Cambridge Assessment International Education

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.

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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).

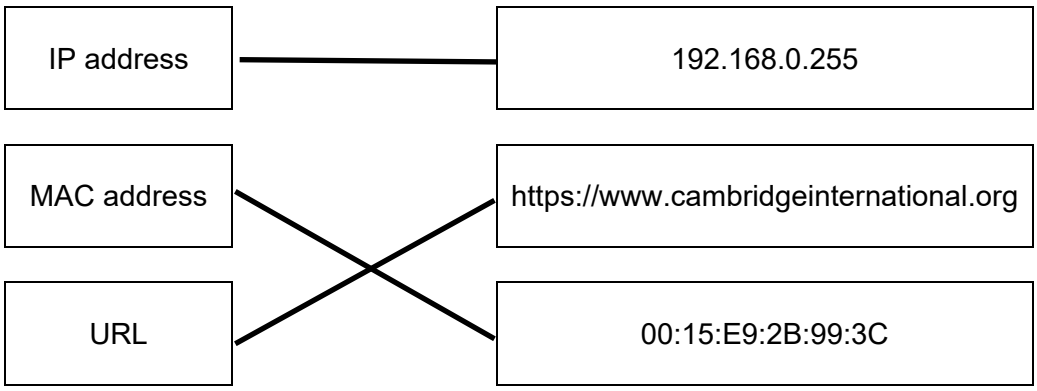
GENERIC MARKING PRINCIPLE 6:

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>1 mark each
<table>
<tr><th>Denary Value</th><th colspan="8">8-bit binary</th></tr>
<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>
</table></td><td>2</td></tr>
<tr><td>1(b)</td><td>– 255</td><td>1</td></tr>
<tr><td>1(c)</td><td>– 11</td><td>1</td></tr>
<tr><td>1(d)(i)</td><td>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</td><td>3</td></tr>
<tr><td>1(d)(ii)</td><td>– Transmission in both directions …
– …not at the same time // asynchronous</td><td>2</td></tr>
<tr><td>1(d)(iii)</td><td>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</td><td>3</td></tr>
</table>

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**

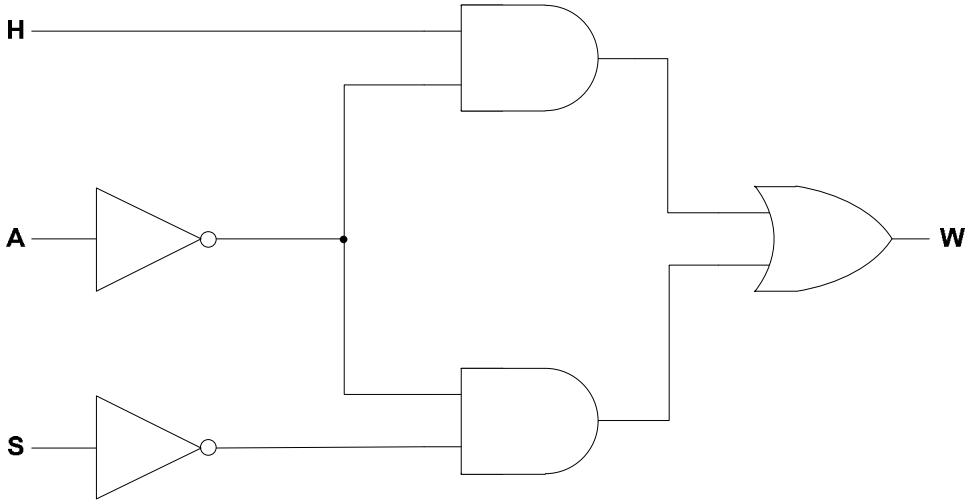
Question	Answer	Marks
2(b)	1 mark for 1 line, 2 marks for 3 lines **Term** **Details**  	**2**
2(c)(i)	– Data if intercepted cannot be understood // Data is **encrypted** // Data is **scrambled** // uses keys to **encode/decode** data	**1**
2(c)(ii)	**Four** from: – Uses (digital) **certificates** – ….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**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>3</td><td>One mark for each device/description
<table>
<tr><th>Name of device</th><th>Description</th></tr>
<tr><td><u>Inkjet</u> Printer</td><td>Uses either thermal bubble or piezoelectric technology</td></tr>
<tr><td>Actuator</td><td>– 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>– 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>
</table></td><td>4</td></tr>
</table>

Question	Answer	Marks
4(a)	**Six** from Max **four** from: – 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 Max **three** from: – 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)	Max **three** from: – 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)	Max **one** from: – Faster read/write operation – Produces less heat // needs less cooling – Less susceptible to interference/magnets – Less power consumption	**1**

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

Question	Answer	Marks
5(b)	**One** mark for each logic gates with correct inputs  – NOT A – NOT S – H AND NOT A – NOT A AND NOT S – Final OR	**5**

Question	Answer	Marks
6(a)	Any **four** from: – 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)	**One** mark for risk, **two** marks for description – 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)	Any **two** from: – 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)	**Four** from **Max 2** for only giving compiler/interpreter features – **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)	Any **five** from: – 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)	– Claiming another person's work **as your own**	**1**
7(e)	– To identify legal ownership // to claim ownership // protect intellectual property	**1**

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Question	Answer	Marks
8(a)	– **Instructions** and **data** stored in the same/main memory – Instructions fetched and executed in order / one after another / in sequence	**2**
8(b)(i)	– Holds the **address** … – … of **next** / **current** instruction	**2**
8(b)(ii)	Any **two** from: – 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: – 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**

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