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Cambridge Assessment International Education

Cambridge International AS & A Level

COMPUTER SCIENCE **9608/31**

Paper 3 Advanced Theory **October/November 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 October/November 2021 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)	`SchoolComputer.ComputerID ← 1234` `SchoolComputer.ComputerLocation ← Lab2`	2
1(b)(i)	`DECLARE StudentID : ARRAY[1:20] OF INTEGER`	1
1(b)(ii)	`DECLARE ComputerID : 1000 .. 1999 //` `DECLARE ComputerID : INTEGER 1000 .. 1999`	1
1(c)	Any **three** from • Computer ID hashed to give address / home location • Compared to ID stored at address / home location • Nothing stored, output message 'record not found' • Record IDs equal, record is found • Record IDs not equal, search overflow area / next record • Until record found or whole area searched • If no record found error message	3

Question	Answer	Marks
2(a)	**One mark** for correct layer in correct position **Application** **Transport** **Internet / Network** **Network Access // Network Interface // (Data) Link // Physical**	3
2(b)	HTTP – used by browsers to fetch web pages // transmission of HTML files FTP – used to transfer files (between computers) over a network(s) POP3 – used to receive / download emails SMTP – used to send emails	4

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Question	Answer	Marks
3(a)	Bus … … diagram showing bus topology … diagram with correct labels (terminators, terminals etc)	3
3(b)	Any **four** from • carrier sense multiple access with collision detection • before transmission • … devices listen to see if line is idle • If line idle begins transmission • If a collision is detected • ... device halts transmission/ send a jam signal • … device waits a random wait time • … before attempting retransmission	4

Question	Answer	Marks
4(a)(i)	**One** mark for 2 or 3 correct, **two** marks for 4 correct $X = \bar{P}.\bar{Q}.\bar{R}.\bar{S} + \bar{P}.\bar{Q}.\bar{R}.S + P.Q.R.\bar{S} + P.Q.R.S$	2
4(a)(ii)	**One** mark for each correct pair of rows/columns to **max 2**	2

PQ

RS	00	01	11	10
00	1	0	0	0
01	1	0	0	0
11	0	0	1	0
10	0	0	1	0

Question	Answer	Marks
4(a)(iii)	**One** mark for each correct loop **max 2**	2

PQ

RS	00	01	11	10
00	1	0	0	0
01	1	0	0	0
11	0	0	1	0
10	0	0	1	0

Question	Answer	Marks
4(a)(iv)	**One** mark per bullet point • $\overline{P}.\bar{Q}.\bar{R}$ • $+P.Q.R$ $X = \overline{P}.\bar{Q}.\bar{R} + P.Q.R$ // $X = P.Q.R + \overline{P}.\bar{Q}.\bar{R}$	2

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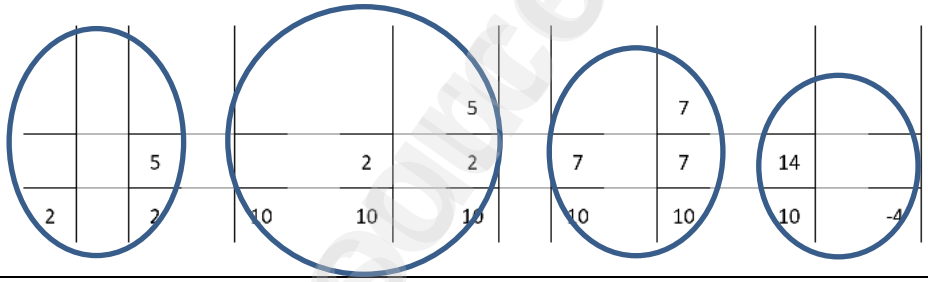
Question	Answer	Marks
4(b)	**One** mark for correct use of distributive law **One** mark for correct use of complement law $X = \bar{P}.\bar{Q}.\bar{R}(\bar{S} + S) + P.Q.R(\bar{S} + S)$ $X = \bar{P}.\bar{Q}.\bar{R}(1) + P.Q.R(1)$ or **Two** marks for correct use of redundancy law $X = (\bar{P}.\bar{Q}.\bar{R}).\bar{S} + (\bar{P}.\bar{Q}.\bar{R}).S + (P.Q.R).\bar{S} + (P.Q.R).S$ $X = \bar{P}.\bar{Q}.\bar{R} + P.Q.R$	2

Question	Answer	Marks
5(a)(i)	`a b * a b + c + -` **One mark** for `a b *` **One mark** for `a b + c + -`	2
5(a)(ii)	**One** mark per ring max 4  	4

5(b)	**Two** marks all 3 elements of the expression are seen
	One mark if 2 elements of the expression are seen
	`(d * b)` // `d * b`
	`+(b - (c + d))` // `+ b - (c + d)`
	`/ a`
	
	One mark for fully correct expression
	`((d * b) + (b - (c + d))) / a`
	// `(d * b + b - (c + d)) / a`
		3

5(c)	Any **three** from • Evaluation does not need to use rules of precedence for operators • No need for brackets // infix may require the use of brackets • Enables evaluation in the sequence read / left to right • … no need to backtrack	3
6(a)(i)	Any **four** from • The **message** in plain text Is hashed … • …using an **agreed** algorithm • to produce a message digest • this is then encrypted • … using the **private key of the sender**	4

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Question	Answer	Marks
6(a)(ii)	Any **two** from • To make sure the message is from Mohammed // Authentication • Message has not been tampered with **during transmission** • Mohammed cannot deny that he sent the message // Non-repudiation	**2**
6(b)(i)	Any **five** from • Two **matching** keys are used … • … one public and one private • obtain the public key of head office • Before the message is sent • The message Is encrypted (by the sender's computer) using the **public key of the receiver** • When the message is received at head office • The message Is decrypted (by the receiver's computer) using the **private key of the receiver**	**5**
6(b)(ii)	Only the receiver has the key to decrypt the message // private key does not need to be transmitted	**1**

Question	Answer	Marks
7(a)(i)	Monitoring	**1**
7(a)(ii)	Any **two** from • System does not alter any conditions in the building • No actuators required • No feedback loop used	**2**
7(a)(iii)	**One mark** for identifying the sensor, **one** for reason in context Any **two** from • Acoustic / sound sensor (1) so the system can check for excessive noise / check for intruders (1) • temperature sensor (1) the system can check for excessive heat/fire (1) • smoke sensor (1) so the system can check for fire (1) • pressure (1) so the system can check for the presence of intruders (1) • motion (1) so the system can check for the presence of intruders (1) • infra-red / microwave (1) so the system can check for the presence of intruders (1) • proximity (1) so the system can check for the presence of intruders (1) • moisture sensor (1) to check for flooding (1)	**4**

7(b)(i)	`FALSE // TRUE`
	`20`
	`4`
	`Always = TRUE / Always // NOT Always/Always = FALSE`
		4

7(b)(ii)	**One** mark for suitable loop, could be FOR, REPEAT or WHILE
	One mark for suitable delay must be at least 100
	`FOR Count ← 1 to 99999`
	`ENDFOR / NEXT`
		2

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Question	Answer	Marks
7(c)(i)	Floor 10 sensors 2 and 4 **out of range**	**2**
7(c)(ii)	Any **five** from • Find the location 407 • … using 4 as first digit of the address • … + floor number for the last two digits • Decide on bit to use (1/2) or (7/6) • AND 00000010 with contents of calculated location (407) • … to mask out that bit • Check if that bit is set / not set	**5**

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