from: – Low power consumption – Runs at cool temperature – Do not suffer image burn – Do not suffer flicker issues – Bright image/colours – High resolution image – Cheaper to purchase than e.g. LED screen	3

Question	Answer	Marks
9(a)	<p>Any three from:</p> <ul style="list-style-type: none">– Both need a red laser to read/write data– Both are spun to be read– Both use spiral tracks for data– Both are optical storage– Both are off-line storage // both non-volatile– Both use pits and lands to store data	3
9(b)	<p>Any one from:</p> <ul style="list-style-type: none">– DVD can be dual layer, but CD can only be single– DVD has higher storage capacity– DVD has a shorter wavelength laser– DVD are spun faster– DVDs have a higher data transfer rate	1

Question	Answer	Marks
10(a)	<p>One mark for each correct logic gate with the correct input:</p> 	4

Question	Answer	Marks																																													
10(b)	<p>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</p> <table border="1"> <thead> <tr> <th>A</th><th>B</th><th>C</th><th>Working space</th><th>X</th></tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>0</td><td></td><td>0</td></tr> <tr><td>0</td><td>0</td><td>1</td><td></td><td>1</td></tr> <tr><td>0</td><td>1</td><td>0</td><td></td><td>1</td></tr> <tr><td>0</td><td>1</td><td>1</td><td></td><td>0</td></tr> <tr><td>1</td><td>0</td><td>0</td><td></td><td>1</td></tr> <tr><td>1</td><td>0</td><td>1</td><td></td><td>1</td></tr> <tr><td>1</td><td>1</td><td>0</td><td></td><td>1</td></tr> <tr><td></td><td></td><td></td><td></td><td>1</td></tr> </tbody> </table>	A	B	C	Working space	X	0	0	0		0	0	0	1		1	0	1	0		1	0	1	1		0	1	0	0		1	1	0	1		1	1	1	0		1					1	4
A	B	C	Working space	X																																											
0	0	0		0																																											
0	0	1		1																																											
0	1	0		1																																											
0	1	1		0																																											
1	0	0		1																																											
1	0	1		1																																											
1	1	0		1																																											
				1																																											
11	<p>Six from:</p> <ul style="list-style-type: none"> <li>– Suitable sensor used e.g. motion sensor/pressure sensor <li>– (Analogue) data is converted to digital (using ADC) <li>– Sensor sends data to microprocessor <li>– Data compared to stored data ... <li>– ... if value outside range/within range water is sprayed <li>– ... signal sent to actuator to spray water <li>– ... if value within range/outside range no action taken <li>– Continuous loop 	6																																													

Question	Answer	Marks																		
12	<p>One mark for each correct row:</p> <table border="1"><thead><tr><th>Statement</th><th>True (✓)</th><th>False (✗)</th></tr></thead><tbody><tr><td>Provides access to the Internet for customers</td><td>✓</td><td></td></tr><tr><td>Can determine the maximum bandwidth available for customers</td><td>✓</td><td></td></tr><tr><td>Monitors the volume of data downloaded by customers</td><td>✓</td><td></td></tr><tr><td>Can provide an IP address for the customer</td><td>✓</td><td></td></tr><tr><td>Stores the content for all web pages available on the Internet</td><td></td><td>✓</td></tr></tbody></table>	Statement	True (✓)	False (✗)	Provides access to the Internet for customers	✓		Can determine the maximum bandwidth available for customers	✓		Monitors the volume of data downloaded by customers	✓		Can provide an IP address for the customer	✓		Stores the content for all web pages available on the Internet		✓	5
Statement	True (✓)	False (✗)																		
Provides access to the Internet for customers	✓																			
Can determine the maximum bandwidth available for customers	✓																			
Monitors the volume of data downloaded by customers	✓																			
Can provide an IP address for the customer	✓																			
Stores the content for all web pages available on the Internet		✓																		

Question	Answer	Marks
13(a)	Any one from: – Both are designed to steal/collect personal data – Both pretend to be a real company – Both use fake websites	1
13(b)	– Phishing involves use of an email whereas pharming involves installing malicious code – Phishing involves clicking a link or an attachment whereas pharming creates a redirection	2



Cambridge IGCSE™

CANDIDATE
NAME

--	--	--	--	--

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



COMPUTER SCIENCE

0478/11

Paper 1 Theory

October/November 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 **12** pages. Any blank pages are indicated.

1 Binary is a number system that is used by computers.

(a) Tick (\checkmark) one box to show whether binary is a base-2, base-10 or base-16 number system.

Tick (\checkmark)

Base-2

Base-10

Base-16

[1]

(b) Hexadecimal and denary are number systems that can be used by programmers.

Convert these four hexadecimal values into denary values.

09

10

28

A1

[4]

Working space

.....
.....
.....
.....
.....

- 2 Magda has a mobile telephone.

She uses the touch screen on her telephone to send emails to her customers. The touch screen breaks, stopping Magda from using it to type her emails.

- (a) Identify **one** other input device that would be built into the mobile telephone that Magda could use to send an email to her customers.

..... [1]

- (b) The touch screen operates by using the conductive properties of the object that is used to touch the screen.

State whether the touch screen is a resistive, capacitive or infra-red touch screen.

..... [1]

- (c) Magda is listening to music on her mobile telephone when she receives a telephone call. A signal is sent within the telephone to stop the music and output that a call has been received.

Give the name of this type of signal.

..... [1]

- 3 Five statements are given about the error-checking methods checksum, check digit and parity check.

(a) Tick (✓) to show whether each statement applies to checksum, check digit or parity check. Some statements may apply to more than one error-checking method.

Statement	Checksum (✓)	Check digit (✓)	Parity check (✓)
uses an additional bit to create an odd or even number of 1s			
checks for errors on data entry			
compares two calculated values to see if an error has occurred			
will not detect transposition errors			
sends additional values when data is transmitted from a computer to another			

[5]

- (b) Identify one other error-checking method.

..... [1]

- 4 Georgia is a wedding photographer. She wants to store 10 photographs on a USB flash memory drive for a customer. Each photograph is 100 pixels wide and 50 pixels high.

The photographs are 8-bit colour photographs.

- (a) Calculate the total file size, in kilobytes (kB), of all the photographs. For this calculation, you may use the unit of measurement of 1024 or 1000.

Show all your working.

.....

Answer kB

[3]

- (b) Georgia compresses photographs to store them on the USB flash memory drive. It is important that the compression does **not** affect the quality of the photographs in any way.

State which type of compression is the most suitable. Justify your choice.

Compression type

Justification

.....
.....
.....

[3]

- (c) Georgia uses a digital camera. The digital camera takes a photograph that is then converted into a digital image.

Complete the paragraph about the operation of a digital camera, using the most appropriate terms from the list. **Not** all terms in the list need to be used.

- analogue-to-digital
- binary
- charge-coupled
- digital-to-analogue
- lens
- light
- mirror
- pixel
- reflection
- sensor
- storage

When Georgia pushes the button to take a photograph, an aperture opens at the front of

the camera to allow to stream in through

the This is captured by a sensor called a

..... device. The

converter then converts each into a digital value.

[5]

- 5 Tamaz stores confidential data on his computer.

He uses the Internet regularly and is concerned about his data being viewed by unauthorised people. He currently has **one** software method to stop his data being viewed, which is a password.

He wants to add other software methods to stop his data being viewed by unauthorised people.

- (a) State **two** other software methods that Tamaz could use to stop his data being viewed by unauthorised people.

1

2

[2]

- (b) Tamaz's computer has an operating system. **Two** functions of the operating system are file management and memory management.

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

1

2

[2]

- 6 Six statements are given about the role of components in the Central Processing Unit (CPU).

- (a) Tick (✓) to show whether each statement applies to the Memory Address Register (MAR), Memory Data Register (MDR) or Program Counter (PC).

Some statements may apply to more than one component.

