

---

**COMPUTER SCIENCE**

**9608/31**

Paper 3 Written Paper

**May/June 2017**

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 will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2017 series for most Cambridge IGCSE<sup>®</sup>, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.



Question	Answer	Marks
1(a)(i)	DECLARE Book : LibraryBookRecord	1
1(a)(ii)	Book.Title ← "Dune"	1
1(b)	TYPE LibraryBookRecord DECLARE ISBN : INTEGER DECLARE Title : STRING DECLARE Genre : (Fiction, Non-Fiction) DECLARE NumberOfLoans : 1 .. 99 ENDTYPE mark for correct declaration and first two fields ( <b>note:</b> only if attempt at modification)	3 1 1 1
1(c)(i)	6715	1
1(c)(ii)	8216	1
1(c)(iii)	88	1
1(c)(iv)	FALSE	1
1(d)(i)	Temp2 ← 22	1
1(d)(ii)	IntPtr1 ← @Temp1	1
1(d)(iii)	IntPtr1^ ← Temp2	1

Question	Answer	Marks												
2(a)(i)	Worm	1												
2(a)(ii)	Phishing	1												
2(a)(iii)	Malicious software that replicates by inserting a copy of itself (1) into a file of data (1)	2												
2(b)	Example: No <u>up-to-date</u> anti-virus (or equivalent) software Regular virus scans not performed Operating system not up-to-date Attachments/suspicious links clicked on 1 mark for any valid vulnerability	Max 2												
2(c)(i)	public	1												
2(c)(ii)	Bob sends his <u>digital certificate</u> Digital certificate contains Bob's public key Successful decryption of certificate using CA's public key provides legitimacy 1 mark for any valid point – max 2	2												
2(c)(iii)	<table><tr><th>The person performing the action</th><th>What that person does</th></tr><tr><td>Anna</td><td>Requests Bob's <b>public</b> key.</td></tr><tr><td>Bob</td><td>Sends Anna his public key.</td></tr><tr><td>Anna</td><td>Encrypts email with <u>Bob's public key</u>.</td></tr><tr><td>Anna</td><td>Sends the email to Bob.</td></tr><tr><td>Bob</td><td>Decrypts email. Using his private key.</td></tr></table>	The person performing the action	What that person does	Anna	Requests Bob's <b>public</b> key.	Bob	Sends Anna his public key.	Anna	Encrypts email with <u>Bob's public key</u> .	Anna	Sends the email to Bob.	Bob	Decrypts email. Using his private key.	<div>4</div> <div>1</div> <div>1</div> <div>1</div> <div>1</div>
The person performing the action	What that person does													
Anna	Requests Bob's <b>public</b> key.													
Bob	Sends Anna his public key.													
Anna	Encrypts email with <u>Bob's public key</u> .													
Anna	Sends the email to Bob.													
Bob	Decrypts email. Using his private key.													

Question	Answer	Marks																																													
3(a)	$X = A.(\bar{B} + (B \cdot C))$ $B.C$ $\bar{B} + B.C$ $A.$	3 1 1 1																																													
3(b)	<table><tr><th>A</th><th>B</th><th>C</th><th>Working Space</th><th>X</th></tr><tr><td>0</td><td>0</td><td>0</td><td></td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td></td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td><td></td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td></td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td></td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td><td></td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td></td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td></td><td>1</td></tr></table> <p>1 mark first four entries, 1 mark for the last four entries</p>	A	B	C	Working Space	X	0	0	0		0	0	0	1		0	0	1	0		0	0	1	1		0	1	0	0		1	1	0	1		1	1	1	0		0	1	1	1		1	2
A	B	C	Working Space	X																																											
0	0	0		0																																											
0	0	1		0																																											
0	1	0		0																																											
0	1	1		0																																											
1	0	0		1																																											
1	0	1		1																																											
1	1	0		0																																											
1	1	1		1																																											
3(c)(i)	<p style="text-align: center;"><b>AB</b></p> <table><tr><td></td><td></td><td><b>00</b></td><td><b>01</b></td><td><b>11</b></td><td><b>10</b></td></tr><tr><td rowspan="2"><b>C</b></td><td><b>0</b></td><td>0</td><td>0</td><td>0</td><td>1</td></tr><tr><td><b>1</b></td><td>0</td><td>0</td><td>1</td><td>1</td></tr></table>			<b>00</b>	<b>01</b>	<b>11</b>	<b>10</b>	<b>C</b>	<b>0</b>	0	0	0	1	<b>1</b>	0	0	1	1	1																												
		<b>00</b>	<b>01</b>	<b>11</b>	<b>10</b>																																										
<b>C</b>	<b>0</b>	0	0	0	1																																										
	<b>1</b>	0	0	1	1																																										
3(c)(ii)	<p style="text-align: center;"><b>AB</b></p> <table><tr><td></td><td></td><td><b>00</b></td><td><b>01</b></td><td><b>11</b></td><td><b>10</b></td></tr><tr><td rowspan="2"><b>C</b></td><td><b>0</b></td><td>0</td><td>0</td><td>0</td><td>1</td></tr><tr><td><b>1</b></td><td>0</td><td>0</td><td>1</td><td>1</td></tr></table>			<b>00</b>	<b>01</b>	<b>11</b>	<b>10</b>	<b>C</b>	<b>0</b>	0	0	0	1	<b>1</b>	0	0	1	1	2																												
		<b>00</b>	<b>01</b>	<b>11</b>	<b>10</b>																																										
<b>C</b>	<b>0</b>	0	0	0	1																																										
	<b>1</b>	0	0	1	1																																										
3(c)(iii)	$X = A.\bar{B} + A.C$  1      1	2																																													
3(d)	$X = A.(\bar{B} + (B \cdot C))$ $X = A.(\bar{B} + C)$ $X = A.\bar{B} + A.C$	2 1 1 (dependent mark – must be correct outcome from previous line)																																													

