

MARKING SCHEME FOR COMPUTER NETWORKS

1.

3(a)	1 mark for each correct row:	5																								
	<table><tr><th>Statement</th><th>Bus</th><th>Star</th><th>Mesh</th></tr><tr><td>all devices connect to one central device</td><td></td><td>✓</td><td></td></tr><tr><td>all devices connect to a central cable</td><td>✓</td><td></td><td></td></tr><tr><td>multiple paths for the packets to travel</td><td></td><td></td><td>✓</td></tr><tr><td>robust against damage because if any line fails, the rest of the network retains full functionality</td><td></td><td>✓</td><td>✓</td></tr><tr><td>most likely to lose data through collisions</td><td>✓</td><td></td><td></td></tr></table>	Statement	Bus	Star	Mesh	all devices connect to one central device		✓		all devices connect to a central cable	✓			multiple paths for the packets to travel			✓	robust against damage because if any line fails, the rest of the network retains full functionality		✓	✓	most likely to lose data through collisions	✓			
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most likely to lose data through collisions	✓																									
(b)(i)	1 mark for: to be visible to and accessible by other devices on the internet	1																								
(b)(ii)	1 mark each: - IPv4 has 4 groups of digits whilst IPv6 has 8 groups - IPv4 is usually represented in denary whilst IPv6 is usually represented in hexadecimal - IPv4 groups are between 0 and 255 whilst IPv6 is between 0 and FFFF - IPv4 is 32 bits whilst IPv6 is 128 bits	2																								

2.

i(a)	1 mark each: - Identification of server in the bank scenario - Description e.g. Receives requests, processes the requests - Identification of client in bank scenario - Description e.g. Sends request to the server, waits and outputs the response	4
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3.

i)	1 mark for: Continuous ordered flow of bits over a communication path	1
ii)	1 mark each to max 2: - Real-time is direct from source whereas on-demand is pre-recorded/downloaded to view later - Real-time cannot be re-watched, on-demand can be paused, re-watched etc. - Real-time plays continually, on-demand downloads sections/blocks and cannot play until next section is downloaded	2

4.

3(b)

4

1 mark for characteristic
1 mark for description of application to examination software:

Thin-client characteristic	Description of use in this software
Data is not stored on the client computer	Exam papers are stored on the server and not on the examiner's computer // exam papers are not permanently stored on the examiners' computers
Client computer is reliant on access to server	Examiners cannot mark if their device cannot access the server / the server 'goes down'
Client computer heavily reliant on network/internet connection	The marking software will not operate without network/internet access
Client computer requires few local resources/memory	Examiners can use devices with low resources and the marking software will still function
Client computer performs minimal functions/processes	The marking software transmits requests, the server responds and sends the response to the user

i(c)(i)	1 mark each to max 2: - Receives packets from internet - Analyses the destination IP address of each packet - Forwards the packet towards its destination ... using the routing table - Maintains/updates the routing table - Finds the most efficient route to the destination	2
(c)(ii)	1 mark each to max 2: - The PSTN consists of many different types of communication lines ... therefore the digital data may need to be converted into a different form/analogue signal - Data is transmitted in both directions at the same time // duplex data transmission - Using a PSTN the communication passes through different switching centres/ISPs	2
5.		
i(a)(i)	1 mark for: Dedicated/bespoke services/storage on a remote server only available to company	1
(a)(ii)	1 mark each to max 3: e.g. - Not reliant on a third party ... gives greater control over security/privacy ... gives greater control over backup - Storage can be tailored/scalable to company requirements// an example e.g. the amount of storage accessible/ facilitating the sharing of files	3
5(b)	1 mark each: - Sending computer transmits packets directly to switch/router/central device - Switch/router/central device checks destination address of packet and forwards directly to that device	2
i(c)(i)	1 mark each to max 2: - Jamming signal is transmitted by the sending device - Transmission is aborted - The sending device waits a random time before trying to send data again if further collisions occur the wait time is increased	2

(c)(ii)	1 mark each to max 2: • Random time increased each time so can be infinite waiting • May be constant jamming signal so nothing ever sends • Certain nodes cannot be prioritised • High power consumption • Only suitable for short distance network // limited distance • Not scalable // more nodes means exponentially longer waiting times	2
5(d)	1 mark for: Static means the IP for that device does not change and Private means it can only be accessed/seen/used within the LAN	1

6.

