Cambridge International AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

COMPUTER SCIENCE **9608/31**

Paper 3 Written Paper **May/June 2018**

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 May/June 2018 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

IGCSE™ is a registered trademark.

© UCLES 2018

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.

© UCLES 2018

Question	Answer	Marks
1(a)	**1** mark per bullet max **2** • 0101 = 5 (conversion of exponent to denary) • 1.01110011010 = –0.10001100110 (conversion of mantissa to negative binary number) • –10001.100110 (binary value)// –0.54980469 (denary value of mantissa) // –563/1024 Or • Use exponent to denormalise mantissa **1** mark for correct answer • = –17 19/32 // –17.59375	**3**
1(b)	**1** mark per bullet • 5.25 = 101.01 (conversion to binary) • = 0.10101×2^3 (evidence of shifting binary point appropriately) • 010101000000 0011 (stored as mantissa and exponent)	**3**
1(c)	**1** mark per bullet • (Size of mantissa decreased means that) precision is reduced • (Size of exponent is increased means that) range is increased	**2**

Question	Answer	Marks
2(a)	<u>single data type</u> that does not involve a reference to another type/usually built in to a programming language	**1**
2(b)	**1** mark for data type, **1** for definition, max **4,** 2 data types • Integer • Stores a whole number • Boolean • Stores true or false/1 or 0/on or off • Real/Single/Double/Float/Decimal • Stores decimal numbers • String • Stores zero or more characters • Char • Stores a single character • Pointer • Whole number used to reference a memory location	**4**
2(c)	data type constructed from other data types	**1**

Question	Answer	Marks
2(d)	**1** mark for naming, **1** for description, max **4,** 2 data types • Record • collection of related items which may have different data types • Array • (Indexed) collection of items with the same data type • List • (Indexed) collection of items that can have different data types • Set • stores a finite number of different values that have no order // supports mathematical operations • Class/Structure • Gives the properties and methods for an object	**4**

Question	Answer	Marks
3(a)(i)	**1** mark per bullet, max **1** benefit, max **1** drawback Benefits • Signals only go to destination//secure • Easy to connect/remove nodes or devices/trouble shoot. • Centralised management helps in monitoring the network. • Failure of one node or link doesn't affect the rest of network. • Performance does not degenerate under load • Connections may use different protocols • Fewer collisions Drawbacks • If central device fails then whole network goes down. • Performance is dependent on capacity of central device.	**2**
3(a)(ii)	**1** mark per bullet, max **1** benefit, max **1** drawback Benefits • Easier to set-up/extend. • Less cable required Drawbacks • If the main cable breaks, network performance badly degraded. • Difficult to detect and troubleshoot fault at an individual station. • Efficiency reduces as the number of devices connected to it increases. • Collisions // not suitable for networks with heavy traffic. • Security is lower (because several computers receive the sent signal from the source.)	**2**

© UCLES 2018

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>3(b)</td><td>1 mark for each correct pair of letters in the right order max 3
<table>
<tr><td>1</td><td>Computer X sends a connection request to Computer Y.</td></tr>
<tr><td>2</td><td>Computer Y sends ready or busy signal.</td></tr>
<tr><td>3</td><td>If busy, Computer X waits and then resends the connection request to Computer Y.</td></tr>
<tr><td>4</td><td>D</td></tr>
<tr><td>5</td><td>A</td></tr>
<tr><td>6</td><td>C</td></tr>
<tr><td>7</td><td>B</td></tr>
</table></td><td>3</td></tr>
<tr><td>3(c)(i)</td><td>1 mark for each layer
<table>
<tr><th>Protocol</th><th>Layer</th></tr>
<tr><td>TCP</td><td>Transport</td></tr>
<tr><td>IP</td><td>Internet/Network</td></tr>
<tr><td>SMTP</td><td>Application</td></tr>
</table></td><td>3</td></tr>
<tr><td>3(c)(ii)</td><td>Any three points from:
• BitTorrent client software made available
• One computer must keep a complete copy of the torrent/file to be shared
• Torrent/file is split into small pieces
• A computer joins (a swarm) by using the BitTorrent software to load a torrent descriptor file
• The computer can now download a piece of the file
• Once a computer has a piece it can become a seed and upload (to other members of the swarm)
• Pieces of the torrent 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 them to connect to each other</td><td>3</td></tr>
</table>