Question	Answer	Marks										
4(a)	Example: Speed of access Just used as a look-up file No need for any serial or sequential processing 1 mark for any valid point	1										
4(b)(i)	<table><tr><td>CustomerID</td><td>RecordKey</td></tr><tr><td>802139</td><td>2139</td></tr><tr><td>700004</td><td>4</td></tr><tr><td>689998</td><td>89998</td></tr><tr><td>102139</td><td>2139</td></tr></table>	CustomerID	RecordKey	802139	2139	700004	4	689998	89998	102139	2139	1
CustomerID	RecordKey											
802139	2139											
700004	4											
689998	89998											
102139	2139											
4(b)(ii)	Minimum value: 0 Maximum value: 99999	1 1 2										
4(b)(iii)	<pre>PROCEDURE InsertRecord(CustomerID : INTEGER)     RecordKey ← CustomerID MOD 100000     Success ← FALSE     // Find position for new record and insert it     REPEAT         IF record at position RecordKey is <u>empty</u>             THEN                 Insert new record at position RecordKey                 Success ← TRUE             ELSE                 IF RecordKey = <u>99999</u>                     THEN                         RecordKey ← <u>0</u>                     ELSE                         RecordKey ← <u>RecordKey</u> + 1                     ENDIF             ENDIF         UNTIL Success = TRUE     ENDPROCEDURE</pre>	4										
4(c)(i)	For security If file is hacked then encrypted PIN cannot be used Only encrypted PINs are transmitted and compared 1 mark for any valid point	Max 2										
4(c)(ii)	<ol style="list-style-type: none"><li>1. Customer ID is read from card</li><li>2. Customer enters PIN</li><li>3. Customer PIN is <u>encrypted</u></li><li>4. <u>Customer ID is hashed</u></li><li>5. Customer record is located in file</li><li>6. <u>PIN is checked against PIN in record</u></li><li>7. If match then transaction can proceed</li></ol>	3										

Question	Answer	Marks
5(a)(i)	Packet: Both web page and web page request are split into packets Each packet is sent individually from device to device	2 1 1
5(a)(ii)	Router: Transmit packets Contain connections to many other routers When packets arrive at router, router decides where next to send packet 1 mark for any valid point	Max 2
5(a)(iii)	TCP/IP: Is the protocol Rules for communication between web server and browser	2 1 1
5(b)(i)	<b>Two</b> from: Picture and sound not synchronised Interruptions // video not continuous Can be degraded by other competing traffic	Max 2 1 1 1
5(b)(ii)	<u>Dedicated</u> communications channel between the two communicating devices Established prior to start of communication // removal of links at end of communication	2 1 1
5(b)(iii)	In packet switching, packets can take different routes and may not arrive in order Will arrive in order (only one route) As packets can take many different routes / share paths with others can be delayed Dedicated circuit has full bandwidth No loss of synch 1 mark for any valid point	Max 3

Question	Answer	Marks
6(a)(i)	Control system	1
6(a)(ii)	Use of actuators means that the system is controlling	1
6(b)	System wastes processor time checking for values that are not changing Some sensor input needs to be acted upon immediately	1 1 2
6(c)(i)	Interrupts need to be disabled so that the process of dealing with an interrupt is itself not interrupted	1
6(c)(ii)	After handling the interrupt interrupts need to be enabled so that further interrupts can be dealt with	1
6(c)(iii)	Content of <u>registers</u> Placed on stack	1 1 2
6(c)(iv)	Changing sensor value dealt with as soon as it happens Processor needs to check sensor only when an <u>interrupt occurs</u>	1 1 2
6(c)(v)	AND #B00000001000000000 // AND #0200 // AND #512 Op code Operand	1 1 2