Cambridge Assessment International Education

Cambridge International AS & A Level

COMPUTER SCIENCE **9608/32**

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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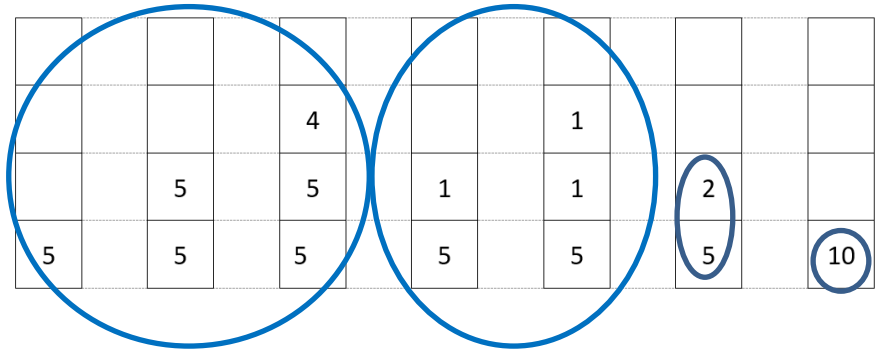
Question	Answer	Marks
1(a)	`LoanBicycle.BicycleID ← 567` `LoanBicycle.BicycleAvailable ← FALSE`	**2**
1(b)(i)	`DECLARE BorrowerID : ARRAY[1:10] OF INTEGER`	**1**
1(b)(ii)	`DECLARE BicycleID : 500 .. 599 //` `DECLARE BicycleID : INTEGER 500 .. 599`	**1**
1(c)	Any **three** from • Bicycle ID **hashed** to give address / home location • Check if a record already stored at address / home location • If nothing stored, store new record • If another record already stored search overflow area / next record • Until free space found or whole area searched • If no space output 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)	**One mark for** per point **max four** **TCP** Any **three** from • Transmission Control Protocol • Working at the Transport layer • sets up and maintains connection between two nodes • ensures delivery of data between two nodes (on the internet) **IP** Any **three** from • Internet Protocol • Working at the Internet/Network layer • provides rules for exchange of packets/datagrams over the Internet • decides the path for transmission of each packet	**4**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>3(a)(i)</td><td>One mark for 2 or 3 correct, 2 marks for 4 correct
$X = \overline{P}.\overline{Q}.\overline{R}.\overline{S} + \overline{P}.Q.R.S + P.\overline{Q}.\overline{R}.\overline{S} + P.Q.R.S$</td><td>2</td></tr>
<tr><td>3(a)(ii)</td><td>One mark two correct rows/columns or
Two marks for four correct rows/columns
PQ
RS
<table><tr><th></th><th>00</th><th>01</th><th>11</th><th>10</th></tr><tr><th>00</th><td>1</td><td>0</td><td>0</td><td>1</td></tr><tr><th>01</th><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><th>11</th><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><th>10</th><td>0</td><td>0</td><td>0</td><td>0</td></tr></table></td><td>2</td></tr>
<tr><td>3(a)(iii)</td><td>One mark for each correct loop max 2
PQ
RS
<table><tr><th></th><th>00</th><th>01</th><th>11</th><th>10</th></tr><tr><th>00</th><td>1</td><td>0</td><td>0</td><td>1</td></tr><tr><th>01</th><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><th>11</th><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><th>10</th><td>0</td><td>0</td><td>0</td><td>0</td></tr></table></td><td>2</td></tr>
<tr><td>3(a)(iv)</td><td>One mark per bullet point
• $\overline{Q}\overline{R}.\overline{S}$
• $+Q.R.S$
$X = \overline{Q}\overline{R}.\overline{S} + Q.R.S$ or $X = Q.R.S + \overline{Q}\overline{R}.\overline{S}$</td><td>2</td></tr>
<tr><td>3(b)</td><td>One mark for correct use of distributive law
One mark for correct use of complement law
$X = \overline{Q}.\overline{R}.\overline{S}\left(\overline{P} + P\right) + Q.R.S(\overline{P} + P)$
$X = \overline{Q}.\overline{R}.\overline{S}(1) + Q.R.S(1)$
Or
Two marks for correct use of redundancy law
$X = \left(\overline{Q}.\overline{R}.\overline{S}\right)\overline{P} + \left(\overline{Q}.\overline{R}.\overline{S}\right)P + (Q.R.S)\overline{P} + (Q.R.S)P)$
$X = \overline{Q}.\overline{R}.\overline{S} + Q.R.S$</td><td>2</td></tr>
</table>

