

QUESTION 3.



3 (a)

Statement	True (✓)
The IP address consists of any number of digits separated by single dots (.)	
Each number in an IP address can range from 0 to 255	✓
IP addresses are used to ensure that messages and data reach their correct destinations	✓
Public IP addresses are considered to be more secure than private IP addresses	

accept words TRUE or FALSE in right hand column

1 mark per tick, –1 mark for each wrong tick if more than 2

[2]

(b) (i) http – enables browser to know what protocol is being used to access information in the domain

cie.org.uk – cie.org.uk is the domain name

computerscience.html – actual web page / file being viewed

[3]

(ii) %20 – because <space> not allowed in a URL, %20 is the coding for a space (32 in denary)

? – separates the URL from all parameters or variables

[2]

QUESTION 4.



7 (a) Internet Protocol

(b)

Address	Denary / Hexadecimal	Valid or Invalid	Reason
3.2A.6AA.BBBB	Hexadecimal	Invalid	One point from: - This is more than <u>32 bits</u> <u>6AA /BBBB</u> in Hex is bigger than <u>FF / 255</u> in denary <u>6AA / BBBB</u> uses more than 8 bits / a byte - The third / fourth group is bigger than <u>FF / 255</u> in denary - The third / fourth group uses more than 8 bits / a byte
2.0.255.1	Denary	Valid	There are 4 bytes, each 255 or below // All the values are in the range 0 - 255
6.0.257.6	Denary	Invalid	<u>257</u> is above 255 // The third group is above 255
0A.78.F4.J8	Hexadecimal	Invalid	J is not a valid hexadecimal digit // J8 is not a valid Hex number

One mark for each combination of valid or invalid **and** the reason.

(c) Two points from:

[2]

- Public address can be reached across the Internet.
- Private address can only be reached internally/through the LAN/Intranet // private address cannot be reached across the Internet.
- NAT (Network Address Translation) is necessary for a private IP address to access the Internet directly.
- A private address is more secure than a public address // A public address is less secure than a private address.
- Public addresses are provided by ISP / assigned by InterNIC // Private addresses are assigned by the router (of the network concerned).
- Public addresses are unique (to the Internet) // Private addresses (are unique within their network, but) can be duplicated within other (discrete) networks.
- 10.0.0.1 to 10.255.255.254 and 172.16.0.1 to 172.31.255.254 and 192.168.0.1 to 192.168.255.254 form the private address space // IP addresses from the private address space are never assigned as public.

QUESTION 5.



6 (a) **Two** from:

- WWW is a collection of interlinked, hypertext documents/webpages/multimedia resources (accessed via the Internet) // WWW is content from web servers organised as web pages
- Internet is the global connection of interconnected computer networks
- The Internet uses TCP/IP protocol / WWW uses http protocols to transmit data

(b)

[5]

Description	Fibre-Optic cables	Copper cables	Radio waves
'Wireless' media			✓
Twisted-pair is an example		✓	
Uses light waves	✓		
WiFi			✓
Fastest transmission media	✓		

(c) **One pair** from:

[2]

- Real-time - a live stream of an event that is currently taking place
- On-demand - streaming of an event/programme that has taken place in the past
- Real time – the event is captured live with a video camera connected to a computer
- On-demand – Existing media are encoded to bit streaming format and uploaded to a server
- Real-time – cannot be paused / rewind etc
- On-demand – can be paused / re-wound / fast forwarded etc

(d) **Two marks** for description, **one mark** for correct example.

[3]

- Four numbers separated with '.'
- Each number is between 0 and 255 / 00 and FF in Hex / stored in one byte.
- 32 bits long
- Correct example

Page 7	Mark Scheme	
	Cambridge International AS/A Level – May/June 2016	

(e) Four from:

- URL is a reference address to a resource on the Internet.
- The URL is passed to the nearest Domain Name Server (by browser software).
- DNS server stores a database / list of URLs and matching IP addresses.
- DNS (Name Resolver) looks for the URL in its database.
- Finds the matching IP address and returns it to the originator.
- Or if it cannot find it, it forwards to another Domain Name Server at a higher level.
- (Original) DNS server adds the returned IP address to its cache



QUESTION 6.

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

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Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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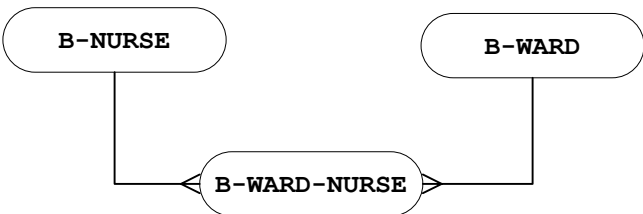
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This document consists of **8** printed pages.