Statement	MAR (✓)	MDR (✓)	PC (✓)
it is a register in the CPU			
it holds the address of the next instruction to be processed			
it holds the address of the data that is about to be fetched from memory			
it holds the data that has been fetched from memory			
it receives signals from the control unit			
it uses the address bus to send an address to another component			

[6]

- (b) Identify the component in the CPU that carries out calculations.

..... [1]

- 7 (a) Tick (✓) one box to identify if an internal Solid State Drive (SSD) is an example of primary, secondary or off-line storage. Justify your choice.

Tick (✓)

Primary

Secondary

Off-line

Justification

.....
.....
.....

[3]

- (b) Describe the operation of an SSD and how it stores data.

.....
.....
.....
.....
.....
.....
.....
.....
.....

[4]

- 8** Victoria develops a computer game to sell on a gaming website. She writes her program using English-like statements.

- (a) State which type of programming language Victoria is using.

[1]

- (b) Victoria uses **two** different types of translator when creating the program for the computer game.

State which translator is the most suitable for the given tasks.

Give the benefits of using that translator for the task.

You must choose a different translator for each task.

- (i) To translate the code during development of the game.

Translator

Benefits

[View Details](#) | [Edit](#) | [Delete](#)

[View Details](#) | [Edit](#) | [Delete](#)

(ii) To translate the final program and upload to the website for distribution, without the source code.

Translator

Benefits

Digitized by srujanika@gmail.com

[View Details](#) | [Edit](#) | [Delete](#)

[View Details](#) | [Edit](#) | [Delete](#)

[3]

- 9** A washing machine uses sensors and a microprocessor to control the washing cycle of clothes.

- (a) A sensor is used in each of the given tasks.

Identify **one** suitable sensor that would be used for each task.

Each sensor given must be different.

Task	Sensor
checking the water is 30 °C	
checking the water acidity level after detergent is added	
checking the weight of the clothes to make sure that the machine is not overloaded	

[3]

- (b) Describe how the sensor and the microprocessor are used to make sure the water remains at 30 °C.

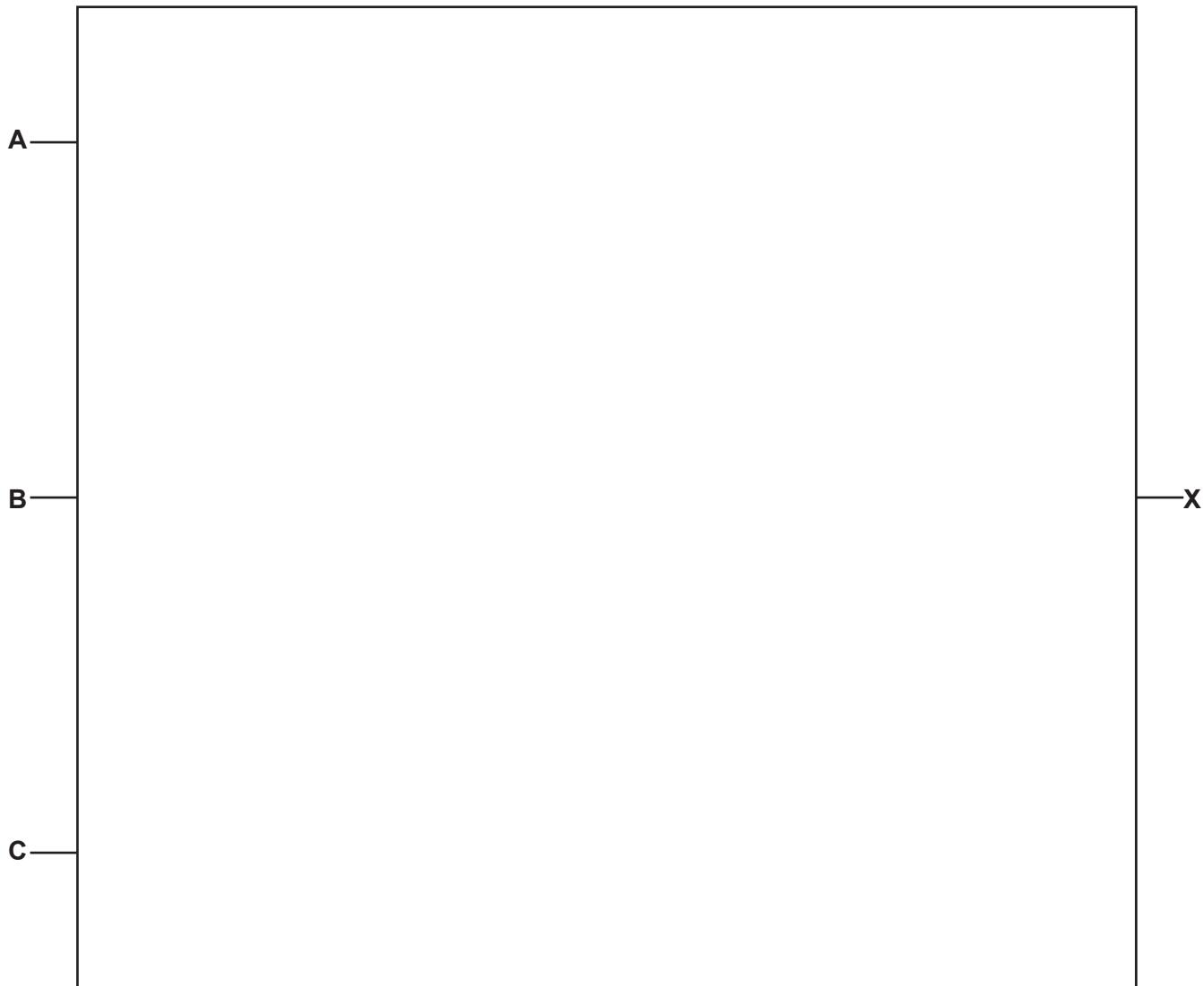
[6]

- 10 Consider the following logic statement:

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

- (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.



[5]

- (b) State the name of a logic gate that does **not** appear in the logic statement and draw the symbol for the logic gate.

Name of logic gate Logic gate symbol:



[2]

- (c) 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]

- 11 The table contains descriptions relating to web pages and the Internet.

Complete the table with the correct terms for the given descriptions.

Term	Description
	the language used to create a web page
	the type of software application used to display a web page
	an address given to a computer, by a network, to allow the computer to be uniquely identified
	a text file sent by a web server to collect data about a user's browsing habits
	the company that provides a connection to the Internet

[5]

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.



Cambridge IGCSE™

COMPUTER SCIENCE

0478/11

Paper 1

October/November 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 October/November 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.

Question	Answer	Marks
1(a)	– Base-2	1
1(b)	– 9 – 16 – 40 – 161	4

Question	Answer	Marks
2(a)	– Microphone	1
2(b)	– capacitive	1
2(c)	– interrupt	1

Question	Answer	Marks																								
3(a)	<p>One mark per each correct row.</p> <table border="1"> <thead> <tr> <th>Statement</th> <th>Checksum (✓)</th> <th>Check digit (✓)</th> <th>Parity check (✓)</th> </tr> </thead> <tbody> <tr> <td>uses an additional bit to create an odd or even number of 1s</td><td></td><td></td><td>✓</td></tr> <tr> <td>checks for errors on data entry</td><td></td><td>✓</td><td></td></tr> <tr> <td>compares two calculated values to see if an error has occurred</td><td>✓</td><td>✓</td><td></td></tr> <tr> <td>will not detect transposition errors</td><td></td><td></td><td>✓</td></tr> <tr> <td>sends additional values when data is transmitted from one computer to another</td><td>✓</td><td></td><td>(✓)</td></tr> </tbody> </table>	Statement	Checksum (✓)	Check digit (✓)	Parity check (✓)	uses an additional bit to create an odd or even number of 1s			✓	checks for errors on data entry		✓		compares two calculated values to see if an error has occurred	✓	✓		will not detect transposition errors			✓	sends additional values when data is transmitted from one computer to another	✓		(✓)	5
Statement	Checksum (✓)	Check digit (✓)	Parity check (✓)																							
uses an additional bit to create an odd or even number of 1s			✓																							
checks for errors on data entry		✓																								
compares two calculated values to see if an error has occurred	✓	✓																								
will not detect transposition errors			✓																							
sends additional values when data is transmitted from one computer to another	✓		(✓)																							
3(b)	– ARQ	1																								

