Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

2152459291

COMPUTER SCIENCE **0478/13**

Paper 1 Theory **October/November 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.

1 **Five** components are shown.

Tick (✓) to show whether each component is an example of input, output or storage.

Component	Input (✓)	Output (✓)	Storage (✓)
actuator			
register			
sensor			
mouse			
Digital Versatile Disc (DVD)			

[5]

2 **(a)** Denary values are converted to binary values to be processed by a computer.

Draw **one** line from each denary value to the correctly converted 8-bit binary value.

Denary	8-bit binary
	11110101
72	01110010
	11100101
245	00010101
15	00001111
	01001000

Working space

.....

.....

.....

.....

[3]

(b) Binary values can be converted to hexadecimal values.

Give the hexadecimal value for the 16-bit binary value 0000100110101110

.....

Working space

.....

.....

.....

[3]

3 Jessica wants to store a large number of small thumbnail images on a USB flash memory drive. Each thumbnail image is 16-bit colour and is 100 pixels wide and 100 pixels high.

She has 5 MB of storage space available on her USB flash memory drive.

Calculate how many images she can store in the 5 MB of storage space. Show all your working.

.....

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.....

.....

Number of images .....

[4]

4 A company wants to manufacture a mobile phone.

(a) The company needs to decide which touch screen technology to use.

State **one** type of touch screen technology that you recommend the company use.

Justify your choice.

Touch screen type .....

Justification .....

.....

.....

.....

.....

..... [4]

(b) The mobile phone uses Random Access Memory (RAM) and Read Only Memory (ROM).

RAM and ROM are both examples of the same type of storage.

Identify this type of storage and justify your answer.

.....

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..... [2]

(c) The mobile phone has a USB port to allow a USB connection to a computer.

(i) Describe how data is transmitted using a USB connection.

.....

.....

.....

..... [2]

(ii) One benefit of a USB connection is that the cable can only be inserted into the port one way, so an incorrect connection cannot be made.

Give **three** other benefits of using a USB connection to connect a mobile phone to a computer.

Benefit 1 .....

.....

Benefit 2 .....

.....

Benefit 3 .....

.....
[3]

(d) When a user is reading a text on the mobile phone, they may also get a telephone call on the mobile phone. An interrupt signal is generated that results in an output to inform the user that a person is calling them.

Describe how the interrupt signal is processed to inform the user that a person is calling them.