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)	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.
	C in the correct place	
	DA,	
	AB	
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 2
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 00000110 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></table> <table><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 The user moves the mouse on the desktop Input/Output Management The user closes the Spreadsheet program Secondary storage Management The user selects the Save command to save their spreadsheet file Human computer interface 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	1 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	1 1 1 1 1 1 1 1

QUESTION 8.



Question	Answer																		
2(a)	Use the IP address instead of the URL																		
2(b)(i)	1 mark per correct answer <table border="1"><thead><tr><th>IP Address</th><th>Valid or invalid</th></tr></thead><tbody><tr><td>21E5:69AA:FFFF:1:E100:B691:1285:F56E</td><td>Valid</td></tr><tr><td>::255.255.255.255</td><td>Valid</td></tr><tr><td>59FB::1005:CC57:6571</td><td>Valid</td></tr><tr><td>56FE::2159:5BBC::6594</td><td>Invalid</td></tr></tbody></table>			IP Address	Valid or invalid	21E5:69AA:FFFF:1:E100:B691:1285:F56E	Valid	::255.255.255.255	Valid	59FB::1005:CC57:6571	Valid	56FE::2159:5BBC::6594	Invalid						
IP Address	Valid or invalid																		
21E5:69AA:FFFF:1:E100:B691:1285:F56E	Valid																		
::255.255.255.255	Valid																		
59FB::1005:CC57:6571	Valid																		
56FE::2159:5BBC::6594	Invalid																		
2(b)(ii)	1 mark per correct row <table border="1"><thead><tr><th>Statement</th><th>Public</th><th>Private</th></tr></thead><tbody><tr><td>192.168.2.1 is an example of this type of address</td><td></td><td>✓</td></tr><tr><td>Assigned by the Internet Service Provider (ISP)</td><td>✓</td><td></td></tr><tr><td>IP address cannot be duplicated in different networks</td><td>✓</td><td></td></tr><tr><td>Network Address Translation (NAT) is necessary to access the Internet directly</td><td></td><td>✓</td></tr></tbody></table>			Statement	Public	Private	192.168.2.1 is an example of this type of address		✓	Assigned by the Internet Service Provider (ISP)	✓		IP address cannot be duplicated in different networks	✓		Network Address Translation (NAT) is necessary to access the Internet directly		✓	4
Statement	Public	Private																	
192.168.2.1 is an example of this type of address		✓																	
Assigned by the Internet Service Provider (ISP)	✓																		
IP address cannot be duplicated in different networks	✓																		
Network Address Translation (NAT) is necessary to access the Internet directly		✓																	
2(c)	1 mark per example to max 2 - Fibre-optic - Wi-Fi / Radio waves - Microwave - Infrared			2															

QUESTION 9.



Question	Answer	Marks
2(a)	1 mark for 1 correct answer, 2 marks for all 3 correct answers 1 Gopal types into the web browser 2 B (Web browser sends URL to Domain name Service (DNS)) 3 DNS looks up URL in a table 4 A (DNS finds corresponding IP address) 5 C (DNS returns IP address to web browser)	2



Question	Answer	
2(b)	1 mark per bullet point to max 2 • Gives each device on a network an identifier // IP address used to locate a device on a network • Each address is <u>unique</u> within the network • Allows a device/gateway/node to send data to the correct destination / a specific device/gateway/node	
2(c)(i)	1 mark per bullet point to max 3 • Less interference in signal • Signal does not degrade as fast // Needs less signal boosting • More difficult to hack // more secure • Greater bandwidth // <u>Faster</u> transmission speeds possible	3
2(c)(ii)	1 mark per bullet point to max 2 • (Initial) installation cost is higher // Cable / hardware is more expensive to buy (per metre) • Specialists / trained personnel needed to install / maintain • Difficult to terminate // Electronics at both ends are more complex • Fibre-optic cables can break <u>when bent</u> • Only transmits data in one direction • If a fibre-optic cable connection fails, many more services can be affected	2

QUESTION 10.