Question	Answer	Marks
4(a)	<p>Two marks for any two correct workings and one mark for the correct answer.</p> <p>Working:</p> <ul style="list-style-type: none"> – $100 \times 50 = 5000$ bits – $5000 \times 8 = 40,000$ bits – $40,000 / 8 = 5,000$ bytes – $5,000 \times 10 = 50,000$ bytes – $50,000 / 1024$ <p>Answer:</p> <p>48.83 kB // 49 kB</p> <p>NOTE: Alternative correct methods of working can be credited. Answer can be given to any number of dp.</p>	3
4(b)	<p>One mark per correct method, two marks per justification.</p> <ul style="list-style-type: none"> – Lossless – Lossy would remove data permanently // lossless would not remove any data permanently // File could be restored to original ... – ... that could affect the quality (lossy) // ... to maintain the quality (lossless) 	3
4(c)	<ul style="list-style-type: none"> – Light – Lens – Charge-coupled – Analogue-to-digital – Pixel 	5

Question	Answer	Marks
5(a)	<p>Any two from:</p> <ul style="list-style-type: none"> – Encryption – Biometric device – Firewall – Anti-spyware – Two-factor authentication // two-step verification 	2
5(b)	<p>Any two from:</p> <ul style="list-style-type: none"> – Interrupt / error-handling – Peripheral management – Providing user interface – Platform for running applications // installing / removing software – Manages security // access rights/levels // user account management – Managing time slicing // multitasking 	2

Question	Answer				Marks
6(a)	One mark per each correct row.				6
	Statement	MAR (✓)	MDR (✓)	PC (✓)	
	it is a register in the CPU	✓	✓	✓	
	it holds the address of the next instruction to be processed	(✓)		✓	
	it holds the address of the data that is about to be fetched from memory	✓		(✓)	
	it holds the data that has been fetched from memory		✓		
	it receives signals from the control unit	✓	✓	✓	
	it uses the address bus to send an address to another component	✓		✓	
6(b)	– Arithmetic Logic Unit // ALU				1

Question	Answer	Marks
7(a)	One mark per correct storage, two marks for justification.	3
	<ul style="list-style-type: none"> – Secondary – It is non-volatile storage – It is not directly accessed by the CPU 	
7(b)	Any four from: <ul style="list-style-type: none"> – Uses flash memory – Data is flashed onto (silicon) chips – Uses NAND/NOR technology // Can use flip-flops – Uses transistors/control gates/floating gates ... – ... to control the flow of electrons – It is a type of EEPROM technology – When data is stored the transistor is converted from 1 to 0 / 0 to 1 – Writes (and reads) sequentially 	4

Question	Answer	Marks
8(a)	<ul style="list-style-type: none"> – High-level 	1
8(b)(i)	<p>One mark for the correct translator, two marks for the benefit(s).</p> <ul style="list-style-type: none"> – Interpreter – Easier to debug – ... as errors are immediately reported when detected – Compiler – All errors are reported in a single report – ... meaning they can all be fixed at the same time – No need to recompile code every time a test is run 	3
8(b)(ii)	<p>One mark for the correct translator, two marks for the benefits.</p> <ul style="list-style-type: none"> – Compiler – Creates an executable file – ... so, translator is no longer needed to run it – Source code cannot be stolen // can be provided without the source code 	3

Question	Answer	Marks								
9(a)	<p>One mark per each correct sensor.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; padding: 5px;">Task</th> <th style="text-align: center; padding: 5px;">Sensor</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">checking the water is 30 °C</td> <td style="padding: 5px;">Temperature</td> </tr> <tr> <td style="padding: 5px;">checking the water acidity level after detergent is added</td> <td style="padding: 5px;">pH</td> </tr> <tr> <td style="padding: 5px;">checking the weight of the clothes to make sure that the machine is not overloaded</td> <td style="padding: 5px;">Pressure</td> </tr> </tbody> </table>	Task	Sensor	checking the water is 30 °C	Temperature	checking the water acidity level after detergent is added	pH	checking the weight of the clothes to make sure that the machine is not overloaded	Pressure	3
Task	Sensor									
checking the water is 30 °C	Temperature									
checking the water acidity level after detergent is added	pH									
checking the weight of the clothes to make sure that the machine is not overloaded	Pressure									
9(b)	<p>Six from:</p> <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 (of 30) <p>If data is below 30 then a microprocessor sends signal is sent to a heater to heat the water up/add hot water</p> <ul style="list-style-type: none"> – if data is above 30 then a microprocessor sends signal is sent to turn the heater off to allow the water to cool down/add cold water – Actuator used to turn headset on/off // Actuator used to add water – If data is 30 then no action is taken – It is a continuous process 	6								

Question	Answer	Marks
10(a)	<p>One mark per each correct logic gate with the correct input(s).</p>	5
10(b)	<p>One mark per logic gate name and one mark per correct drawing.</p> <ul style="list-style-type: none"> – NAND <ul style="list-style-type: none"> – NOR 	2

Question	Answer					Marks
10(c)	A	B	C	Working space	X	4
	0	0	0		0	
	0	0	1		0	
	0	1	0		0	
	0	1	1		1	
	1	0	0		0	
	1	0	1		1	
	1	1	0		0	
	1	1	1		1	
	4 marks per 8 correct outputs 3 marks per 6/7 correct outputs 2 marks per 4/5 correct outputs 1 mark per 2/3 correct outputs					

Question	Answer		Marks
11	One mark per each correct term.		5
	Terms	Description	
	HTML	the language used to create a web page	
	Browser	the type of software application used to display a web page	
	IP address	an address given to a computer, by a network, to allow the computer to be uniquely identified	
	Cookie	a text file sent by a web server to collect data about a user's browsing habits	
	Internet Service Provider // ISP	the company that provides a connection to the Internet	



Cambridge IGCSE™

CANDIDATE
NAME

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



COMPUTER SCIENCE

0478/12

Paper 1 Theory

October/November 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 **12** pages. Any blank pages are indicated.

- 1 (a) Denary is a number system that is used by programmers.

Tick (\checkmark) **one** box to show whether denary is a base-2, base-10 or base-16 number system.

Tick
 \checkmark

Base-2

Base-10

Base-16

[1]

- (b) Hexadecimal values can be used to represent denary values.

Convert these **four** hexadecimal values into denary values.

05

20

1A

AB

[4]

Working space

.....
.....
.....
.....
.....

- (c) Hexadecimal values can also be converted to binary values.

Tick () **one** box to show the correct 8-bit binary value for each hexadecimal value.

- (i) Hexadecimal value 25

Tick
()

00011001

00100101

10100001

[1]

- (ii) Hexadecimal value 1B

Tick
()

00011011

10110001

00011010

[1]

- (d) (i) Give **one** way that hexadecimal is used in website development.

..... [1]

- (ii) Give **one** way that hexadecimal is used in low-level programming.

..... [1]

- 2 A train company wants to install a self-service ticket machine system for its train stations. When the customer has purchased their tickets, the machine will provide a paper ticket.

- (a) **One** output device that is used in the ticket machine is a display screen.

Identify **one** other output device that is used in the ticket machine system.

..... [1]

- (b) The train company does **not** want users to use a keyboard or a mouse to enter their data, when buying a ticket. The company is worried that they may be stolen or get too dirty.

Identify **one** other input device that would be suitable for use in the ticket machine system, to allow users to enter their data.

..... [1]

- 3 (a) Six statements are given about methods of data transmission.

Tick (✓) to show if each statement applies to serial simplex, parallel simplex, parallel half-duplex or serial duplex data transmission. Some statements may apply to more than **one** data transmission method.