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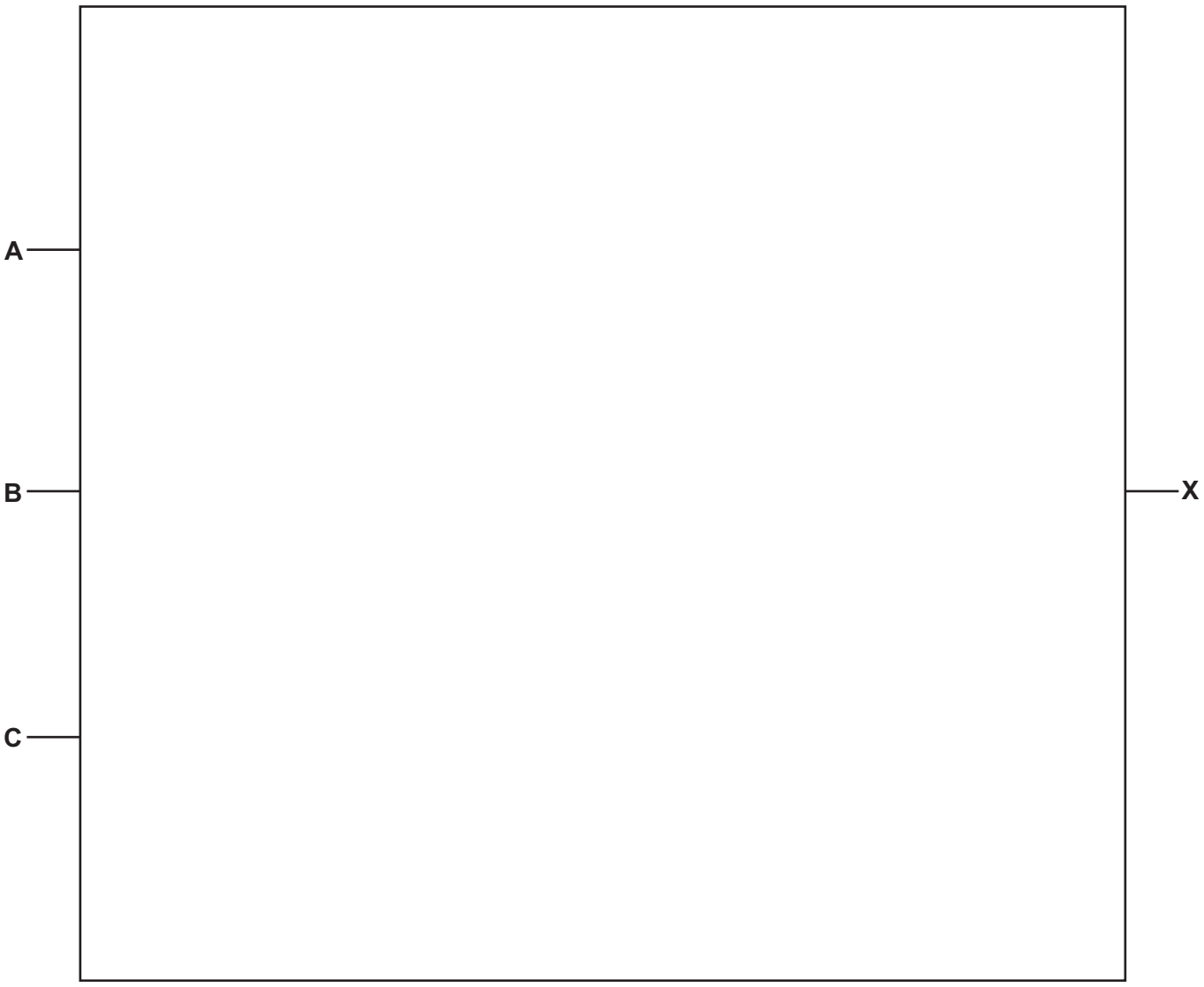
..... [4]

5 Consider the logic statement:

X = ((((**B** AND **C**) OR NOT **C**) NOR **B**) XOR NOT **A**)

(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]

6 A museum has Quick Response (QR) codes that allow visitors to view videos for extra information about items in the museum.

The visitor is given a portable device with a display screen, that they can use to read each QR code.

(a) Describe how the QR code is read and processed to display the video for the visitor.

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..... [4]

(b) Tick (✓) to show whether the videos are MP3 files, MP4 files or MIDI files.

	Tick (✓)
MP3 files	☐
MP4 files	☐
MIDI files	☐

[1]

(c) The video files are compressed using lossy compression.

Give **two** benefits of using lossy compression to compress the video files.

Benefit 1 .....

.....

Benefit 2 .....

.....

[2]

(d) The portable device has a Light-Emitting Diode (LED) display screen to allow the visitor to watch a video.

Describe how the LED screen operates to display the video.

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..... [4]

7 The paragraph explains how an instruction is processed by the Central Processing Unit (CPU).

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

- address bus
- Arithmetic Logic Unit (ALU)
- calculations
- data bus
- decoded
- execute
- fetched
- interrupt
- Memory Address Register (MAR)
- Memory Data Register (MDR)
- Program Counter (PC)
- protocol
- ROM
- stored

An instruction is ..... from RAM into the CPU, where it is temporarily stored in the ..... . The instruction is then sent along the ..... to the Control Unit (CU) to be ..... . The ..... will then perform any ..... and logic operations that are required to ..... the instruction.

[7]

8 A computer can have both a Media Access Control (MAC) address and an Internet Protocol (IP) address.

(a) Give **two** similarities between a MAC address and an IP address.

