Cambridge International AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

COMPUTER SCIENCE **9608/32**

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.

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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)	`CollegeStudent.StudentID ← 6539`	**1**
1(b)(i)	**1** mark per bullet • `StudentCourse: ARRAY[1:6] OF` • All valid string options , for example: `DECLARE StudentCourse: ARRAY[1:6] OF ("Computer Science", "Engineering", "Science", "Maths", "Physics", "Chemistry", "Music", "Drama", "English Language")`	**2**
1(b)(ii)	`DECLARE StudentID: 1 .. 8000`	**1**

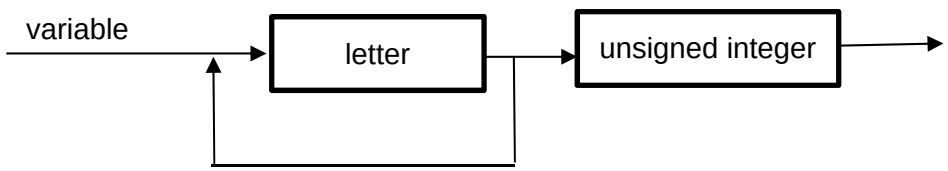
1(c)(i)	**1** mark per bullet
	
	• Type declaration `TYPE` and `ENDTYPE`
	• Declaring `Code` as `STRING`
	• Declaring `Mark` as `ARRAY [1:6] OF INTEGER`
	• `AverageMark` as `REAL`
	
	For example:
	`TYPE StudentAssessment`
	`  DECLARE Code : STRING`
	`  DECLARE Mark : ARRAY[1:6] OF INTEGER`
	`  DECLARE AverageMark : REAL`
	`ENDTYPE`
		4

1(c)(ii)	Any **3** from, **1** mark per bullet • `StudentID`/key field is hashed to produce home location • If home location is free, insert record/data • Else use overflow method to find free location to store record / data • If no free location available then file is full and record/data cannot be stored	**3**

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Question	Answer	Marks
2(a)(i)	`5` is not a variable	**1**
2(a)(ii)	`D` is not a valid letter	**1**
2(a)(iii)	There are two operators (only one is allowed) // three variables on the right hand side but only two allowed	**1**

2(b)	**1** mark for each bullet
	
	assignment:
	• `<variable> = <variable><operator><variable>;`
	
	variable:
	• `<letter>|`
	• `<letter><unsigned integer>`
	
	unsigned integer:
	• `<digit>|`
	• `<digit><unsigned integer>`
	
	operator:
	• `+ | - | * | /`
	
	`<assignment statement> ::= <variable> = <variable><operator><variable>;`
	`<variable> ::= <letter> | <letter><unsigned integer>`
	`<unsigned integer> ::= <digit> | <digit><unsigned integer>`
	`<operator> ::= + | - | * | /`
		6

2(c)	**1** mark per bullet • variable with arrow • followed by repeated letter • followed by unsigned integer and arrow 	**3**

Question	Answer	Marks
3(a)	**1** mark per bullet • 21.75 = 010101.11 (conversion to correct binary) • 0.1010111×2^5 (evidence of shifting binary point appropriately) • 01010111 0101 (stored as mantissa and exponent)	**3**

3(b)	**1** mark per bullet, max **2**
	
	• 1110 = –2 (conversion of exponent to denary)
	• 1.011000 = –0.101 (conversion of mantissa to negative binary number)// –0.625 (denary value of mantissa)// –5/8
	• –0.00101 (binary value) //
	
	Or
	• Use exponent to denormalise mantissa
	
	1 mark for correct answer
	• –5/32 // –0.15625
		3

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>4(a)</td><td>1 mark per correct row
<table><tr><th>Responsibility</th><th>TCP</th><th>IP</th></tr><tr><td>Correct routing</td><td></td><td>✓</td></tr><tr><td>Host to host communication</td><td>✓</td><td></td></tr><tr><td>Communication between networks</td><td></td><td>✓</td></tr><tr><td>Retransmitting missing packets</td><td>✓</td><td></td></tr><tr><td>Reassembling packets into the correct order</td><td>✓</td><td></td></tr></table></td><td>5</td></tr>
<tr><td>4(b)</td><td>1 mark for name, 1 mark for matching use, max 4 for 2 protocols

• POP3/IMAP (1) receiving emails // download emails from a server (1)
• SMTP (1) sending emails (1)
• FTP (1) allows files to be transferred from one computer to another (1)
• HTTP/HTTPS (1) transfer of web pages/hypertext (1)
• Bit Torrent (1) used for peer-to-peer file sharing (1)</td><td>4</td></tr>
<tr><td>4(c)</td><td>Internet / Network (layer)</td><td>1</td></tr>
<tr><td>4(d)(i)</td><td>1 mark per bullet to max 4

