

QUESTION 2.



9 (a) One mark for validation, one mark for verification.

validation

- check whether data is reasonable / meets given criteria

verification

- method to ensure data which is copied / transferred is the same as the original
- entering data twice and computer checks both sets of data
- check entered data against original document / source

[2]

(b) any **four** from:

- parity can be even or odd
- parity check uses the number of 1s in a binary pattern
- if there is an even / odd number of 1s, then the parity is even / odd
- following transmission ...
- parity of each byte checked
- a parity bit is used to make sure binary pattern has correct parity
- example: 1 0 0 1 0 1 1 1 has parity bit set to 1 in MSB since system uses odd parity (original data: 0 0 1 0 1 1 1 which has four 1 bits)

[4]

10 (a) any **two** from:

- malicious code / software / program
- that replicates / copies itself
- can cause loss of data / corruption of data on the computer
- can cause computer to “crash” / run slowly
- can fill up hard disk with data

[2]

(b) any **two** from:

- checks for boot sector viruses when machine is first turned on
- when an external storage device is connected
- checks a file / web page when it is accessed / downloaded

[2]



11

Statement	Interpreter	Correct
This translator creates an executable file		✓
When this translator encounters a syntax error, game execution will halt	✓	
The translator analyses and checks each line just before executing it	✓	
This translator will produce faster execution of the game program		✓
Use of this translator makes it more difficult for the user to modify the code of the game supplied to the user		✓

1 mark for each correct row

[5]

QUESTION 3.



7 (a) **One mark** for the name and **one mark** for the explanation for **three** utility programs

- Disk formatter
- Prepares a hard disk to allow data to be stored on it
- Virus checker
- Checks for viruses and then quarantines removes any virus found
- File compression
- Reduces file size by removing redundant details (lossy / lossless)
- Backup software
- Makes copy of files on another medium in case of corruption / loss of data
- Firewall
- Prevents unauthorised access to computer system from external sources

[6]

(b) **Four** from:

- Bitmap is made up of pixels
// Vector graphic store a set of instructions about how to draw the shape
- Bitmap files are usually bigger than vector graphics files // Take up more memory space
- Enlarging a bitmap can mean the image is pixelated
// vector graphic can be enlarged without the image becoming pixelated
- Bitmap images can be compressed (with significant reduction in file size)
// Vector graphic images do not compress well
- Bitmaps are suitable for photographs / scanned images
// Vector graphics are suitable for more geometric shapes
- Bitmap graphics use less processing power than vector graphics
- Individual elements of a bitmap cannot be grouped
// Individual elements of a vector graphic can be grouped
- Vector graphics need to be 'rasterised' in order to display or print

[4]

Page 9	Mark Scheme	
	Cambridge International AS/A Level – October/November 2016	



- (c) (i) • Hackers can still access the data (and corrupt it, change it or delete it)
- Encryption simply makes data incomprehensible (without decryption key)

(ii) Any **two** from:

- This is an explanation of data verification (not validation)
- Data validation ensures that data is reasonable / sensible / within a given criteria
- Original data may have been entered correctly but is not reasonable (e.g. age of 210)

[2]

- (iii) • A password does not prevent unauthorised access, it makes it more difficult

QUESTION 4.

Cambridge
International
AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level



COMPUTER SCIENCE

9608/11

Paper 1 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.

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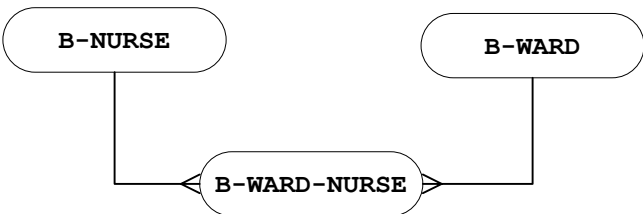
Cambridge is publishing the mark schemes for the May/June 2017 series for most Cambridge IGCSE[®], Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