Similarity 1 .....

.....

Similarity 2 .....

.....

[2]

(b) Give **two** differences between a MAC address and an IP address.

Difference 1 .....

.....

Difference 2 .....

.....

[2]

9 A system uses parity checks and Automatic Repeat reQuests (ARQ) to detect and correct errors in the transmission of data.

Describe how parity checks and ARQ operate together to detect and correct errors.

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..... [6]

10 Mario has a website that he uses to sell his artwork.

(a) The website uses HTTPS to transmit data.

(i) Describe what is meant by HTTPS.

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.....

.....

.....

.....

..... [3]

(ii) One way a user can check a website uses HTTPS is to check whether the Uniform Resource Locator (URL) begins with HTTPS.

Give **one** other way a user can check if a website uses HTTPS.

.....

..... [1]

(b) There is a risk that people that use the Internet to access websites can have their stored data maliciously damaged.

State **three** ways that stored data can be maliciously damaged.

1 .....

2 .....

3 .....
[3]

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

PUBLISHED

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

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

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

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

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Please note the following further points:

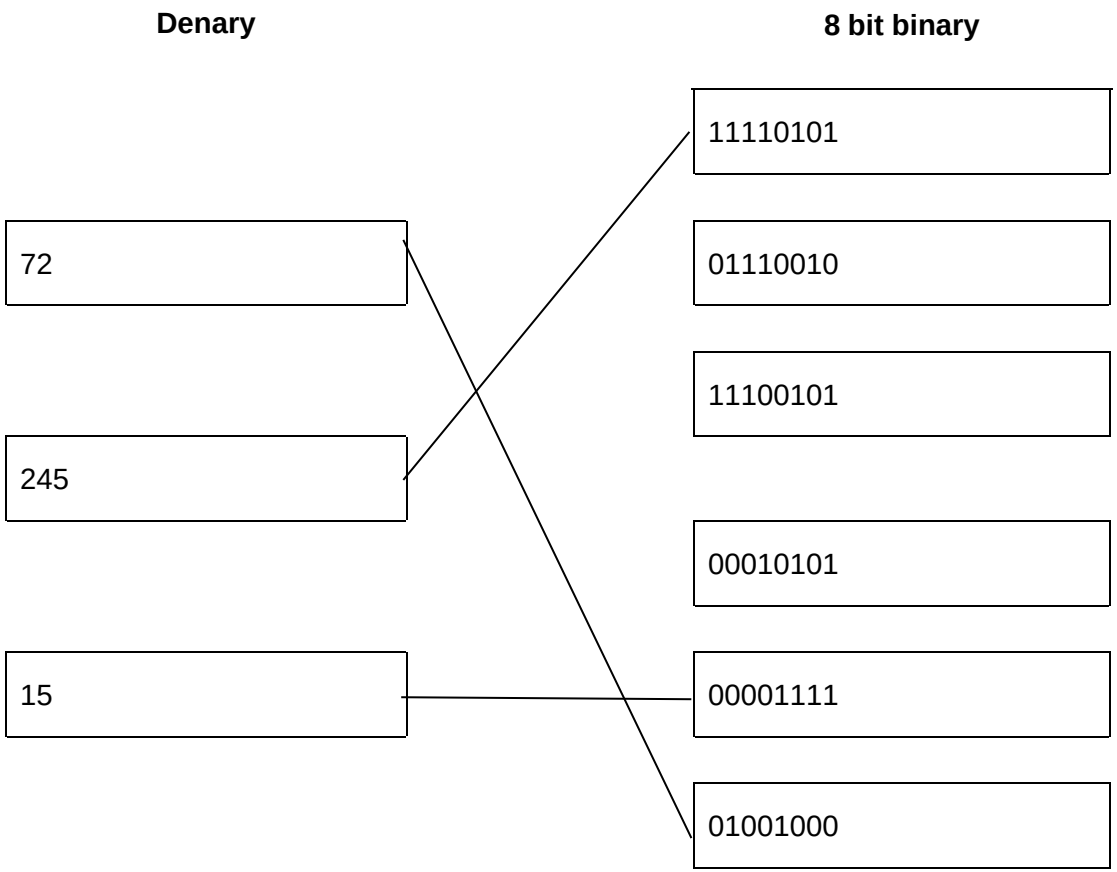
The words in **bold** in the mark scheme are important text that needs to be present, or some notion of it needs to be present. It does not have to be the exact word, but something close to the meaning.