• Message data / payload
• IP version number
• Internet header length
• Type of service
• Explicit Congestion Notification
• Total length/size of packet (in bytes)
• Identification / sequence / packet number
• Fragmentation flags
• Fragmentation offset
• Time to live // number of hops
• Protocol
• (Header) checksum
• Source (IP) address
• Destination (IP) address</td><td>4</td></tr>
<tr><td>4(d)(ii)</td><td>1 mark per benefit, 1 mark per expansion, max 4 for 2 benefits

For example :

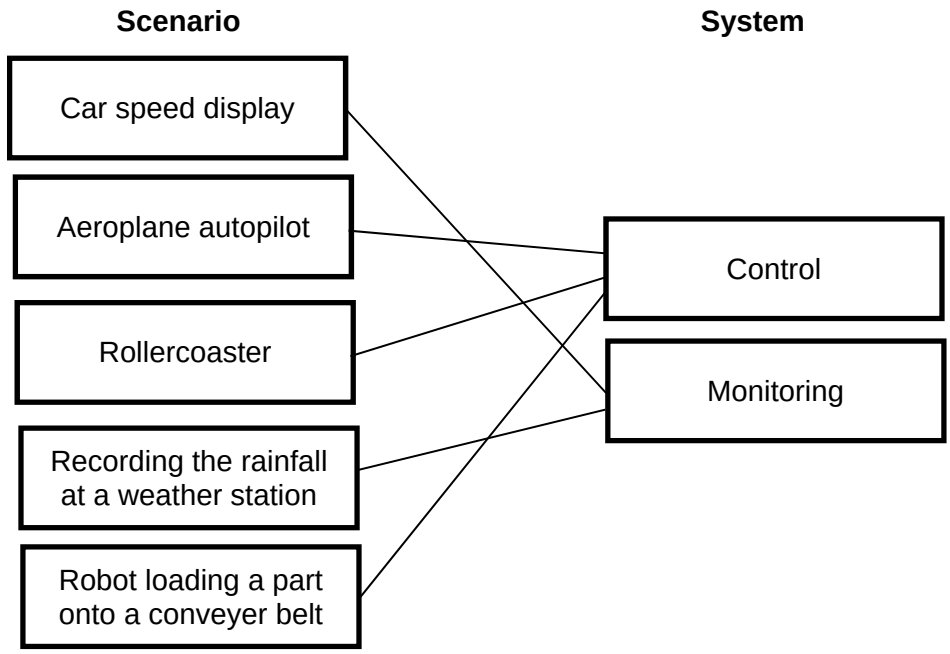
• alternative route available…
• in case of network problem
• If packet fails to arrive…
• then only that packet has to be resent</td><td>4</td></tr>
</table>

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Question	Answer	Marks
4(d)(iii)	**1** mark per bullet to max **2** • Network ID // (IP Address of) network destination (1) Subnetmask (1) • Routing metric // data to decide best route • (IP Addresses of possible) next hop / Gateway • Interface	**2**

Question	Answer	Marks
5(a)	**1** mark per bullet to max **4** • Katarina's computer/software encrypts the email before she sends it • using Lucy's public key • Lucy's computer/software decrypts the email when it is received • using Lucy's private key • As the private key is known only to Lucy, only she can understand the email	**4**
5(b)	**1** mark per bullet to max **3** • Julio's computer/software checks the digital certificate of the online shop's website • If digital certificate is invalid his computer/software rejects website • If valid a session is created/the transaction can continue • The encryption algorithms to be used are agreed • The session keys to be used are generated • The (session) key is used to encrypt the data sent	**3**
5(c)	**1** mark per bullet to max **3** • Attaching a portable storage device • Opening an email attachment // clicking links on an email attachment • Accessing a suspicious website • Downloading a file from the Internet • Buffer overflow • Software not up to date // Software poorly written • No up-to-date anti-virus/anti-malware software installed • Regular virus/malware scans not completed • A firewall that is not set up correctly • Weak/easily cracked passwords • Lack of user/staff training	**3**

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Question	Answer	Marks
6(a)	**2** marks for all 5 single lines correct, 1 mark for 4 lines correct otherwise zero  	**2**
6(b)	**1** mark for identifying hardware, **1** for purpose to max **6** for 3 hardware devices • temperature sensor/thermistor (1) measures current temperature (1) • thermostat (1) measures current temperature automatically turns heater on/off (1) • actuator/relay/switch (1) to turn a heater/fan on or off (1) • heater (1) to heat the water in the tank(s) (1) • fan (1) to cool the water in the tank(s) (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)	**6**

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Question	Answer	Marks
6(c)(i)	**1** mark per bullet • temperature reading in fish tank number 3 • temperature is 11 • has not been processed	**3**
6(c)(ii)	1 mark per bullet • Byte 1: 10010000 • Byte 2: 11111110	**2**
6(d)	**1** mark per bullet • `LDD 6753` • `OR #B00010000 / #16 / #&10` • `STO 6753`	**3**

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