



CANDIDATE  
NAME

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CENTRE  
NUMBER

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CANDIDATE  
NUMBER

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## 0478/11

October/November 2021

**1 hour 45 minutes**

No additional materials are needed.

- 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.

- 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 (✓) **one** box to show whether binary is a base-2, base-10 or base-16 number system.

Tick (✓)

☐

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 <b>two</b> calculated values to see if an error has occurred			
will <b>not</b> 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 .....

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

[3]

(ii) To translate the final program and upload to the website for distribution, without the source code.

Translator .....

Benefits .....

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

[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 <b>not</b> overloaded	

[3]

- (b)** Describe how the sensor and the microprocessor are used to make sure the water remains at 30 °C.

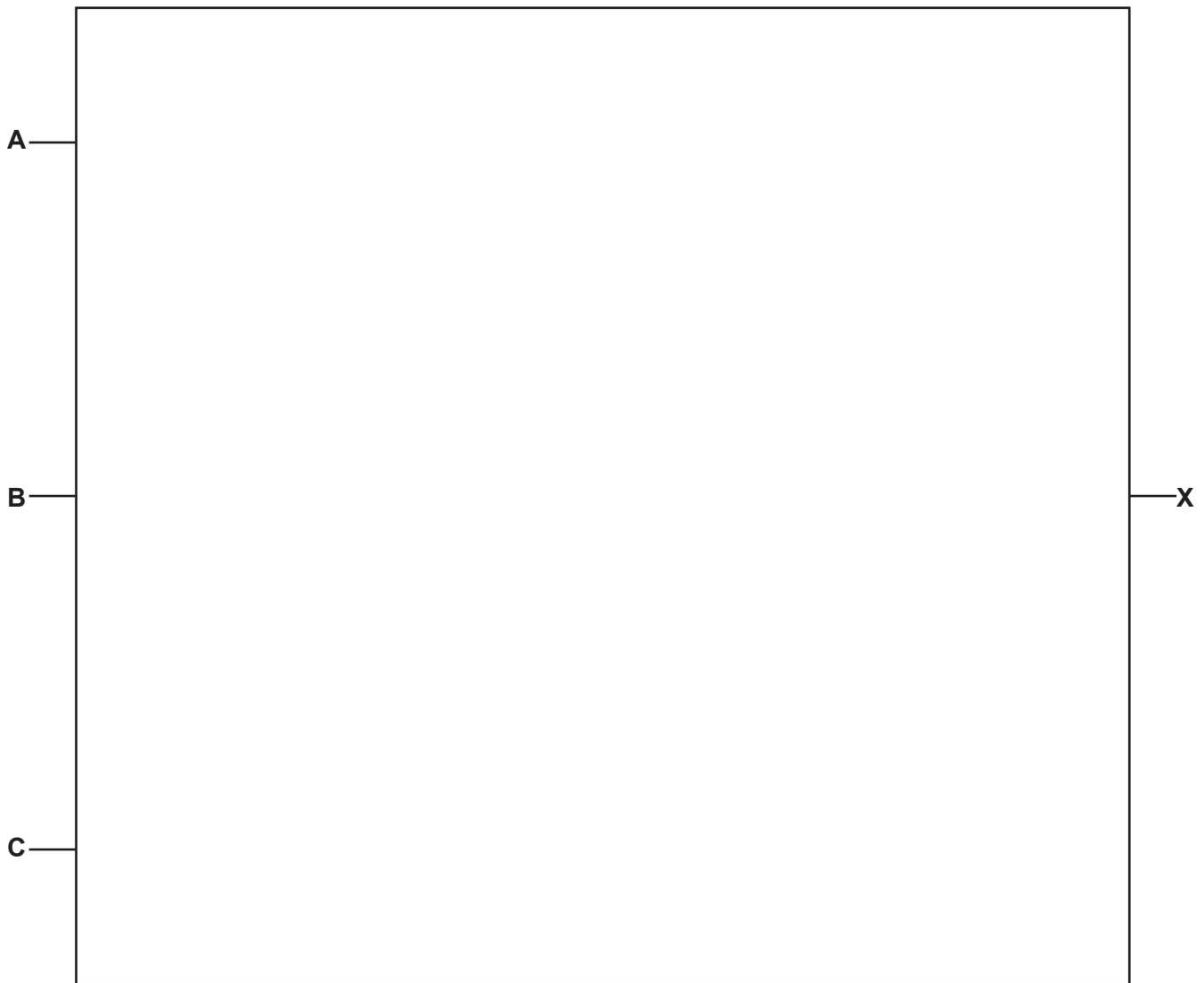
..... [6

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.

