Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

1617936764

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.

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1 **(a)** Xia has **three** files stored on her computer.

Tick (✓) **one** box to show which is the largest file size.

File size	Tick (✓)
999 kB	
1 MB	
850 000 bytes	

[1]

(b) Denise has **three** files stored on her computer.

Tick (✓) **one** box to show which is the smallest file size.

File size	Tick (✓)
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:

000000100000100

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 (✓) **one** box to show if a sensor is an example of an input device, storage device or output device.

Device	Tick (✓)
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 .....

.....

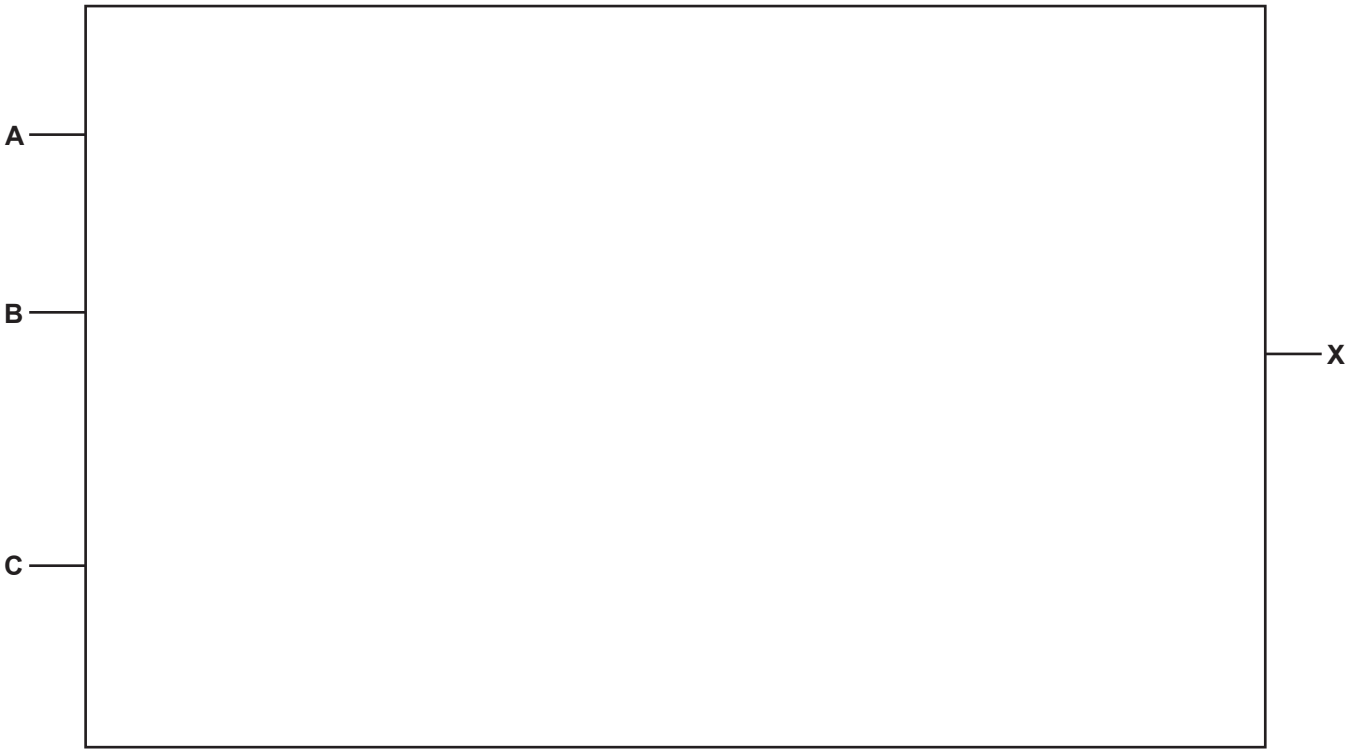
[2]

8 Consider the following logic statement:

X = (((**A** OR **B**) AND (NOT(**B** XOR **C**))) OR 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]

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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.