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Question	Answer		
1(a)	Many-to-one		
1(b)(i)	A-NURSE (<u>NurseID</u> , FirstName, FamilyName, WardName)		
1(b)(ii)	- The primary key <u>WardName</u> in the A-WARD table links to the foreign key <u>WardName</u> in the A-NURSE table.	1 1	
1(c)(i)	Many-to-many relationship		1
1(c)(ii)	B-WARD-NURSE (<u>WardName</u> , <u>NurseID</u>) Both attributes (with no additions) Joint primary key correctly underlined	1 1	2
1(c)(iii)	 Correct relationship between B-NURSE and B-WARD-NURSE Correct relationship between B-WARD and B-WARD-NURSE	1 1	2
1(d)(i)	SELECT NurseID, FamilyName FROM B-NURSE WHERE Specialism = 'THEATRE';	1 1 1	3
1(d)(ii)	UPDATE B-NURSE SET FamilyName = 'Chi' WHERE NurseID = '076';	1 1 1	3



Question	Answer															
2(a)(i)	<table><tr><td>1</td><td>A laser beam and a rotating mirror are used to draw an image of the page on the photosensitive drum.</td></tr><tr><td>2</td><td>C // The image is converted on the drum into an electrostatic charge.</td></tr><tr><td>3</td><td>Electrostatic charge attracts toner.</td></tr><tr><td>4</td><td>The charged paper is rolled against the drum.</td></tr><tr><td>5</td><td>D // The oppositely-charged paper picks up the toner particles from the drum. After picking up the toner, the paper is discharged to stop it clinging to the drum.</td></tr><tr><td>6</td><td>A // The paper passes through a fuser, which heats up the paper. The toner melts and forms a permanent image on the paper.</td></tr><tr><td>7</td><td>B // The electrical charge is removed from the drum and the excess toner is collected.</td></tr></table>	1	A laser beam and a rotating mirror are used to draw an image of the page on the photosensitive drum.	2	C // The image is converted on the drum into an electrostatic charge.	3	Electrostatic charge attracts toner.	4	The charged paper is rolled against the drum.	5	D // The oppositely-charged paper picks up the toner particles from the drum. After picking up the toner, the paper is discharged to stop it clinging to the drum.	6	A // The paper passes through a fuser, which heats up the paper. The toner melts and forms a permanent image on the paper.	7	B // The electrical charge is removed from the drum and the excess toner is collected.	
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	C in the correct place	1														
	DA,	1														
	AB	1														
2(a)(ii)	Inkjet printer	1														
2(b)	Hard disk drive // HDD	1														
	Solid state drive //SSD // flash memory	1														
	One from:															
	<i>Hard disk</i>															
	Inexpensive per unit of storage	1														
	<u>Larger</u> storage capacity than flash drive	1														
	<i>Solid state storage</i>															
	No moving parts / noise	1														
	Robust	1														
	Low latency // Fast read/write time	1														



Question	Answer	
3(a)	Sampling rate The <u>number of samples</u> taken <u>per unit time</u> // the number of times the amplitude is measured <u>per unit time</u> Increasing the sampling rate will increase the accuracy / precision of the digitised sound // Increasing the sampling rate will result in smaller quantisation errors.	1 1
3(b)(i)	Pixel Smallest picture element which can be drawn Screen resolution The number of pixels which can be viewed horizontally and vertically on the screen // or by example - A typical screen resolution is 1680 pixels × 1080 pixels.	1 1
3(b)(ii)	8	1
3(b)(iii)	Working: Max <u>two</u> from: - Number of pixels is 2048×512 - One pixel will be stored as one byte - Number of kilobytes = $(2048 \times 512) / 1024$ Answer: <u>One</u> mark: Number of kilobytes = 1024 KB	1 1 1 1
3(b)(iv)	<u>One</u> from: - Confirmation that the file is a BMP - File size - Location/offset of image data within the file - Dimensions of the image in pixels // image resolution - Colour depth (bits per pixel) - Type of compression used, if any	1 1 1 1 1 1



Question	Answer	
4(a)(i)	500	
4(a)(ii)	496	
4(a)(iii)	502	
4(a)(iv)	86	1
4(b)	00000001 00010001 00001100 01100001 Both correct op codes Operand 0001 0001 Operand 0110 0001	3
4(c)	256	1
4(d)(i)	07 C2 07 C2	2
4(d)(ii)	LDI 63 LDI 63	2