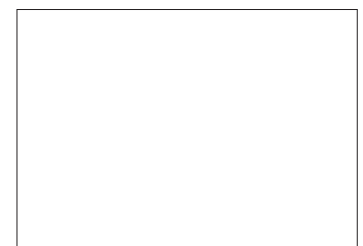


[5]

(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]

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# Cambridge IGCSE™

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**COMPUTER SCIENCE**

**0478/11**

Paper 1

**October/November 2021**

**MARK SCHEME**

Maximum Mark: 75

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**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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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)	<b>One</b> mark per each correct row.				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 <b>two</b> calculated values to see if an error has occurred	✓	✓		
	will <b>not</b> 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><b>Two</b> marks for any <b>two</b> correct workings and <b>one</b> mark for the correct answer.</p> <p>Working:</p> <ul style="list-style-type: none"> <li>– <math>100 \times 50 = 5000</math> bits</li> <li>– <math>5000 \times 8 = 40,000</math> bits</li> <li>– <math>40,000 / 8 = 5,000</math> bytes</li> <li>– <math>5,000 \times 10 = 50,000</math> bytes</li> <li>– <math>50,000 / 1024</math></li> </ul> <p>Answer: 48.83 kB // 49 kB</p> <p><b>NOTE:</b> Alternative correct methods of working can be credited. Answer can be given to any number of dp.</p>	<b>3</b>
4(b)	<p><b>One</b> mark per correct method, <b>two</b> marks per justification.</p> <ul style="list-style-type: none"> <li>– Lossless</li> <li>– Lossy would remove data <b>permanently</b> // lossless would not remove any data <b>permanently</b> // File could be restored to original ...</li> <li>– ... that could affect the quality (lossy) // ... to maintain the quality (lossless)</li> </ul>	<b>3</b>
4(c)	<ul style="list-style-type: none"> <li>– Light</li> <li>– Lens</li> <li>– Charge-coupled</li> <li>– Analogue-to-digital</li> <li>– Pixel</li> </ul>	<b>5</b>

Question	Answer	Marks
5(a)	<p>Any <b>two</b> from:</p> <ul style="list-style-type: none"> <li>– Encryption</li> <li>– Biometric device</li> <li>– Firewall</li> <li>– Anti-spyware</li> <li>– Two-factor authentication // two-step verification</li> </ul>	<b>2</b>
5(b)	<p>Any <b>two</b> from:</p> <ul style="list-style-type: none"> <li>– Interrupt / error-handling</li> <li>– Peripheral management</li> <li>– Providing user interface</li> <li>– Platform for running applications // installing / removing software</li> <li>– Manages security // access rights/levels // user account management</li> <li>– Managing time slicing // multitasking</li> </ul>	<b>2</b>

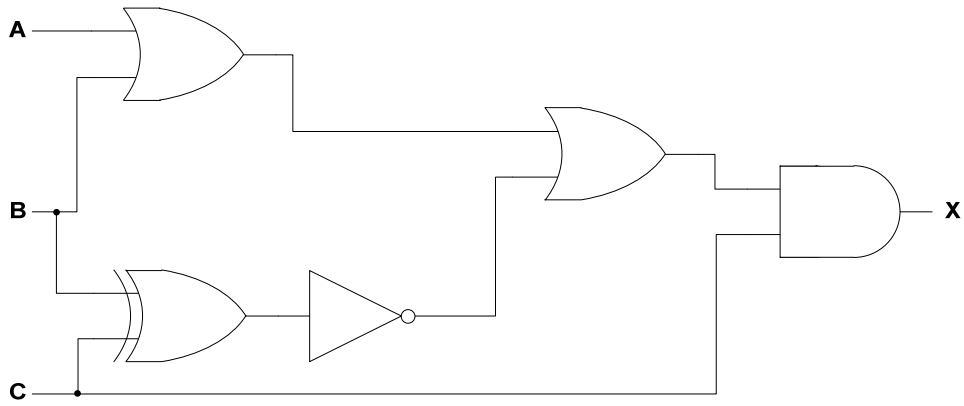
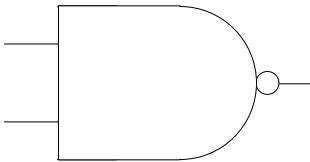
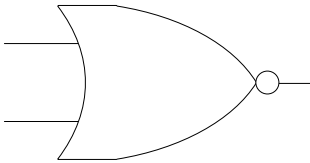


