Cambridge Assessment International Education

Cambridge International AS & A Level

COMPUTER SCIENCE **9608/31**

Paper 3 Advanced Theory **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.

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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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Question	Answer	Marks
1(a)	Exponent = 5 (conversion of exponent to denary) 0.00011 or 0.09375 or 3/32 (value of mantissa) //moving of binary point 3 (answer)	**3**
1(b)(i)	Mantissa = 011000000000 Exponent = 0010	**2**
1(b)(ii)	Any **two** from Precision lost Redundant leading zeros in the mantissa Bits lost off right hand end / least significant end Multiple representations of a single number	**2**

Question	Answer	Marks

2(a)(i)	Composite
	`box`
	Non-composite
	`size` / enumerated
	`REAL`
	`STRING`
		4

2(a)(ii)	`size`	**1**

2(b)	`myBox[1].volume ← medium`
	`myBox[1].price ← 10.99`
	`myBox[1].colour ← "red"`
		3

Question	Answer	Marks
3(a)(i)	Any **five** from A layered model / stack … with 4 layers Uses a set of protocols for transmission of data .. transport control protocol with internet protocol Named layers of Application Layer, Transport Layer, Internet/Network Layer, Data Link Layer two layers correct … … all four layers correct … in the correct order	**5**

Question	Answer	Marks
3(a)(ii)	**One** mark for protocol, **four** marks for description Protocol: BitTorrent Description: Any **four** from BitTorrent client software made available to friends and family's computers a complete copy of the torrent/file to be shared is available on at least one computer the torrent/file is split into small pieces… … rare pieces are given priority for downloading the torrent descriptor file is made available a computer/user joins (the swarm) by using the BitTorrent software to load the torrent descriptor file the computer/user can now download a piece of the torrent/file once a computer has a piece/ the whole file, it can become a seed (and upload to other members of the swarm) pieces of the torrent/file are both downloaded and uploaded (by each member of the of the swarm) a server called a tracker keeps records of all the computers in the swarm the tracker shares their IP addresses allowing connection to each other	**5**
3(b)(i)	**One** mark for method Method: Packet switching **Three** marks for description, any **three** from Description: file is divided into packets … and necessary data added to each packet, e.g. header which are sent independently of each other and do not need to take the same route packets are reassembled at the destination missing / corrupt packets can be resent	**4**

3(b)(ii)	**One** mark for benefit, **one** mark for drawback
	
	Benefit:
	packets can be rerouted if there are problems
	// packets can take the least congested route
	// transmission errors can be detected
	// missing / corrupt packets can be resent
	
	Drawback: packets can be dropped / delayed
		2

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>4(a)</td><td>For each expression, 2 marks all products correct no incorrect products seen, 1 mark 2 or 3 products correct, max 4

$X = \overline{A}.\overline{B}.C + \overline{A}.B.\overline{C} + A.\overline{B}.\overline{C} + A.B.C$
$Y = \overline{A}.B.C + A.\overline{B}.C + A.B.\overline{C} + A.B.C$</td><td>4</td></tr>
<tr><td>4(b)</td><td>One mark for each correct K-map max 2

OUTPUT X
AB
<table>
<tr><th></th><th>00</th><th>01</th><th>11</th><th>10</th></tr>
<tr><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td></tr>
</table>
C

OUTPUT Y
AB
<table>
<tr><th></th><th>00</th><th>01</th><th>11</th><th>10</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr>
</table>
</td><td>2</td></tr>
<tr><td>4(c)(i)</td><td>One mark for OUTPUT X no loops
OUTPUT Y one mark vertical loop correct one mark horizontal loops correct

OUTPUT X
AB
<table>
<tr><th></th><th>00</th><th>01</th><th>11</th><th>10</th></tr>
<tr><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td></tr>
</table>
C

OUTPUT Y
AB
<table>
<tr><th></th><th>00</th><th>01</th><th>11</th><th>10</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr>
</table>
</td><td>3</td></tr>
<tr><td>4(c)(ii)</td><td>One mark for each correct product and no incorrect products max 3

A.B + B.C + A.C</td><td>3</td></tr>
<tr><td>4(d)</td><td>Logic circuit: Full Adder
X: Sum
Y: Carry</td><td>3</td></tr>
</table>

Question	Answer	Marks
5	Software / a program Physical / different Guest Host	**4**

Question	Answer	Marks
6(a)	**Three** marks similarities, **three** marks differences max 4 Similarities: any **three** from Both used in asymmetric … encryption … as a pair of keys is required … one is used to encrypt the data/message and the other is used to decrypt the data/message Both hashing algorithms Differences: any **three** from Private key **only** known to owner of the key pair …The public key can be distributed to anyone When messages are sent to the owner of a public key, they are encrypted with the **owners public key** …so they can only be decrypted by the **owner's private key** Message digests are encrypted with the **private key of the sender** to form a digital signature … messages are encrypted with the **public key of the receiver**	**4**
6(b)	**Three** marks similarities, **three** marks differences max 4 Similarities: any **three** from Both used for authentication Both are unique to the **owner/subject** Include / use owner's public key include / make use of hash algorithm Differences: any **three** from Certificate obtained from issuing authority … signature created from a message Certificate provides authentication of owner …Signature used to authenticate messages that are sent by the owner Certificate remains unchanged whilst it is valid …new signature created for every message Only certificate provides extra information Only signature makes use of a private key	**4**

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Question	Answer	Marks
6(c)	**Three** marks similarities, **three** marks differences max 4 Similarities: any **three** from Both malware / malicious software Both collect personal / sensitive data …via **fake** websites …the data are then used illegally Differences: any **three** from Phishing uses (malicious) emails … … that **direct users** to fake websites Pharming misdirects browser to a bogus website … by modifying entries on a DNS server … or by being installed on your computer	**4**

Question	Answer	Marks
7(a)	108 kilometres 10.25 litres Load unstable	**3**
7(b)	**One** mark for 801 correct **One** mark for 802 correct **One** mark for 803 correct 801 **0 1 1 1 1 0 0 0** 802 **1 0 0 0 1 1 0 1** 803 **1 0 0 1 0 0 0 0**	**3**

7(c)(i)	Loading 0 and storing in `801` and `802`
	Loading 240
	…and storing in `803`
	
	`LDM #0/B00000000/&(0)0`
	`STO 801`
	`STO 802`
	`LDM #240/B11110000/&F0`
	`STO 803`
		3

7(c)(ii)	`&40 / #64 / B01000000`
	`&20 / #32 / B00100000`
	`TEMP`
	`CHECKLOAD`
		4