Question	Answer																																																																																	
5(a)(i)	- Count the number of one bits in the <u>first seven</u> bit positions - Add a 0 or 1 to bit position 0, to make the count of one bits an <u>odd</u> number																																																																																	
5(a)(ii)	A = 1 B = 1																																																																																	
5(a)(iii)	Two from: - A parity bit is worked out for each <u>column</u> 1 - The computer checks the parity of each bit position in parity byte // the computer generates copy of the parity byte and <u>compares</u> 1 - If incorrect parity then there is an error in the data received // No parity error means no error in the data received 1 - The position of the incorrect bit can be determined 1	2																																																																																
5(b)(i)	<table><tr><th colspan="8">Bit position</th></tr><tr><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>0</th></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td></tr></table>	Bit position								7	6	5	4	3	2	1	0	1	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	1	0	1	1	1	1	1	0	0	0	1	1	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	0	0	0	2
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5(b)(ii)	Three from: - Consider each row in sequence 1 - Identify any row with incorrect parity 1 - Repeat the process for each column in sequence 1 - Identify where a row and column with incorrect parity intersect 1	3																																																																																



Question	Answer	
6(a)	Main memory management Input/Output Management Secondary storage Management Human computer interface The user moves the mouse on the desktop The user closes the Spreadsheet program The user selects the Save command to save their spreadsheet file The user selects the Print command to output their spreadsheet file One mark for each correct line from each left hand box to max <u>three</u> marks.	
6(b)(i)	File compression software	1
6(b)(ii)	Backup software	1
6(b)(iii)	Disk repair software	1
6(b)(iv)	Anti-virus software	1



Question	Answer	
7(a)	Two from: - The user's web browser is the client software 1 - The requested web page has program code / script embedded <u>within it</u> 1 - This code is interpreted by the web browser 1	
7(b)	Four from: - The browser parses the URL to obtain the Domain Name 1 - The browser software passes the Domain Name to the nearest Domain Name Server (DNS) 1 - The DNS stores a list of Domain Names and matching IP addresses 1 - The DNS Name Resolver looks for the Domain Name in its database 1 - If found the corresponding IP address is returned to the originator 1 - If not found the request is forwarded to another higher level DNS 1 - The original DNS adds the returned IP address to its cache 1 - The original DNS returns the IP address to the originator 1 - The browser uses the IP address to request the required web page from the <u>web server</u> 1 - The web server retrieves the page and delivers it to the originator 1 - The browser software interprets <u>the script</u> and displays the web page 1	Max 4
7(c)(i)	Message1, Message2 1 x 1	2
7(c)(ii)	6 – 19	1
7(c)(iii)	11	1
7(c)(iv)	Checks that the product code has not be left blank // presence check on product code	1
7(c)(v)	Two checks from: One mark for check and one mark for description - Range check 1 - Check the number entered is (say) between 1 and 100 1 - Format check 1 - Checks the product code is a particular format // Checks the number has digit characters only // by example 1 - Length check 1 - The number of items has exactly five characters 1 - Existence check 1 - To ensure the product code has been assigned 1	Max 4

Question	Answer	
6(a)	Two from: - The <u>file</u> is made available from a web/email/FTP server - The user's <u>browser</u> is the client software - The client (software browser) <u>requests</u> the <u>file</u> from the server - The desired <u>file</u> is returned to the client computer	1 1 1 1
6(b)	1. The user keys in the Uniform Resource Locator (URL) into the browser Software. 2. E // The Domain Name Service (DNS) uses the domain name from the browser to look up the IP address of the web server. 3. D // The web server retrieves the page 4. F // Sends the web page content to the browser 5. B // Browser software renders the page and displays	4 1 1 1 1
6(c)(i)	Output1, Output2 RunnerID // Runner ID	1 1
6(c)(ii)	6 – 21	1
6(c)(iii)	13	1
6(c)(iv)	Checks that the RunnerID entered starts with the characters CAM or VAR only	1
6(c)(v)	Two checks from: One mark for check and one mark for description - Format check RunnerID is three letter characters followed by two digit characters //Position is digit characters only - Length check RunnerID has exactly five characters - Range check The value for Position is between 1 and (say) 50 - Presence check The text box for RunnerID or Position is not empty - Existence check To ensure that RunnerID has been registered - Uniqueness check To ensure no two runners have the same number	Max 4 1 1 1 1 1 1 1 1

QUESTION 6.



Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level



COMPUTER SCIENCE

9608/11

Paper 1 Written Paper

October/November 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.

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Cambridge Assessment
International Education



Question	Answer									
1(a)(i)	119									
1(a)(ii)	−120									
1(a)(iii)	<table border="1"><tr><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr></table>	1	1	1	0	1	1	1	1	
1	1	1	0	1	1	1	1			
1(a)(iv)	Lowest value: −128 Highest value: +127	1								
1(b)(i)	0110 0101 0011	1								
1(b)(ii)	The second block of four binary digits represents a digit larger than 9 // 14	1								
1(b)(iii)	A string of digits on any electronic device displaying numeric values	1								

Question	Answer	Marks
2(a)	A web page contains a client-side script Each instruction in the source code consists of an op code and an operand The source code is required at run-time When the source code is translated, copies of the executable program can be distributed without the need for the source code Assembler Interpreter Compiler	4
2(b)(i)	One mark from: - The program code can be translated to run on any processor / platform - Source code is translated into machine independent intermediate code not machine dependent code	1



Question	Answer
2(b)(ii)	Two marks from: • Java uses a two-step translation process • Java code is partially interpreted – partially compiled • Code is translated first into intermediate code / "bytecode"... • ...using the Java compiler • The bytecode is finally interpreted by the Java Virtual Machine

Question	Answer	Marks																																													
3(a)	Two marks from: - Physical measures - Access rights - Encryption - Firewall - Use authentication methods such as usernames and passwords - Anti-malware program	Max 2																																													
3(b)(i)	<table border="1"><tr><td>7</td><td>X</td><td>6</td><td>=</td><td>42</td></tr><tr><td>8</td><td>X</td><td>5</td><td>=</td><td>40</td></tr><tr><td>6</td><td>X</td><td>4</td><td>=</td><td>24</td></tr><tr><td>5</td><td>X</td><td>3</td><td>=</td><td>15</td></tr><tr><td>3</td><td>X</td><td>2</td><td>=</td><td>6</td></tr><tr><td>1</td><td>X</td><td>1</td><td>=</td><td>1</td></tr><tr><td></td><td></td><td></td><td>Total:</td><td>128 / 11</td></tr><tr><td></td><td></td><td></td><td></td><td>11 R 7</td></tr><tr><td colspan="4">Check digit:</td><td>11 – 7 = 4</td></tr></table> 1 mark for 6 values 1 mark for 2 steps Accept 128 MOD 11 = 7 1 mark for subtraction Answer: 786531 4 (1 mark for answer)	7	X	6	=	42	8	X	5	=	40	6	X	4	=	24	5	X	3	=	15	3	X	2	=	6	1	X	1	=	1				Total:	128 / 11					11 R 7	Check digit:				11 – 7 = 4	4
7	X	6	=	42																																											
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3	X	2	=	6																																											
1	X	1	=	1																																											
			Total:	128 / 11																																											
				11 R 7																																											
Check digit:				11 – 7 = 4																																											
3(b)(ii)	One mark for name of check One mark for description Max two checks Uniqueness check Each PatientID must be unique Length check Each PatientID is exactly 7 characters Format check / Type check All 7 characters must be <u>digits</u> Presence check PatientID must be entered	Max 4																																													