Question	Answer	Marks																												
6(a)	<p><b>One</b> mark per each correct row.</p> <table><tr><th>Statement</th><th>MAR (✓)</th><th>MDR (✓)</th><th>PC (✓)</th></tr><tr><td>it is a register in the CPU</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>it holds the address of the next instruction to be processed</td><td>(✓)</td><td></td><td>✓</td></tr><tr><td>it holds the address of the data that is about to be fetched from memory</td><td>✓</td><td></td><td>(✓)</td></tr><tr><td>it holds the data that has been fetched from memory</td><td></td><td>✓</td><td></td></tr><tr><td>it receives signals from the control unit</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>it uses the address bus to send an address to another component</td><td>✓</td><td></td><td>✓</td></tr></table>	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
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)	<p><b>One</b> mark per correct storage, <b>two</b> marks for justification.</p> <ul style="list-style-type: none"> <li>– Secondary</li> <li>– It is non-volatile storage</li> <li>– It is not directly accessed by the CPU</li> </ul>	<b>3</b>
7(b)	<p>Any <b>four</b> from:</p> <ul style="list-style-type: none"> <li>– Uses flash memory</li> <li>– Data is flashed onto (silicon) chips</li> <li>– Uses NAND/NOR technology // Can use flip-flops</li> <li>– Uses transistors/control gates/floating gates ...</li> <li>– ... to control the flow of electrons</li> <li>– It is a type of EEPROM technology</li> <li>– When data is stored the transistor is converted from 1 to 0 / 0 to 1</li> <li>– Writes (and reads) sequentially</li> </ul>	<b>4</b>

Question	Answer	Marks
8(a)	– High-level	1
8(b)(i)	<b>One</b> mark for the correct translator, <b>two</b> marks for the benefit(s). <ul style="list-style-type: none"> <li>– Interpreter</li> <li>– Easier to debug</li> <li>– ... as errors are immediately reported when detected</li> <li>– Compiler</li> <li>– All errors are reported in a single report</li> <li>– ... meaning they can all be fixed at the same time</li> <li>– No need to recompile code every time a test is run</li> </ul>	3
8(b)(ii)	<b>One</b> mark for the correct translator, <b>two</b> marks for the benefits. <ul style="list-style-type: none"> <li>– Compiler</li> <li>– Creates an executable file</li> <li>– ... so, translator is no longer needed to run it</li> <li>– Source code cannot be stolen // can be provided without the source code</li> </ul>	3

Question	Answer	Marks								
9(a)	<div>One mark per each correct sensor.</div> <table><tr><th>Task</th><th>Sensor</th></tr><tr><td>checking the water is 30 °C</td><td>Temperature</td></tr><tr><td>checking the water acidity level after detergent is added</td><td>pH</td></tr><tr><td>checking the weight of the clothes to make sure that the machine is <b>not</b> overloaded</td><td>Pressure</td></tr></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 <b>not</b> 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 <b>not</b> overloaded	Pressure									
9(b)	<div><b>Six</b> from:</div> <div><ul style="list-style-type: none"><li>– Sensor sends data to microprocessor</li><li>– Data is converted from analogue to digital (using ADC)</li><li>– Data is compared to stored value (of 30)</li></ul></div> <div>If data is below 30 then a <b>microprocessor sends signal</b> is sent to a heater to heat the water up/add hot water</div> <div><ul style="list-style-type: none"><li>– if data is above 30 then a <b>microprocessor sends signal</b> is sent to turn the heater off to allow the water to cool down/add cold water</li><li>– Actuator used to turn headset on/off // Actuator used to add water</li><li>– If data is 30 then no action is taken</li><li>– It is a continuous process</li></ul></div>	6								

Question	Answer	Marks
10(a)	<p><b>One</b> mark per each correct logic gate with the correct input(s).</p> 	<b>5</b>
10(b)	<p><b>One</b> mark per logic gate name and <b>one</b> mark per correct drawing.</p> <p>– NAND</p>  <p>– NOR</p> 	<b>2</b>

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.		<b>5</b>
	<b>Terms</b>	<b>Description</b>	
	<b>HTML</b>	the language used to create a web page	
	<b>Browser</b>	the type of software application used to display a web page	
	<b>IP address</b>	an address given to a computer, by a network, to allow the computer to be uniquely identified	
	<b>Cookie</b>	a text file sent by a web server to collect data about a user's browsing habits	
	<b>Internet Service Provider // ISP</b>	the company that provides a connection to the Internet	