Question	Answer	Marks
4(a)	1 mark for 1 letter in correct space 2 marks for all 3 letters in correct places 1 C 2 URL goes to Domain Name Service (DNS) 3 B 4 A 5 DNS returns IP address to client	2
4(b)(i)	1 mark per bullet point • <u>258</u> is too large/largest individual numbers is 255 • 4 numbers needed/1 number missing/only 3 groups of numbers given	2



Question	Answer																
4(b)(ii)	1 mark per bullet point • L not a valid hexadecimal number • Only one double colon is allowed																
4(c)	1 mark per row <table border="1" data-bbox="315 508 1377 885"> <thead> <tr> <th data-bbox="315 508 1103 578">Description</th><th data-bbox="1103 508 1240 578">Public</th><th data-bbox="1240 508 1377 578">Private</th></tr> </thead> <tbody> <tr> <td data-bbox="315 578 1103 647">The address can be reached over the Internet.</td><td data-bbox="1103 578 1240 647">✓</td><td data-bbox="1240 578 1377 647"></td></tr> <tr> <td data-bbox="315 647 1103 716">The address is more secure.</td><td data-bbox="1103 647 1240 716"></td><td data-bbox="1240 647 1377 716">✓</td></tr> <tr> <td data-bbox="315 716 1103 817">The address can only be accessed through the same LAN.</td><td data-bbox="1103 716 1240 817"></td><td data-bbox="1240 716 1377 817">✓</td></tr> <tr> <td data-bbox="315 817 1103 885">The address can be duplicated in different networks.</td><td data-bbox="1103 817 1240 885"></td><td data-bbox="1240 817 1377 885">✓</td></tr> </tbody> </table>	Description	Public	Private	The address can be reached over the Internet.	✓		The address is more secure.		✓	The address can only be accessed through the same LAN.		✓	The address can be duplicated in different networks.		✓	4
Description	Public	Private															
The address can be reached over the Internet.	✓																
The address is more secure.		✓															
The address can only be accessed through the same LAN.		✓															
The address can be duplicated in different networks.		✓															

QUESTION 11.



Question	Answer	
1(a)	1 mark for each correct indication and explanation 3A.21.2H.1 Invalid H is not a valid hexadecimal digit 299.53.2.2 Invalid 299 is not in the correct range 192.2.1.0 Valid Consists of four numbers in the range 0–255 separated by full stops	
1(b)	1 mark per bullet point to max 3 • URL is parsed to obtain the Domain name • Domain name is sent to the nearest Domain Name Server (DNS) • DNS holds a list of Domain names and matching IP addresses • DNS name resolver searches its database for the Domain name • If DNS does not find the Domain name, the request is forwarded to a higher level DNS • If the Domain name is found, the IP address is returned • If the Domain name is not found, the request is passed to a higher level server • If the Domain name is finally not found, an error message is generated	3
1(c)	1 mark for each correct term Real-time On-demand	2
1(d)(i)	1 mark per bullet point to max 1 • The data files are very large • It would take a long time to send the uncompressed file // Compressed files will download faster • A higher bandwidth would be needed to transmit the uncompressed file	1
1(d)(ii)	1 mark per bullet point to max 1 • Data is lost • The decompressed file is not the same as the original	1
1(d)(iii)	1 mark per bullet point to max 3 • Lossy creates a smaller file than lossless // lossy compresses further than lossless • The recording of the concert is a large file size and needs <u>significant</u> reduction in size • Lossy removes detail which can be lost without people noticing • By example e.g. reduction in sound quality <u>will not be noticed</u>	3

QUESTION 12.



Question	Answer	
1(a)(i)	1 mark for any valid example e.g. 192.168.0.1	
1(a)(ii)	1 mark for correct answer The number of IP addresses needed will exceed the number available using IPv4.	1
1(a)(iii)	1 mark per bullet point to max 2 • Too many digits per group • Too many groups of digits • The address is more than 32 bits / 4 bytes • Colons are used as separators	2
1(b)(i)	1 mark per bullet point to max 2 • The PSTN consists of many different types of communication lines • Data is transmitted in both directions <u>at the same time</u> // (full) <u>duplex</u> data transmission • The communication passes through different switching centres	2
1(b)(ii)	1 mark for benefit, 1 mark for drawback Benefit • (Probably) faster connection / communication / transmission of data • (Usually) more consistent transmission speed • Improved security Drawback • Expensive to <u>set-up / maintain</u> • Disruption to the dedicated line would leave no alternative	2



Question	Answer	
1(c)	1 mark per bullet point to max 4, max 3 for router, max 3 for gateway Only award the repeated bullet points (1 to 5 in each section) once Router: • Connects two (or more) networks • Can connect a network to a WAN // acts as the single access point for... • Receives packets and forwards towards the destination • ...using the IP address of the destination • Assigns private IP addresses • Operates between <u>similar</u> networks // networks using the <u>same protocol</u> • Can be used to segment a network Gateway: • Connect two (or more) networks • Can connect a network to a WAN // acts as the single access point for... • Receives packets and send packets towards the destination • ...using the IP address of the destination • Assigns private IP addresses • Connects two <u>dissimilar</u> networks // networks that use <u>different protocols</u>	
1(d)	1 mark per bullet point to max 3 for any valid answer For example: • File server • Print server • Proxy server • Web server • Application server	3