Question	Answer																															
4(a)	A – System clock B – Control unit C – Main memory E – Control bus F – Data bus																															
4(b)	<table border="1"> <thead> <tr> <th>ACC</th><th>CountDown</th><th>OUTPUT</th></tr> </thead> <tbody> <tr> <td></td><td>15</td><td></td></tr> <tr> <td>67</td><td></td><td>C</td></tr> <tr> <td>15</td><td></td><td></td></tr> <tr> <td>14</td><td>14</td><td></td></tr> <tr> <td>51</td><td></td><td>3</td></tr> <tr> <td>14</td><td></td><td></td></tr> <tr> <td>13</td><td>13</td><td></td></tr> <tr> <td>32</td><td></td><td></td></tr> <tr> <td>88</td><td></td><td>x</td></tr> </tbody> </table> (1) (1) + (1) (1) (1)	ACC	CountDown	OUTPUT		15		67		C	15			14	14		51		3	14			13	13		32			88		x	5
ACC	CountDown	OUTPUT																														
	15																															
67		C																														
15																																
14	14																															
51		3																														
14																																
13	13																															
32																																
88		x																														
4(c)	Three marks from: - The assembler scans the assembly language instructions in sequence - When it meets a symbolic address checks to see if already in symbol table - If not, it adds it to the symbol table in the symbolic address column - If it is already in symbol table check if absolute address known - If the absolute address is known, it is entered in the appropriate cell - If the absolute address is not known mark / leave as unknown	Max 3																														
4(d)(i)	The op code / mnemonic / instruction table	1																														
4(d)(ii)	A – 1110 0110 0110 1000 (1) (1) B – E6 68 (1)	3																														



Question	Answer	
5(a)(i)	Three marks from: • Diaphragm / cone • (Voice) coil of wire • Spider / Suspension • (Permanent) Magnet • Basket • Dust cap • Outer frame	
5(a)(ii)	Four marks from: • Takes an electrical signal and translates it into physical vibrations to create sound waves • An electric current in the coil creates an electro-magnetic field • Changes in the audio signal causes the direction of the electric current to change • The direction of the current determines the polarity of the electro-magnet // changing the direction of the current changes the direction of the polarity of the electro-magnet • The electro-magnet is repelled by or attracted to the permanent magnet • Causing the coil to vibrate • The movement of the coil causes the cone / diaphragm to vibrate • That vibration is transmitted to the air in front of the cone / diaphragm as sound waves • The amount of movement will determine the frequency and amplitude of the sound wave produced	Max 4
5(b)(i)	One mark from: • External hard disk drive // SSD • External CD / DVD drive • Pen drive • Blu-ray drive	1
5(b)(ii)	Two marks from: • Additional secondary file storage // storing files • Backup of files • Archiving of files • Transfer files to second computer	Max 2



Question	Answer	
6(a)	Two marks from: - A system of moral principles - That guide behaviour / decision making - Based on philosophical / religious views - By example, e.g. respectful and considerate behaviour	
6(b)	One mark for identifying the issue One mark for correct principle One mark for possible action Max 2 issues (2 × 3 marks) 1 Uncomfortable with one of his colleagues Client and Employer // Management / Colleagues // Judgement // Self For example: Team building exercises // arranged meeting 2 Unfamiliar with programming language Self // Client and Employer // Product // Profession // Colleagues For example: Undergo training 3 Visit to unfamiliar workplace Client and employer // Management // Judgement // Profession // Colleagues For example: He should speak to his manager to discuss situation	Max 6

Question	Answer	Marks
7(a)(i)	<u>PatientID</u> } <u>DoctorID</u> } (1) <u>AppointmentDate, AppointmentTime</u> (1)	2
7(a)(ii)	<pre> graph TD PATIENT <--> DOCTOR PATIENT --> APPOINTMENT DOCTOR --> APPOINTMENT </pre> One PATIENT attends many APPOINTMENTs One DOCTOR takes many APPOINTMENTs Special case for 1 mark only (only if no one to many relationships shown) Many PATIENTs are seen by many DOCTORs	2