If a word is underlined, this **exact** word must be present.

A single forward slash means this is an alternative word. A double forward slash means that this is an alternative mark point.

Ellipsis (…) on the end of one-mark point and the start of the next means that the candidate **cannot** get the second mark point without being awarded the first one. If a mark point has an ellipsis at the beginning, but there is no ellipsis on the mark point before it, then this is just a follow-on sentence and **can** be awarded **without** the previous mark point.

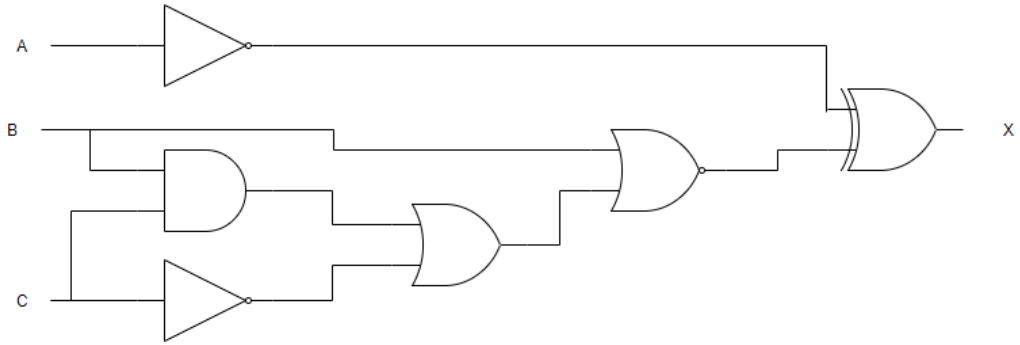
<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1</td><td>One mark for each correct row
<table>
<tr><th>Component</th><th>Input (✓)</th><th>Output (✓)</th><th>Storage (✓)</th></tr>
<tr><td>actuator</td><td></td><td>✓</td><td></td></tr>
<tr><td>register</td><td></td><td></td><td>✓</td></tr>
<tr><td>sensor</td><td>✓</td><td></td><td></td></tr>
<tr><td>mouse</td><td>✓</td><td></td><td></td></tr>
<tr><td>Digital Versatile Disc (DVD)</td><td></td><td></td><td>✓</td></tr>
</table></td><td>5</td></tr>
</table>

Question	Answer	Marks
2(a)	**One** mark for each correct line  	**3**
2(b)	**One** mark for two correct characters, **two** marks for three correct characters, **three** marks for four correct characters, in the correct place • 09AE	**3**

Question	Answer	Marks
3	**One** mark for the correct answer • 262 // 250 **Three** marks for three stages of working • 100 × 100 • 10 000 * 16 then / 8 // 10 000 *2 • 20 000 / 1024 or 1000 = 19.5 kB // 20 kB • 5 × 1024 = 5120 // 5 × 1000 = 5000 • 5120 / 19.5 // 5000 / 20	**4**

Question	Answer	Marks
4(a)	**One** mark for a type of touchscreen technology, **three** marks for benefits • Resistive • … cheap to **manufacture/buy** • … more simple/easier technology to **manufacture** • … less affected by weather // more waterproof • … does not need bare finger // can be pressed with most things • … screen less likely to shatter/break • … lower power consumption • … (can) support multitouch • Capacitive • … good **visibility** in sunlight • … supports multitouch • … more longevity • … faster response times • … requires less/no pressure • … high quality **image/screen** • … doesn't need to be calibrated • … if screen is shattered, it will still register touch • Infrared • … good **visibility** in sunlight • … supports multitouch • … does not need bare finger // can be pressed with most things • … high quality **image/screen** • … if screen is shattered, it will still register touch • … does not need to be calibrated • … requires less/no pressure • … faster response times	**4**