Statement	Serial simplex (✓)	Parallel simplex (✓)	Parallel half-duplex (✓)	Serial duplex (✓)
bits are transmitted along a single wire				
data is transmitted in both directions				
it is only suitable for distances less than 5 metres				
bits from the same byte are transmitted one after the other				
data may not arrive in the correct sequence				
data is transmitted in both directions, but only one direction at a time				

[6]

- (b) A Universal Serial Bus (USB) connection can be used to transmit data from a mobile device to a computer.

Give **three** benefits of using a USB connection for this purpose.

Benefit 1

.....

Benefit 2

.....

Benefit 3

.....

[3]

- 4 The paragraph explains the operation of different touch screen technologies.

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

- capacitive
- change
- circuit
- conductive
- coordinates
- grid
- heat
- infra-red
- insulating
- light
- manufacture
- pressure
- resistive

In touch screen technology, an electrostatic field is present on the surface of the touch screen. The properties of a user cause a in the field. The of the user's touch can be calculated.

In touch screen technology, a user pushes the top layer of the screen and makes it connect with the bottom layer to complete a

This type of touch screen is cheaper to

[7]

- 5 Sammi works for a finance company and has a laptop that he uses for his work. He has confidential data about his customers stored on his laptop.

Sammi does **not** connect the laptop to any networks.

- (a) Sammi is concerned about his customers' confidential data being viewed by other people in his office.

One method he uses to prevent others viewing the data is encryption.

Identify **three** other methods Sammi could use to prevent his customers' confidential data being viewed.

1

2

3

[3]

- (b) Sammi creates videos for the finance company website that give customers advice about their finances.

He uses lossy compression to reduce the file size of the videos for the website.

- (i) Give **three** ways that lossy compression can reduce the file size of the videos.

1

.....

2

.....

3

.....

[3]

- (ii) Give **one** drawback of using lossy compression to reduce the file size of the videos.

.....

[1]

(c) Sammi could have used lossless compression to compress the videos for the website.

(i) Give **one** reason why he would use lossless compression, rather than lossy compression, for the videos.

.....
.....

[1]

(ii) Give **two** disadvantages of Sammi using lossless compression, rather than lossy compression, for the videos.

Disadvantage 1

.....
.....

Disadvantage 2

[2]

6 A programmer can use translators, such as an interpreter and a compiler, when developing a computer program.

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

.....
.....

[1]

(b) Describe **two** differences between a compiler and an interpreter.

Difference 1

.....
.....
.....

Difference 2

.....
.....
.....

[4]

(c) Identify **one** other type of translator.

.....

[1]

- 7 Five statements are given about devices.

Tick (✓) to show if each statement applies to a 3D scanner, barcode reader or a Quick Response (QR) code reader. Some statements may apply to more than one type of device.

Statement	3D scanner (✓)	Barcode reader (✓)	QR code reader (✓)
uses position and alignment markers for orientation when scanning			
scans the shape and appearance of an object			
uses reflected light from a laser to convert a black-and-white pattern into binary			
can often be built into an Electronic Point Of Sale (EPOS) terminal, for example, a supermarket checkout			
it is an example of an input device			

[5]

- 8 An electronic game has three square mats that are coloured red, green and blue.

The player will see a colour displayed on a screen and has 1 second to hit the mat that matches the colour. If the player hits the correct mat, within 1 second, a counter is incremented. When a player hits an incorrect mat, the game ends.

The game uses sensors and a microprocessor to determine if the player hits the correct mat within 1 second.

Explain how the game uses sensors and a microprocessor to count the number of times a player hits a correct mat within 1 second.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[7]

- 9 Padma opens an application on her computer.

An interrupt is generated to inform the Central Processing Unit (CPU) that the application has been opened.

- (a) Give **three** other examples of when an interrupt signal could be generated.

1

2

3

[3]

- (b) State what would happen if interrupt signals were **not** used in a computer.

.....
.....

[1]

- 10 Jermain uses the Secure Socket Layer (SSL) protocol for secure transmission when sending data using the internet.

- (a) Explain how the SSL protocol secures the data for transmission.

.....
.....
.....

[2]

- (b) Identify an alternative protocol that could be used for secure transmission of data using the internet.

.....

[1]

- (c) Give **two** ways that a user can identify if a website uses secure data transmission.

1

.....

2

.....

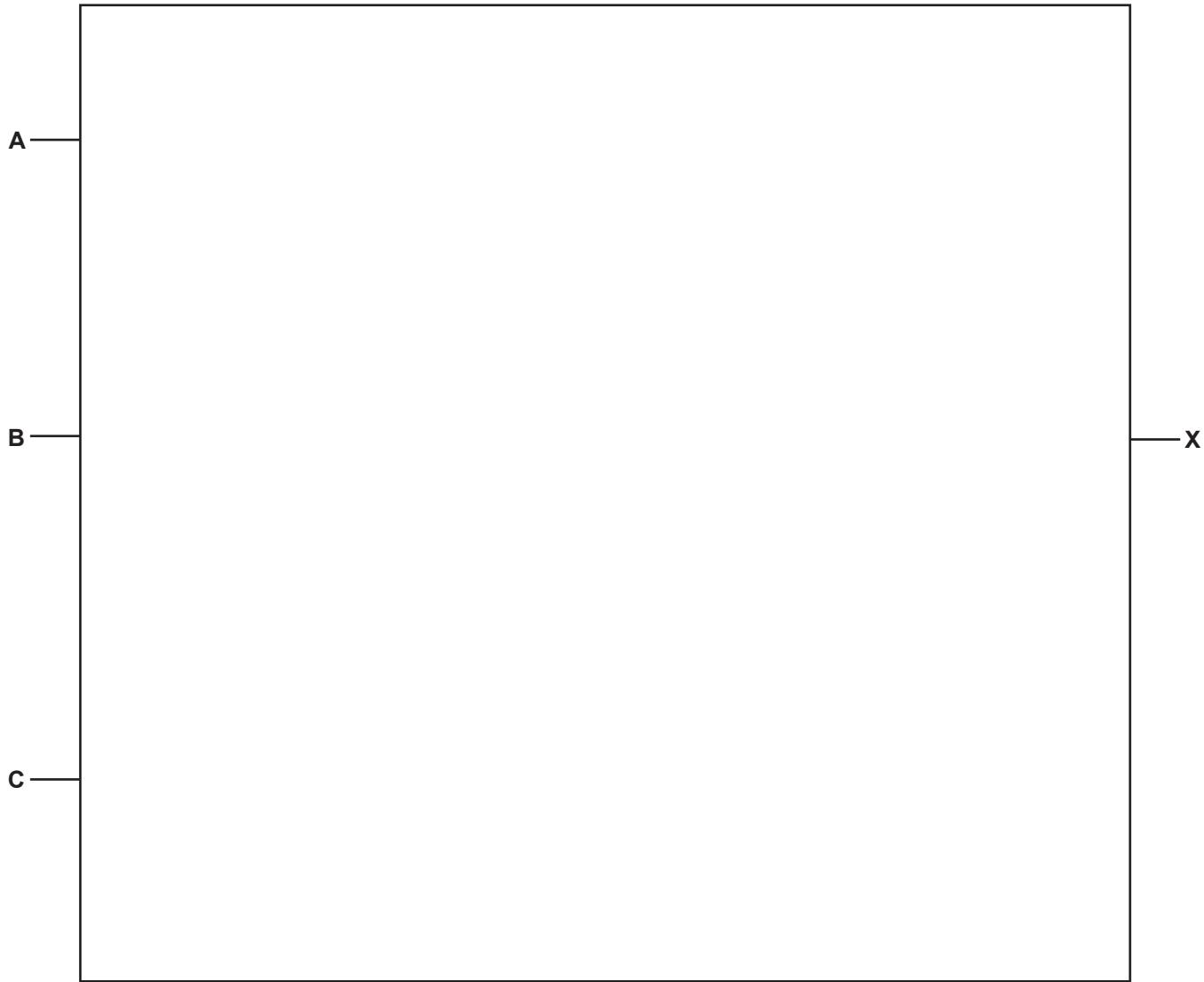
[2]

11 Consider the following logic statement:

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

- (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.