Question	Answer	
7(b)	Two marks from: Either: - Add an attribute (for example <code>Attended</code>) - To the appointment table // <code>APPOINTMENT</code> Or: - Add an attribute (for example <code>AppointmentsMissed</code>) - To the patient table // <code>PATIENT</code>	
7(c)(i)	Available to work at both <code>SITE-A</code> and <code>SITE-B</code>	1
7(c)(ii)	<code>APPOINTMENT(Site, AppointmentDate, AppointmentTime, DoctorID, PatientID)</code>	1
7(d)(i)	One mark per line <code>UPDATE DOCTOR</code> <code>SET DoctorID = '017'</code> <code>WHERE DoctorID = '117';</code>	3
7(d)(ii)	1 Mark per bullet, max 2 - Referential integrity should be maintained // Referential integrity could be violated. - Data becomes inconsistent - There may be records in the <code>APPOINTMENT</code> table showing doctor ID 117 - The <code>APPOINTMENT</code> table might not be automatically updated - Records in the <code>APPOINTMENT</code> table will become orphaned	Max 2
7(e)	One mark per line <code>SELECT AppointmentDate, AppointmentTime</code> <code>FROM APPOINTMENT</code> <code>WHERE PatientID = '556';</code>	3

QUESTION 7.



	For example: Personal data of students / staff	
3(b)	1 Mark for stating the security measure 1 Mark for a corresponding description Maximum 2 marks for each measure Maximum 2 measures Physical measures • Locked doors/keyboards etc. • Secure methods of access, keypads/ biometric scans etc. Backup of data • Regular copies of the data are made • If the data is corrupted it can be restored Disk-mirroring • All activity is duplicated to a second disk in real time so that if the first disk fails there is a complete copy available Access rights • Different access rights for individuals/groups of users • To stop users editing data they are not permitted to access • By example Encryption • If accessed, data cannot be understood by unauthorised personnel • Accessed only by those with the decryption key Firewall • To stop unauthorised access/hackers gaining access to the computer network Use authentication methods such as passwords and usernames • Passwords should be strong / biometrics • To prevent unauthorised access to data Anti-malware program • To detect / remove / quarantine viruses / key-loggers etc. • Carrying out regular scans Concurrent Access Controls // Record locking • Closes a record to second user until first update complete • To prevent simultaneous updates being lost	4



Question	Answer
3(c)	1 Mark per bullet, max 2 • Checking that the data entered matches / is consistent with that of the source. • Comparison of two versions of the data • Examples include double entry, visual checking, proof reading etc... • In the event of a mismatch – the user is forced to re-enter the data • By example, e.g. creation of a password • Does not check data is sensible/acceptable

QUESTION 8.



Question	Answer	
2(a)	1 mark per bullet point • Security: keep data safe from accidental/malicious damage/loss • Privacy: keep data confidential // only seen by authorised personnel	
2(b)	1 mark for identifying method 2 marks for description to max 2 × 3 For example: • User accounts • User has a username and password Access to resources can be limited to specific accounts • Cannot access <u>system</u> without valid username and password // prevents unauthorised access to the <u>system</u> • Firewall • All incoming and outgoing network traffic goes through firewall • Blocks signals that do not meet requirements • Keeps a log of signals • Applications can have network access restricted • Anti-malware • Scans for malicious software • Quarantines or deletes any malicious software found • Scans can be scheduled at regular intervals • Should be kept up to date • Auditing • Logging all actions/changes to the system • In order to identify any unauthorised use • Application Security (accept equivalent) • Applying regular updates / patches • Finding, fixing and preventing security vulnerabilities in any (installed) application	6
2(c)(i)	1 mark per bullet to max 4 • Each byte has a parity bit // horizontal parity • An additional parity byte is sent with vertical (and horizontal) parity • Each row and column must have an <u>even/odd number of 1s</u> • Identify the incorrect row and column • The intersection is the error	4
2(c)(ii)	1 mark for correct answer • Errors in an even number of bits (could cancel each other out)	1



Question	Answer	
2(d)	1 mark per bullet point to max 3 For example: He should ... • ...Keep the client's personal data private • ...Involve the client in the development // ...Communicate with the client • ...Provide the solution that the client asked for • ...Keep the project running on time // budget • ...Keep the client informed of any problems/delays	
2(e)	1 mark per bullet point to max 3 • He uses a compiler because it creates a separate executable file • The executable means the client cannot access the source code // edit the program • The executable means the client does not need the IDE / compiler • It will (probably) be faster to run the executable than to interpret the source code every time the program is run	3