© UCLES 2018

Question	Answer	Marks
4(a)(i)	**2** marks all products correct, **1** mark 2 or 3 products correct $X = \bar{A}.B.\bar{C} + \bar{A}.B.C + A.\bar{B}.\bar{C} + A.\bar{B}.C$	**2**
4(a)(ii)	**1** mark for all correct bits **AB** **C** **00** **01** **11** **10** **0** 0 1 0 1 **1** 0 1 0 1	**1**
4(a)(iii)	**1** mark for each correct loop **AB** **C** **00** **01** **11** **10** **0** **0** **1** **0** **1** **1** **0** **1** **0** **1**	**2**
4(a)(iv)	**1** mark per bullet – allow follow through from **4(a)(iii)** • $\bar{A}.B$ • $+A.\bar{B}$ $X = \bar{A}.B + A.\bar{B}$	**2**
4(b)(i)	**1** mark per bullet max **2** • Correct column headings and row headings – values only • Correct column headings and row headings – order 1 mark for 2 correct rows/columns, 2 marks for 4 correct rows/columns (based on headings) max **2** **AB** **CD** **00** **01** **11** **10** **00** 0 1 1 0 **01** 0 1 1 0 **11** 0 1 0 0 **10** 0 1 0 0	**4**
4(b)(ii)	**1** mark for each correct loop **CD** **00** **01** **11** **10** **00** 0 1 1 0 **01** 0 1 1 0 **11** 0 1 0 0 **10** 0 1 0 0	**2**
4(b)(iii)	**1** mark per bullet $\bar{A}.B$ $+B.\bar{C}$ $X = \bar{A}.B + B.\bar{C}$	**2**

Question	Answer	Marks
5(a)(i)	`c4` is not a signed integer	**1**
5(a)(ii)	`10` is not a valid signed integer // 0 is not a valid digit/signed integer // only one digit allowed	**1**
5(a)(iii)	wrong assignment operator // should be = not `:=` // 6 is not a valid digit/signed integer	**1**

5(b)	1 mark per bullet
	assignment
	• `<variable>=<variable><operator><signed integer>`
	variable
	• `<letter><letter>`
	signed integer
	• `+<digit> | -<digit>`
	operator
	• `^ | \`
	
	`<assignment statement> ::=`
	`<variable> = <variable><operator><signed integer>`
	`<variable> ::= <letter><letter>`
	`<signed integer> ::= +<digit> | -<digit>`
	`<operator> ::= ^ | \`
		4

5(c)	1 mark per bullet
	• `<letter>|`
	• `<letter><variable>`
	
	For example:
	`<letter>|<letter><variable>`
	`<letter>|<variable><letter>`
		2

Question	Answer	Marks
6(a)(i)	**1** mark for each term or description	**4**

Description	Term
Redirection to a bogus website that appears to be legitimate to gain confidential data	**Pharming**
Use email to attempt to gain a user's confidential data	**Phishing**
A piece of software that records/stores user actions/keystrokes without the user's knowledge and sends them to a third party for analysis	Spyware
A standalone piece of malicious software that replicates itself	Worm

Question	Answer	Marks
6(a)(ii)	**1** mark for pharming solution, **1** for phishing Allow follow through from **(a)(i)** Pharming • Use a reliable ISP //check URL is spelt correctly // check that http has changed to https //security software installed and kept updated // only accept valid public key certificates // check that links are genuine Phishing • ignore email // delete email // don't click on links in emails	**2**
6(b)	**1** mark per bullet to max **4** • software is put through a hashing algorithm by the company • hash total is encrypted with the company's private key • company sends software and encrypted hash • customer is in possession of company's public key (from the digital certificate) • customer decrypts the received hash with public key • customer hashes the received software with the hash algorithm (from the digital certificate) • if decrypted hash and the software hash match, the software has come from the company/is authentic and has not been altered.	**4**

Question	Answer	Marks
7(a)	control system // monitoring and control system	**1**
7(b)	**1** mark for identifying hardware, **1** for purpose to max **4** for 2 hardware devices For example: • actuator/relay/switch (1) to turn a heater/fan on or off (1) • heater (1) to heat the museum (1) • fan (1) to cool the museum (1) • analogue to digital converter (1) to convert analogue signal from sensor to a digital value that can be stored/manipulated (1) • transmission hardware//cable (1) to transfer data/signals (1) • processor (1) to manage the temperature control (1) • Visible/audible warning device (1) to give warning to a human if temperature is at a dangerous level (1)	**4**
7(c)(i)	**1** mark per bullet • Temperature reading is 179 • reading in room 5 • has been processed	**3**
7(c)(ii)	**1** mark for each 8 bits **Byte 1**: 1 1 1 0 1 1 1 0 **Byte 2**: **7 6 5 4 3 2 1 0** — 0 0 0 1 0 0 0 0	**2**