[5]

- (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]

- (c) Identify **two** logic gates that are **not** included in the given logic statement.

Logic gate 1

Logic gate 2

[2]

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.



Cambridge IGCSE™

COMPUTER SCIENCE

0478/12

Paper 1

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

This document consists of **12** printed pages.

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.

Question	Answer	Marks
1(a)	– Base-10	1
1(b)	– 5 – 32 – 26 – 171	4
1(c)(i)	– 00100101	1
1(c)(ii)	– 00011011	1
1(d)(i)	Any one from: – To represent HTML colour codes – In error messages	1
1(d)(ii)	Any one from: – Assembly code/language – Memory address locations – In error messages – Memory dump	1

Question	Answer	Marks
2(a)	Any one from: – Printer – Speaker – Light/LED – Actuator	1
2(b)	Any one from: – Touchscreen – Trackpad / touchpad – Microphone – QR code reader – Barcode reader – Magnetic strip reader – RFID reader	1

Question	Answer	Marks																																			
3(a)	<p>One mark per each correct row.</p> <table border="1"> <thead> <tr> <th>Statement</th><th>Serial simplex (✓)</th><th>Parallel simplex (✓)</th><th>Parallel half-duplex (✓)</th><th>Serial duplex (✓)</th></tr> </thead> <tbody> <tr> <td>bits are transmitted along a single wire</td><td>✓</td><td></td><td></td><td>✓</td></tr> <tr> <td>data is transmitted in both directions</td><td></td><td></td><td>✓</td><td>✓</td></tr> <tr> <td>it is only suitable for distances less than 5 metres</td><td></td><td>✓</td><td>✓</td><td></td></tr> <tr> <td>Bits from the same byte are transmitted one after the other</td><td>✓</td><td></td><td></td><td>✓</td></tr> <tr> <td>data may not arrive in the correct sequence</td><td></td><td>✓</td><td>✓</td><td></td></tr> <tr> <td>data is transmitted in both directions, but only one direction at a time</td><td></td><td></td><td>✓</td><td></td></tr> </tbody> </table>	Statement	Serial simplex (✓)	Parallel simplex (✓)	Parallel half-duplex (✓)	Serial duplex (✓)	bits are transmitted along a single wire	✓			✓	data is transmitted in both directions			✓	✓	it is only suitable for distances less than 5 metres		✓	✓		Bits from the same byte are transmitted one after the other	✓			✓	data may not arrive in the correct sequence		✓	✓		data is transmitted in both directions, but only one direction at a time			✓		6
Statement	Serial simplex (✓)	Parallel simplex (✓)	Parallel half-duplex (✓)	Serial duplex (✓)																																	
bits are transmitted along a single wire	✓			✓																																	
data is transmitted in both directions			✓	✓																																	
it is only suitable for distances less than 5 metres		✓	✓																																		
Bits from the same byte are transmitted one after the other	✓			✓																																	
data may not arrive in the correct sequence		✓	✓																																		
data is transmitted in both directions, but only one direction at a time			✓																																		
3(b)	<p>Any three from:</p> <ul style="list-style-type: none"> – Can charge/power the mobile device (at the same time) – (Uses serial transmission so) data less likely to be skewed / corrupted – Universal / industry standard / connection – Cable can only be plugged in one way // Cannot be inserted incorrectly – Fast transmission speed – Backward compatible – Supports different transmission speeds – Automatically detects device // Automatically downloads drivers 	3																																			

Question	Answer	Marks
4	<p>One mark per each correct term in the correct order.</p> <ul style="list-style-type: none"> – Capacitive – Conductive // Capacitive – Change – Coordinates – Resistive – Circuit – Manufacture 	7

Question	Answer	Marks
5(a)	<p>Any three from:</p> <ul style="list-style-type: none"> – Password – Add a biometric device to the laptop // set biometric password – Use two-step verification // Use two factor authentication – Physically lock the laptop away in a secure cupboard // Taking laptop with him at all times 	3
5(b)(i)	<p>Any three from:</p> <ul style="list-style-type: none"> – A compression algorithm is used – The resolution could be reduced – Colour depth could be reduced // bits per pixel reduced – Sounds not heard by human ear could be removed // Perceptual music shaping can be used – Repeating frames could be removed 	3
5(b)(ii)	<p>Any one from:</p> <ul style="list-style-type: none"> – Quality may be reduced – Data is lost // original file cannot be reconstructed 	1
5(c)(i)	<p>Any one from:</p> <ul style="list-style-type: none"> – Maintains quality // quality better than lossy – Original file is retained // Data is not permanently lost – A significant reduction in file size is not required 	1

Question	Answer	Marks
5(c)(ii)	<p>Any two from:</p> <ul style="list-style-type: none"> – Takes more time to transmit file // Takes more time to upload to web server // Takes more time to download to customer // Web page will load slower – Takes up more storage space – Data usage would be increased – Uses more bandwidth 	2

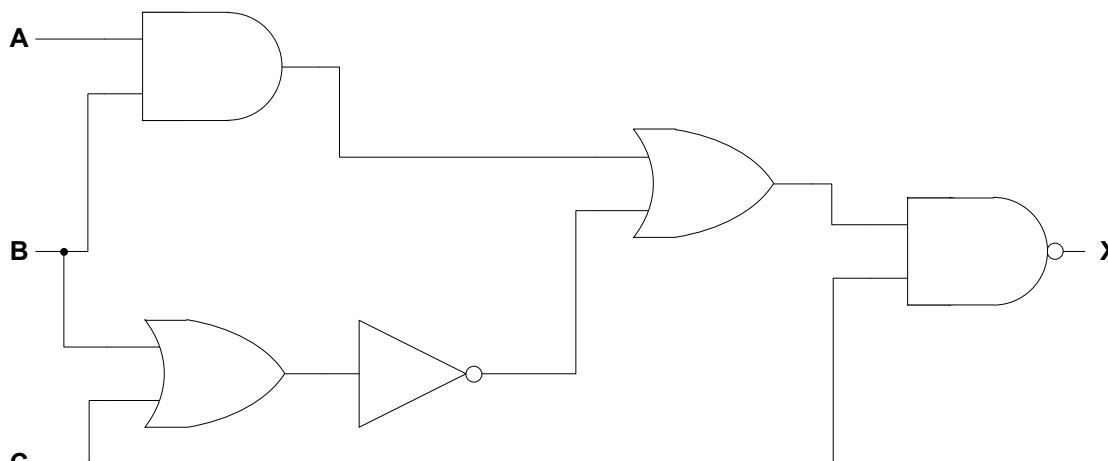
Question	Answer	Marks
6(a)	<p>Any one from:</p> <ul style="list-style-type: none"> – They both translate high-level language into machine code / low-level language – They both check for errors – They both report errors 	1
6(b)	<p>Four from (Max 2 per translator):</p> <ul style="list-style-type: none"> – An interpreter translates and executes the code line by line – ... whereas a compiler translates and executes the whole code all in one go – An interpreter stops translating and reports an error as it finds one – ... whereas a compiler produces an error report at the end of translation – An interpreter does not produce an executable file – ... but a compiler does produce an executable file – An interpreter will execute the code until it finds an error – ... whereas a compiler will not execute any code if there are errors present – An interpreter allows correction of errors in real-time – ... whereas a compiler needs to retranslate the code each time after errors are found and corrected 	4
6(c)	<ul style="list-style-type: none"> – Assembler 	1