Question	Answer	Marks
4(b)	**One** mark for the correct storage type and **one** mark for the explanation • Primary storage • Both **directly accessed** by the **CPU**	**2**
4(c)(i)	Any **two** from: • Using serial transmission • Data is sent one bit **at a time** • Data is sent down a single wire	**2**
4(c)(ii)	Any **three** from: • It can charge/power the device • It is a universal/industry standard • Fast rate of data transfer • Supports different data transmission speeds • **Automatically** detects the phone • Backward compatible • Little chance of data being skewed	**3**
4(d)	Any **four** from: • The interrupt signal is **sent to the CPU/processor** • The CPU stops the task it is currently processing … • … to service the interrupt • An interrupt service routine is used (to service the interrupt) • Once the interrupt is serviced, a message is displayed to notify the user of the call	**4**

Question	Answer	Marks
5(a)	**One** mark for each correct logic gate with the correct inputs 	**6**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>5(b)</td><td>
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

<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>0</td></tr>
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<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>0</td></tr>
</table>
</td><td>4</td></tr>
</table>

Question	Answer	Marks
6(a)	**Four** from: • The device shines a light/laser onto the QR code • Corners of code are used to determine position/orientation • Black and white sections of code reflect light differently • The device captures the light that is reflected back … • … using sensors • The light reflections are converted to binary • Link/URL to **video** is stored in the QR code	**4**
6(b)	• MP4	**1**
6(c)	Any **two** from: • Reduces the size of the **file** • Takes up less storage space • Quicker to transmit to device • Use less bandwidth • Less buffering	**2**
6(d)	**Four** from: • **Display** made up of pixels • … that are arranged in a matrix • LEDs are behind the screen • Light shone at pixels • Can have diffuser is used to distribute light evenly • RGB filters used • … and are mixed to create different colours	**4**

Question	Answer	Marks
7	**One** mark for each correct term in the correct order • Fetched • MDR • Data bus • Decoded • ALU • Calculations • Execute	**7**

Question	Answer	Marks
8(a)	Any **two** from: • They are both unique addresses • They can both be used to **identify** a device (on a network) • They are both assigned to hardware • They can both be represented as hexadecimal	**2**
8(b)	Any **two** from: e.g. • A MAC address is assigned by the manufacturer, whereas an IP address is assigned by the network/router/ISP • A MAC address is represented as hexadecimal, whereas an IP address can sometimes be represented as numeric • A MAC address is normally static, whereas an IP address can be dynamic • A MAC address has 6 groups of digits, whereas an IP address has 4/8 groups • A MAC address is 6 bytes (48 bit), whereas an IP address is 4/16 bytes (32/128 bit)	**2**

Question	Answer	Marks
9	Any **six** from (MAX four for ARQ): • Odd or even parity is **set/agreed** for the data • A parity bit is added to each byte of data • … to make the number of 1s match parity • Data is checked after transmission to see if parity is correct • ARQ uses acknowledgement and timeout • If no error is found, a positive acknowledgement is sent to the sender / no acknowledgement is sent to the sender • If an error is found, a negative acknowledgement is sent to the sender … • … that triggers the data to be resent • When the data is sent, a timer is started • If an acknowledgement is not received within the time set, the data is resent ... • … until an acknowledgement is received / resend limit is reached	**6**

Question	Answer	Marks
10(a)(i)	Any **three** from: • It is a secure protocol // hypertext transfer protocol secure • It is a set of rules for data transmission • It combines HTTP and SSL/TLS to transmit data • It encrypts data for transmission	**3**
10(a)(ii)	Any **one** from: • Look for a locked padlock • Check the digital certificate	**1**
10(b)	Any **three** from: • Hacking • Virus • Malware **Note**: If three different types of correct malware are given, they can be awarded.	**3**