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[Turn over

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.

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1(a)</td><td>One mark for the correct tick
<table><tr><th>File Size</th><th>Tick (✓)</th></tr><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></table></td><td>1</td></tr>
<tr><td>1(b)</td><td>One mark for the correct tick
<table><tr><th>File Size</th><th>Tick (✓)</th></tr><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></table></td><td>1</td></tr>
</table>

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 **Device** / **Tick (✓)** input ✓ storage output	**1**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>3(a)</td><td>One mark per each row

<table>
<tr><th>Statement</th><th>ARQ (✓)</th><th>Check digit (✓)</th><th>Checksum (✓)</th></tr>
<tr><td>checks for errors on data entry</td><td></td><td>✓</td><td></td></tr>
<tr><td>uses a process of acknowledgement and timeout</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>may resend data until it is confirmed as received</td><td>✓</td><td></td><td></td></tr>
<tr><td>checks for errors in data after transmission from a computer to another</td><td></td><td></td><td>✓</td></tr>
</table></td><td>5</td></tr>
<tr><td>3(b)</td><td>– Parity check</td><td>1</td></tr>
</table>

Question	Answer	Marks
4(a)	Any **four** from: – 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)	Any **two** from: – 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 **NOTE:** If two suitable different errors are described, this can be awarded two marks	**2**

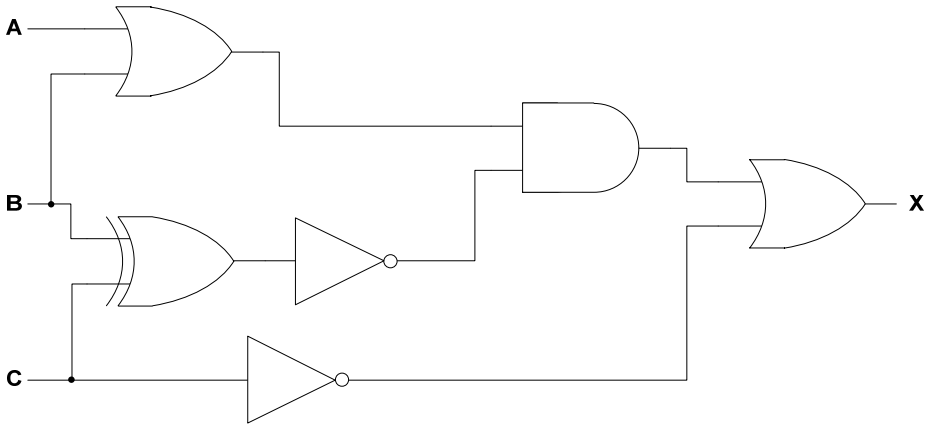
Question	Answer	Marks
4(c)(i)	**Four** from: – Bits sent **one at a time** – … down a single wire – Data sent in both directions … – … but only one direction at a time	**4**
4(c)(ii)	Any **two** from: – Simplex only sends data in one direction – … so, printer may not be able to tell computer an error has occurred, and computer may not be able to send printer the document to be printed **NOTE:** Award any valid contextual answer for MP2	**2**

Question	Answer	Marks
5	**One** mark per correct term or description.	**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	**One** mark per correct term in the correct order. – MP4 – MP3 – Microphone – Compressed – MIDI – Notes – Can	**7**

Question	Answer	Marks
7(a)	Any **four** from: – 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)	Any **three** from: – 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)	Any **one** from: – 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)	Any **four** from : (MAX 3 per software licence) Freeware: – 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 Free software: – 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)	– Distribute as shareware	**1**
7(d)	Any **two** from: – URL begins with HTTPS – Padlock symbol is locked	**2**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>8(a)</td><td>One mark per each correct logic gate with correct inputs
.
 
</td><td>6</td></tr>
<tr><td>8(b)</td><td>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

<table>
<tr><th>A</th><th>B</th><th>C</th><th>Working space</th><th>X</th></tr>
<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>
</table></td><td>4</td></tr>
</table>

Question	Answer	Marks
9	– 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**