Question	Answer	Marks																								
7	<p>One mark per each correct row.</p> <table border="1"> <thead> <tr> <th>Statement</th><th>3D scanner (✓)</th><th>Barcode reader (✓)</th><th>QR code reader (✓)</th></tr> </thead> <tbody> <tr> <td>uses position and alignment markers for orientation when scanning</td><td></td><td></td><td>✓</td></tr> <tr> <td>scans the shape and appearance of an object</td><td>✓</td><td></td><td></td></tr> <tr> <td>uses reflected light from a laser to convert a black-and-white pattern into binary</td><td></td><td>✓</td><td>(✓)</td></tr> <tr> <td>can often be built into an Electronic Point Of Sale (EPOS) terminal, for example, a supermarket checkout</td><td></td><td>✓</td><td>(✓)</td></tr> <tr> <td>it is an example of an input device</td><td>✓</td><td>✓</td><td>✓</td></tr> </tbody> </table>	Statement	3D scanner (✓)	Barcode reader (✓)	QR code reader (✓)	uses position and alignment markers for orientation when scanning			✓	scans the shape and appearance of an object	✓			uses reflected light from a laser to convert a black-and-white pattern into binary		✓	(✓)	can often be built into an Electronic Point Of Sale (EPOS) terminal, for example, a supermarket checkout		✓	(✓)	it is an example of an input device	✓	✓	✓	5
Statement	3D scanner (✓)	Barcode reader (✓)	QR code reader (✓)																							
uses position and alignment markers for orientation when scanning			✓																							
scans the shape and appearance of an object	✓																									
uses reflected light from a laser to convert a black-and-white pattern into binary		✓	(✓)																							
can often be built into an Electronic Point Of Sale (EPOS) terminal, for example, a supermarket checkout		✓	(✓)																							
it is an example of an input device	✓	✓	✓																							

Question	Answer	Marks
8	<p>Seven from:</p> <ul style="list-style-type: none"> – Timer is started – Pressure sensor (within each mat) – Sensor sends data to microprocessor – Analogue data is converted to digital (using ADC) – Microprocessor compares data to stored value(s) – If data matches / in/out range microprocessor stops timer – If data matches / in/out range microprocessor checks if data has come from correct colour mat sensor – If data matches / in/out range microprocessor checks to see if timer is stopped at less than 1 second – If data matches / in/out range microprocessor increments counter if timer is less than 1 second and colour/mat is correct – If correct colour/mat is hit, timer is reset and the whole process is repeated – If data has not come from the correct colour mat sensor the game ends 	7

Question	Answer	Marks
9(a)	<p>Any three from: e.g.</p> <ul style="list-style-type: none"> – A suitable description of any error that might occur – A peripheral is connected/disconnected – A key on a keyboard is pressed – A mouse button click – A phone/video call is received – A buffer requires more data – A printer has a paper jam – A printer runs out of paper – A printer runs out of ink – When switching from one application to another <p>NOTE: If three suitable different errors are described, this can be awarded three marks.</p>	3
9(b)	<p>Any one from:</p> <ul style="list-style-type: none"> – The computer would only start a new task when it had finished processing the current task // by example – Computer will not be able to multitask – Errors may not be dealt with – Computer would become impossible to use 	1

Question	Answer	Marks
10(a)	<ul style="list-style-type: none"> – Enables an encrypted link (between the browser and the web server) // It encrypts the data – ... based on the authentication of an (SSL) certificate // and will only send it if the certificate is authentic 	2
10(b)	<ul style="list-style-type: none"> – Transport Layer Security // TLS 	1
10(c)	<p>Any two from:</p> <ul style="list-style-type: none"> – URL begins with HTTPS – Padlock symbol is locked – Check the certificate is valid 	2

Question	Answer	Marks
11(a)	<p>One mark per each correct logic gate with correct input(s)</p>  <pre>graph LR; A((A)) --> NOR1[NOR]; NOR1 --> NOR2[NOR]; NOR2 --> NOR3[NOR]; B((B)) --> NOR1; C((C)) --> NOR3; NOR3 --> X((X));</pre>	5

Question	Answer	Marks																																													
11(b)	<p>4 marks for 8 correct outputs 3 marks for 6/7 correct outputs 2 marks for 4/5 correct outputs 1 mark for 2/3 correct outputs</p> <table border="1"> <thead> <tr> <th>A</th><th>B</th><th>C</th><th>Working space</th><th>X</th></tr> </thead> <tbody> <tr> <td>0</td><td>0</td><td>0</td><td></td><td>1</td></tr> <tr> <td>0</td><td>0</td><td>1</td><td></td><td>1</td></tr> <tr> <td>0</td><td>1</td><td>0</td><td></td><td>1</td></tr> <tr> <td>0</td><td>1</td><td>1</td><td></td><td>1</td></tr> <tr> <td>1</td><td>0</td><td>0</td><td></td><td>1</td></tr> <tr> <td>1</td><td>0</td><td>1</td><td></td><td>1</td></tr> <tr> <td>1</td><td>1</td><td>0</td><td></td><td>1</td></tr> <tr> <td>1</td><td>1</td><td>1</td><td></td><td>0</td></tr> </tbody> </table>	A	B	C	Working space	X	0	0	0		1	0	0	1		1	0	1	0		1	0	1	1		1	1	0	0		1	1	0	1		1	1	1	0		1	1	1	1		0	4
A	B	C	Working space	X																																											
0	0	0		1																																											
0	0	1		1																																											
0	1	0		1																																											
0	1	1		1																																											
1	0	0		1																																											
1	0	1		1																																											
1	1	0		1																																											
1	1	1		0																																											
11(c)	<ul style="list-style-type: none"> – NOR – XOR / EOR 	2																																													



Cambridge IGCSE™

CANDIDATE
NAME

--	--	--	--	--

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



COMPUTER SCIENCE

0478/13

Paper 1 Theory

October/November 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 **12** pages.

- 1 (a) Xia has **three** files stored on her computer.

Tick (\checkmark) **one** box to show which is the largest file size.

File size	Tick (\checkmark)
999 kB	
1 MB	
850 000 bytes	

[1]

- (b) Denise has **three** files stored on her computer.

Tick (\checkmark) **one** box to show which is the smallest file size.

File size	Tick (\checkmark)
4000 MB	
2 GB	
2 500 000 kB	

[1]

- 2 A sports stadium has an electronic counter that counts each person that enters the stadium.

The count is stored as binary in a 16-bit register.

A denary value of the count is displayed on a screen at the entrance.

- (a) The screen currently displays:

0	0	7	1
---	---	---	---

Give the binary value that is stored in the register to display the count shown.

Binary value:

Working space

.....

.....

.....

[2]

- (b) More people enter the sports stadium and the screen now displays:

0	2	5	7
---	---	---	---

Give the binary value that is stored in the register to display the count shown.

Binary value:

Working space

.....

.....

.....

[2]

- (c) After everyone has entered the stadium, the register stores the binary value:

0000001000000100

Show what the screen will display when this binary value is stored.

Display:

[1]

Working space

.....

.....

.....

.....

- (d) Sensors are used at the entrance to count the number of people entering the stadium.

- (i) Identify **two** sensors that could be used to count the number of people entering the stadium.

Sensor 1

Sensor 2

[2]

- (ii) Tick (\checkmark) **one** box to show if a sensor is an example of an input device, storage device or output device.

Device	Tick (\checkmark)
input	
storage	
output	

[1]

3 Five statements are given about error-checking methods.

- (a) Tick (✓) to show whether each statement applies to Automatic Repeat reQuest (ARQ), check digit or checksum. Some statements may apply to more than one error-checking method.

Statement	ARQ (✓)	Check digit (✓)	Checksum (✓)
checks for errors on data entry			
uses a process of acknowledgement and timeout			
compares two calculated values to see if an error has occurred			
may resend data until it is confirmed as received			
checks for errors in data after transmission from a computer to another			

[5]

- (b) Identify one other error-checking method.

..... [1]

- 4 Frederick prints a document that he has typed.

The printer begins to print the document, but then a message is displayed on Frederick's computer to say that the paper has jammed.

- (a) Describe the role of an interrupt in generating a message on the computer that the paper has jammed.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
..... [4]

- (b) Give **two** other examples of when an interrupt signal could be generated.