Question	Answer	Marks
4(a)	**One** mark per point to **max two** • nodes on use (high frequency) **radio waves** to communicate whereas a wired network uses **cable** // a wireless network requires less hardware / no cables whereas a wired network does • a wired network has higher security than a wireless network • a wired network has lower interference than a wireless network • wired network nodes can be further apart than wireless network nodes • a wired network has faster rate of data transfer than a wireless network • devices using a wireless network can be more portable whereas devices in a wired network use fixed connections	**2**
4(b)	Device: (Wireless) router Justification: To provide a public IP address	**2**

Question	Answer	Marks
5(a)(i)	`p p q - r + *` **One mark** for `p p q -` **One mark** for `r + *`	**2**
5(a)(ii)	**One mark** per ring to **max four** 	**4**

5(b)	**Two marks** all 3 elements of the expression are seen
	One mark if any 2 elements of the expression are seen
	`(p * q)` // `p * q`
	`+(p - (q + r))` // `p - (q + r)`
	`/ p`
	One mark for fully correct expression
	`((p * q) + (p - (q + r))) / p`
	`(p * q + p - (q + r)) / p`
		3

5(c)	Any **two** stages, **one** mark name, **one** mark matching description • Lexical Analysis (1) converts source code into tokens (1) • Code Generation (1) produces the object code (1) • (Code) Optimisation (1) improving efficiency of object code (1)	**4**

Question	Answer	Marks
6(a)	Any **two** from • The bank wants to be sure that the message came from Lara • The bank wants to know that the message has not been tampered with **during transmission** • Lara cannot deny that she sent the message	**2**
6(b)	Any **five** from • Two **matching** keys are used … • … one public and one private • **obtain** the public key of the bank • before the message is sent • encrypt the message in plain text using the **public key of the bank** • when the message is received at the bank's computer • decrypt the encrypted message using the **private key of the bank**	**5**
6(c)	Any **two** from • A virus/worm could be launched • Phishing could be attempted • Spyware could be installed on Lara's computer • Lara's personal details could be sent to a malicious third party etc.	**2**

Question	Answer	Marks
7	**One mark** for each benefit to **max 2** from • Because software can be tried on different OS (using same hardware) • Because no need to purchase / request all sorts of different hardware • Easier to recover if software causes system crash • VM provides protection to other software / host OS from malfunctioning software **One mark** for each limitation to **max 2** from • Virtual machines may not be able to emulate some hardware • Virtual machines cannot directly access some hardware • Using virtual machine means execution of extra code // processing time increased • A virtual machine might not be as efficient // performance degrades • Use of a virtual machine increases the maintenance overheads	**4**

Question	Answer	Marks
8(a)(i)	Monitoring	**1**
8(a)(ii)	Any **two** from • System does not alter any conditions in the carpark • No feedback loop used • No actuators required	**2**

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Question	Answer	Marks
8(a)(iii)	Any **two** from • pressure sensor • light sensor • motion sensor • infra-red sensor	**2**

8(b)(i)	`01 FALSE // TRUE`
	`21 Forever/Forever = TRUE // NOT Forever/Forever = FALSE`
	
	`03 6`
	`05 256`
	`11 0`
	
	`13 FloorNumber`
	`15 FloorNumber`
	
	`13 SpaceAvailable`
		6

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

8(b)(iii)	To allow time to elapse between readings	**1**
8(c)(i)	• Cars parking on floor 6 • Cars parked in spaces 25 and 32 // spaces 26 – 31 are empty // 6 spaces still available // 2 spaces full	**2**
8(c)(ii)	Any **five** from • Find the location 532 • … using 5 for the first digit of the address and • … using DIV 8 and 254 • … to give 32 for the last two digits • Decide on the bit to use (6/5) or (2/3) // 254 MOD 8 • AND 00100000 with contents of calculated location (532) • to mask out that bit • Check if that bit is zero	**5**

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