Cambridge International AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

COMPUTER SCIENCE **9608/31**

Paper 3 Written Paper **October/November 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 October/November 2018 series for most Cambridge IGCSE™, Cambridge International A and AS Level 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) Record	**1**
	(b) Enumerated	**1**
	(c) `DECLARE BestSeller : Book`	**1**
	(d) `BestSeller.Author ← "John Williams"`	**1**

Question	Answer	Marks
2(a)(i)	1 mark per bullet point: • Correct value for exponent identified e.g. (0.0111 × 2^)7 • Used to give correct value e.g. 111 000 (1/4 + 1/8 +1/16) × 128, 0.4375 • Correct answer i.e. 56	**3**
2(a)(ii)	The two most significant bits are 0 in the mantissa // In mantissa, 2nd bit is not the inverse of 1st bit	**1**
2(a)(iii)	1 mark per bullet point: • Mantissa = 01110000 • Exponent = 0110	**2**
2(b)(i)	1 mark per bullet point: • Mantissa = 01111111 • Exponent = 0111	**2**
2(b)(ii)	1 mark per bullet point: • Mantissa = 01000000 • Exponent = 1000	**2**
2(c)(i)	Precision of numbers represented will increase	**1**
2(c)(ii)	Range of numbers represented will increase	**1**
2(d)	1 mark per bullet point to max 3: • 0.1/0.2/0.3 cannot be represented exactly in binary / rounding errors • adding two or more inaccurate representations together <u>increases</u> the probability of <u>inaccuracy</u> • giving an answer where the difference is significant enough to be seen	**3**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>3(a)</td><td>1 mark per bullet point to max 2:

• to only allow data to be sent when the line is idle
• to detect a collision on the network
• to halt transmissions when a collision occurs
• calculates random wait time
• allow retransmission after a random amount of time</td><td>2</td></tr>
<tr><td>3(b)(i)</td><td>1 mark per bullet point to max 3:

• allows applications to exchange data
• establishes and maintains a connection …
• … until exchange of data is complete
• determines how to break application data into packets
• adds sequence / packet number to (TCP) header
• sends packets to and accepts packets from the network / Internet layer
• manages flow control // manages congestion avoidance
• acknowledges all packets that arrive
• detects when a packet has not arrived at destination
• handles retransmission of dropped packets
• reassembles packets into the correct order</td><td>3</td></tr>
<tr><td>3(b)(ii)</td><td>1 mark per bullet point to max 2

• routes the packets around the network
• adds to the IP header a source/destination address for each packet
• encapsulates data into datagram
• passes datagram to the network access layer (for transmission on the LAN)// passes datagram to the transport layer (on arrival at destination)
• Defines the addressing method e.g. subnetting, NAT</td><td>2</td></tr>
<tr><td>3(b)(iii)</td><td>HTTP(S) // FTP // POP3 // SMTP // UDP // etc...</td><td>1</td></tr>
<tr><td>3(c)</td><td>1 mark for appropriate protocol in each layer

<table><tr><th>Layer</th><th>Protocol</th></tr><tr><td>Application</td><td>HTTP(S) // FTP // POP3 // SMTP // UDP etc...</td></tr><tr><td>Transport</td><td>TCP</td></tr><tr><td>Internet</td><td>IP</td></tr></table></td><td>3</td></tr>
</table>

Question	Answer	Marks
3(d)	1 mark per bullet point to max 4: • Message is split into packets • Each packet is a fixed size • Each packet is given a header…. • …including destination IP address, sequence number etc. • Packets are forwarded from one LAN to the other LAN • Packets may take different routes • Missing packets are requested to be resent • Packets re-assembled into order at destination	**4**

Question	Answer	Marks
4(a)(i)	1 mark for 2 or 3 correct, 2 marks for 4 correct $X = \overline{A}.B.C + A.\overline{B}.C + A.B.\overline{C} + A.B.C$	**2**
4(a)(ii)	1 mark for the correct K-map **AB** **C** **00** **01** **11** **10** **0** 0 0 1 0 **1** 0 1 1 1	**1**
4(a)(iii)	1 mark for each loop max 3 **AB** **C** **00** **01** **11** **10** **0** 0 0 1 0 **1** 0 1 1 1	**3**
4(a)(iv)	1 mark for each pair. Allow follow through from **(iii)** • A.B • +B.C • +A.C $X = A.B + B.C + A.C$	**3**

Question	Answer	Marks
4(b)(i)	1 mark per bullet point max 2: • Correct column headings and row headings – values only • Correct column headings and row headings – order 1 mark for 2 correct rows or columns, 2 marks for 4 correct rows or columns (based on headings) **AB** **CD** **00** 0 1 1 0 **01** 0 0 1 0 **11** 0 0 1 0 **10** 0 0 1 0	**4**
4(b)(ii)	1 mark per loop **AB** **CD** **00** **0** **1** **1** **0** **01** **0** **0** **1** **0** **11** **0** **0** **1** **0** **10** **0** **0** **1** **0**	**2**
4(b)(iii)	1 mark per bullet point: • A.B • +B.$\overline{C}$.$\overline{D}$ $X = A.B + B.\overline{C}.\overline{D}$	**2**

Question	Answer	Marks
5(a)(i)	1 mark per bullet point: • Running process is halted • Process moves to blocked state	**2**

Question	Answer	Marks
5(a)(ii)	1 mark per bullet point max 2: • Running process is halted // another process has use of the processor • Process moves to ready state • … Until next time slice allocated	**2**
5(b)(i)	1 mark per bullet point: • Current process no longer running // processor is available • Process was at the head of the ready queue / / process has highest priority	**2**
5(b)(ii)	1 mark per bullet point: • The only • Required resource becomes available // event is complete	**2**
5(c)	1 mark per bullet point to max 3: • to allow multiprogramming • to give each process a fair share of the CPU time • to allow all processes to complete in a reasonable amount of time • to allow highest priority jobs to be executed first • to keep the CPU busy all the time • to service the largest possible number of jobs in a given amount of time • to minimize the amount of time users must wait for their results • to maximise the use of peripherals	**3**

Question	Answer	Marks
6(a)	1 mark for each correct row	**3**

Symbol	Token	
	Value	Type
`Start`	60	Variable
`1`	61	Constant
`Number`	62	Variable
`Counter`	63	Variable
`12`	64	Constant

60	01	61	51	62	4E	63	01	60	50	64	52	62	02	63	53

Question	Answer	Marks
6(c)	1 mark per bullet point to max 2: • constructing parse tree // parsing • checking the table of tokens to ensure that the rules/syntax/grammar of the language are/is obeyed • producing an error report	**2**
6(d)(i)	shortens execution time of program// time taken to execute whole program decreases	**1**

6(d)(ii)	1 mark for each of the following:
	
	• `LDD 236`
	`ADD 237`
	`STO 512`
	`ADD 238`
	`STO 513`
	`ADD 239`
	`STO 514`
	
	• Remove line 4 `LDD 236` correct lines 3 and 6 in original code
	• Remove line 5 `ADD 237` correct lines 3 and 6 in original code
	• Remove line 8 and 9 `LDD 236` and `ADD 237` correct lines 7 and 11 in original code
	• Remove line 10 `ADD 238` correct lines 7 and 11 in original code
		5

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