1
2 [2]

- (c) The type of data transmission between the computer and the printer is serial half-duplex data transmission.

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

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
..... [4]

- (ii) Explain why the data transmission needs to be half-duplex rather than simplex.

.....

[2]

- 5 In a Von Neumann model for a computer system, a Central Processing Unit (CPU) contains a number of different components.

The table contains the name of a component or a description of their role in the fetch-execute cycle.

Complete the table with the missing component names and descriptions.

Component name	Description
Memory Address Register (MAR)
Program Counter (PC)
.....	This is a register that is built into the arithmetic logic unit. It temporarily holds the result of a calculation.
.....	This is a register that holds data or an instruction that has been fetched from memory.
Control Unit (CU)
.....	This carries addresses around the CPU.

[6]

- 6 The paragraph describes an MP3 file, MP4 file and a MIDI file.

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

- can
- cannot
- compressed
- image
- microphone
- MIDI
- MP3
- MP4
- notes
- pixels
- speaker
- should
- uncompressed

..... files are a multimedia format that stores video and audio.

..... files are only used as a digital recording of sound; they are created using a and recording software. The data in the file is

..... files contain instructions on how to create the sound. They are created using digital instruments. The file stores individual

....., each **one** be changed in this type of file.

[7]

- 7 Julius creates a computer application that calculates how many years it will take to pay for a house.

- (a) Julius uploads his application to his website for people to download. Before he uploads the application, he translates the code using a compiler.

Explain why Julius uses a compiler, rather than an interpreter, to do this.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
..... [4]

- (b) Julius also creates videos to explain how to use the application that he has created. He reduces the file size of the videos using lossless compression.

- (i) Describe how lossless compression reduces the file size of the video.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
..... [3]

- (ii) State why Julius uses lossless compression, rather than lossy compression.

..... [1]

- (c) Julius wants to distribute his application to a wider audience. He is considering distributing it as freeware or free software.

- (i) Describe freeware and free software.

Freeware

.....

.....

.....

Free software

.....

.....

.....

[4]

- (ii) Julius also considers distributing a trial version of the application.

Identify the type of software he could use to distribute his application as a trial version.

..... [1]

- (d) Julius makes sure that all data transmission to and from his website is secure.

One way a user can check if his website uses secure data transmission is to check its certificate.

Give **two** other ways that a user can identify if his website uses secure data transmission.

1

.....

2

.....

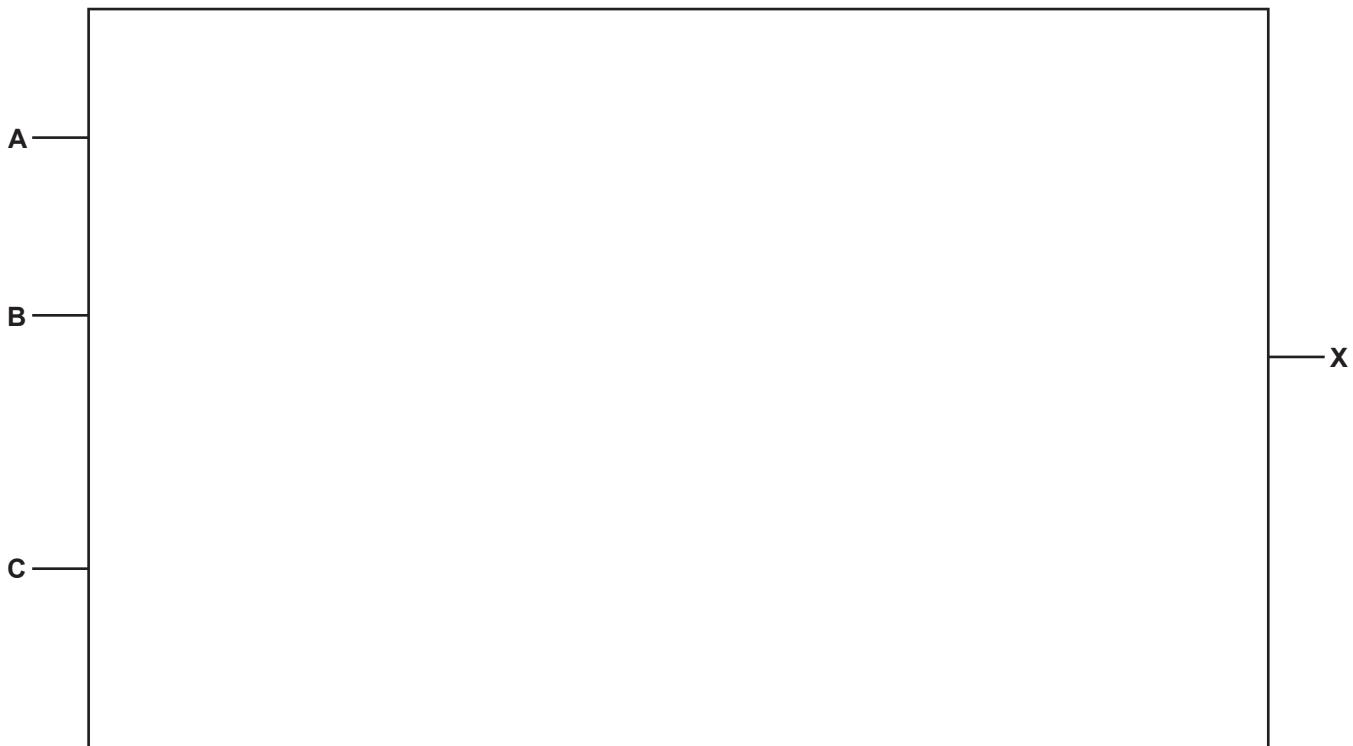
[2]

- 8 Consider the following logic statement:

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

- (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.



[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]

- 9 A parity check is used to check for errors after transmission on the **four** given binary values.

All **four** values are transmitted and received correctly.

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.

Binary value	Type of parity
10011001	
01111110	
11100000	
00111001	

[4]

- 10 (a) A denial of service (DoS) attack is a type of Internet security risk.

State the purpose of a denial of service attack.

.....
.....

[1]

- (b) Phishing and pharming are also types of Internet security risk. They have the same purpose.

State the purpose of phishing and pharming.

.....
.....

[1]

- (c) Identify **three** other types of Internet security risk.

- 1
- 2
- 3

[3]

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.



Cambridge IGCSE™

COMPUTER SCIENCE

0478/13

Paper 1

October/November 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 October/November 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.

Question	Answer		Marks							
1(a)	One mark for the correct tick		1							
	<table border="1"> <thead> <tr> <th>File Size</th> <th>Tick (✓)</th> </tr> </thead> <tbody> <tr> <td>999 kB</td> <td></td> </tr> <tr> <td>1 MB</td> <td>✓</td> </tr> <tr> <td>850 000 bytes</td> <td></td> </tr> </tbody> </table>	File Size	Tick (✓)	999 kB		1 MB	✓	850 000 bytes		
File Size	Tick (✓)									
999 kB										
1 MB	✓									
850 000 bytes										
1(b)	One mark for the correct tick		1							
	<table border="1"> <thead> <tr> <th>File Size</th> <th>Tick (✓)</th> </tr> </thead> <tbody> <tr> <td>4000 MB</td> <td></td> </tr> <tr> <td>2 GB</td> <td>✓</td> </tr> <tr> <td>2 500 000 kB</td> <td></td> </tr> </tbody> </table>	File Size	Tick (✓)	4000 MB		2 GB	✓	2 500 000 kB		
File Size	Tick (✓)									
4000 MB										
2 GB	✓									
2 500 000 kB										
Question	Answer		Marks							
2(a)	One mark for correct binary value, one mark for leading zeros 00000000 01000111		2							
2(b)	One mark for leading zeros, one mark for correct binary value 00000001 00000001		2							
2(c)	– 0516		1							
2(d)(i)	– Pressure sensor – Motion sensor		2							
2(d)(ii)	One mark for the correct tick		1							
	<table border="1"> <thead> <tr> <th>Device</th> <th>Tick (✓)</th> </tr> </thead> <tbody> <tr> <td>input</td> <td>✓</td> </tr> <tr> <td>storage</td> <td></td> </tr> <tr> <td>output</td> <td></td> </tr> </tbody> </table>	Device	Tick (✓)	input	✓	storage		output		
Device	Tick (✓)									
input	✓									
storage										
output										

Question	Answer				Marks
3(a)	One mark per each row				5
	Statement	ARQ (✓)	Check digit (✓)	Checksum (✓)	
	checks for errors on data entry		✓		
	uses a process of acknowledgement and timeout	✓			
	compares two calculated values to see if an error has occurred		✓	✓	
	may resend data until it is confirmed as received	✓			
	checks for errors in data after transmission from a computer to another			✓	
3(b)	– Parity check				1

Question	Answer	Marks
4(a)	<p>Any four from:</p> <ul style="list-style-type: none"> – Printer generates interrupt – Interrupt is given a priority – Interrupt is queued – Interrupt stops CPU from processing current task – CPU will service interrupt // Interrupt handler services interrupt ... – ... generating an output message to state there is a paper jam 	4
4(b)	<p>Any two from:</p> <ul style="list-style-type: none"> – A suitable description of any error that might occur – A peripheral is connected/disconnected – A key on a keyboard is pressed – A mouse button click – A phone/video call is received – A buffer requires more data – A printer runs out of paper – A printer runs out of ink – Opening an application – When switching from one application to another <p>NOTE: If two suitable different errors are described, this can be awarded two marks</p>	2

Question	Answer	Marks
4(c)(i)	<p>Four from:</p> <ul style="list-style-type: none"> – Bits sent one at a time – ... down a single wire – Data sent in both directions ... – ... but only one direction at a time 	4
4(c)(ii)	<p>Any two from:</p> <ul style="list-style-type: none"> – Simplex only sends data in one direction – ... so, printer may not be able to tell computer an error has occurred, and computer may not be able to send printer the document to be printed <p>NOTE: Award any valid contextual answer for MP2</p>	2

Question	Answer	Marks														
5	<p>One mark per correct term or description.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; padding: 5px;">Component name</th> <th style="text-align: center; padding: 5px;">Description</th> </tr> </thead> <tbody> <tr> <td style="padding: 10px;">Memory Address Register (MAR)</td> <td style="padding: 10px;">(A register that) holds the address of the data/instruction that needs to be fetched/processed // holds the address of where the data needs to be stored.</td> </tr> <tr> <td style="padding: 10px;">Program Counter (PC)</td> <td style="padding: 10px;">(A register that) holds the address of the next / current instruction to be processed.</td> </tr> <tr> <td style="padding: 10px;">accumulator // ACC</td> <td style="padding: 10px;">This is a register that is built into the arithmetic logic unit. It temporary holds the result of a calculation.</td> </tr> <tr> <td style="padding: 10px;">memory data register // MDR</td> <td style="padding: 10px;">This is a register that holds data or an instruction that has been fetched from memory.</td> </tr> <tr> <td style="padding: 10px;">Control Unit (CU)</td> <td style="padding: 10px;">Sends control signals to control the flow of data through the CPU // manages the execution of instructions in the CPU</td> </tr> <tr> <td style="padding: 10px;">address bus</td> <td style="padding: 10px;">This carries addresses around the CPU.</td> </tr> </tbody> </table>	Component name	Description	Memory Address Register (MAR)	(A register that) holds the address of the data/instruction that needs to be fetched/processed // holds the address of where the data needs to be stored.	Program Counter (PC)	(A register that) holds the address of the next / current instruction to be processed.	accumulator // ACC	This is a register that is built into the arithmetic logic unit. It temporary holds the result of a calculation.	memory data register // MDR	This is a register that holds data or an instruction that has been fetched from memory.	Control Unit (CU)	Sends control signals to control the flow of data through the CPU // manages the execution of instructions in the CPU	address bus	This carries addresses around the CPU.	6
Component name	Description															
Memory Address Register (MAR)	(A register that) holds the address of the data/instruction that needs to be fetched/processed // holds the address of where the data needs to be stored.															
Program Counter (PC)	(A register that) holds the address of the next / current instruction to be processed.															
accumulator // ACC	This is a register that is built into the arithmetic logic unit. It temporary holds the result of a calculation.															
memory data register // MDR	This is a register that holds data or an instruction that has been fetched from memory.															
Control Unit (CU)	Sends control signals to control the flow of data through the CPU // manages the execution of instructions in the CPU															
address bus	This carries addresses around the CPU.															

Question	Answer	Marks
6	<p>One mark per correct term in the correct order.</p> <ul style="list-style-type: none"> – MP4 – MP3 – Microphone – Compressed – MIDI – Notes – Can 	7

Question	Answer	Marks
7(a)	<p>Any four from:</p> <ul style="list-style-type: none"> – Creates an executable file – ... so, would not release source code – ... so, the source code cannot be stolen/edited. – ... so, would not need to be translated every time // so, translator is not required – ... making it machine independent 	4
7(b)(i)	<p>Any three from:</p> <ul style="list-style-type: none"> – Compression algorithm used – ..., e.g. RLE – Repeating frames/pixels are identified – ... and are collated/indexed – No data is permanently removed – It just records the changes between frames/pixels 	3
7(b)(ii)	<p>Any one from:</p> <ul style="list-style-type: none"> – Maintains quality // quality better than lossy – Original file is retained // Data is not permanently lost – A significant reduction in file size is not required 	1
7(c)(i)	<p>Any four from : (MAX 3 per software licence)</p> <p>Freeware:</p> <ul style="list-style-type: none"> – User does not have access to the source code – Has copyright – User does not have the right to edit the software – Normally distributed for free // no cost <p>Free software:</p> <ul style="list-style-type: none"> – User has access to the source code – Still has copyright // Is copyleft – User has the right to edit and share the software – Normally has a fee // cost to buy 	4
7(c)(ii)	<ul style="list-style-type: none"> – Distribute as shareware 	1
7(d)	<p>Any two from:</p> <ul style="list-style-type: none"> – URL begins with HTTPS – Padlock symbol is locked 	2

Question	Answer	Marks																																													
8(a)	<p>One mark per each correct logic gate with correct inputs</p>	6																																													
8(b)	<p>4 marks for 8 correct outputs 3 marks for 6/7 correct outputs 2 marks for 4/5 correct outputs 1 mark for 2/3 correct outputs</p> <table border="1"> <thead> <tr> <th>A</th> <th>B</th> <th>C</th> <th>Working space</th> <th>X</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> <td></td> <td>1</td> </tr> <tr> <td>0</td> <td>0</td> <td>1</td> <td></td> <td>0</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td></td> <td>1</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> <td></td> <td>1</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td></td> <td>1</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> <td></td> <td>0</td> </tr> <tr> <td>1</td> <td>1</td> <td>0</td> <td></td> <td>1</td> </tr> <tr> <td>1</td> <td>1</td> <td>1</td> <td></td> <td>1</td> </tr> </tbody> </table>	A	B	C	Working space	X	0	0	0		1	0	0	1		0	0	1	0		1	0	1	1		1	1	0	0		1	1	0	1		0	1	1	0		1	1	1	1		1	4
A	B	C	Working space	X																																											
0	0	0		1																																											
0	0	1		0																																											
0	1	0		1																																											
0	1	1		1																																											
1	0	0		1																																											
1	0	1		0																																											
1	1	0		1																																											
1	1	1		1																																											

Question	Answer	Marks
9	<ul style="list-style-type: none"> – Even – Even – Odd – Even 	4

Question	Answer	Marks
10(a)	– To disrupt the operation of a web server/network	1
10(b)	– To obtain a user's personal data	1
10(c)	Any three from: – Hacking // Cracking – Virus – Spyware – Malware	3