(a)	1 mark for each bullet point (max 2) • A WAN covers a large geographical area • External/public infrastructure is used • Non-dedicated hardware	2
(b)	1 mark for correct media 1 mark for matching description e.g. • Fibre optic • Transmits data as pulses of light • Radio waves / microwaves • Transmits electromagnetic waves on different frequencies	4
(c)	1 mark for each bullet point (max 4) • Data is compressed before transmitting • The video and audio are transmitted continuously as a series of bits • The video is uploaded to a media server • On download, the media server sends the data to a buffer • The buffer stores data from server until the receiving device can process it • The receiving device receives the bit stream from the buffer	4

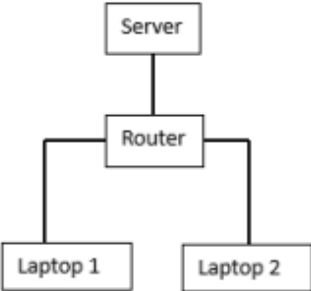
(d)(i)	1 mark for public IP address and 1 mark for private IP address: Public IP address: • So that the router is visible to the Internet/external network/WAN Private IP address: • So that the router is identified to computers within the LAN	2
(d)(ii)	1 mark for each bullet point (max 2) • It allows the network to be divided into smaller networks • ... which reduces traffic in some parts of the network // reduces congestion • ... because traffic only travels through the parts necessary • ... which hides the complexity of network • ... and allows for easier maintenance of the network	2

7.

(a)	1 mark for each bullet point (max 3) • Receives packets from internet / external network • Implements a firewall • Analyses the destination IP address of each packet • Forwards the packet towards its destination // send packets onto local network or external network • ...using the routing table • Maintains / updates the routing • Allocates <u>private</u> IP addresses • Finds the most efficient route to the destination • Changes the packet format for transmission over the next network // • Network Address Translation (NAT): NAT is a technique used by routers to allow multiple devices in a private local area network (LAN) to share a single public IP address.	3
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!(b)	Switch: 1 mark for each bullet point (max 1) - To allow two or more devices to communicate with one another - To connect individual devices to each other - To receive transmissions and forward them to their destination Wireless Access Point (WAP): 1 mark for each bullet point (max 1) - To allow connection of devices (to the central device) using radio signals / Wi-Fi - To allow the central device to send / receive radio signals / Wi-Fi signals - To allow wireless enabled devices to connect to a wired network Bridge: 1 mark for each bullet point (max 1) - To connect two LANs / segments with the same protocol - To transmit data between two networks with the same protocol	3
!(c)	1 mark for each bullet point (max 2) - The students cannot access their files without a reliable internet connection - The amount of space for no payment may be limited so students will have to purchase more space if needed - The students do not have control over the backup (or security) of their work // the students are dependent on a third party for the (security and) backing up of their work	2

8.

'(a)	1 mark for each bullet point (max 2) - Only has four groups of digits // IPv6 has eight groups - Uses dotted notation instead of colons - Because it is a 32 bit / 4 byte address // IPv6 is 128 bits / 16 bytes	2
.b)(i)	1 mark for server only connected to router 1 mark for two laptop computers connected only to router  <pre> graph TD Server[Server] --- Router[Router] Router --- Laptop1[Laptop 1] Router --- Laptop2[Laptop 2] </pre>	2

(b)(ii)	1 mark for each bullet point (max 2) • The data from the sending laptop is transmitted to the router • The data has address of recipient • The router determines recipient's destination address • ... by using a routing table • The router transmits data directly / only to recipient	2
(b)(iii)	1 mark for each use (max 2) and 1 mark for corresponding expansion (max 2) • To improve the security of the LAN • ... so that devices do not receive unintended data • ... so that a compromised device does not expose the whole network • ... so not all devices can access all segments • To make the network management easier • ... because faults can be isolated more efficiently • ... by appropriate example • To make the network easier to expand // For better control of network growth • ... by allowing for greater range of IP addresses to be available • To improve network performance • To reduce network congestion • ... by localising network communications // by dividing data between segments • ... so that devices are not flooded with data • ... because data sent between devices on the same subnet stays within the subnet	4
(c)	1 mark for each bullet point (max 3) • To monitor the communications channel • To send data only when there is no data being transmitted / the line is quiet / idle • To detect a collision and then stop transmissions of further data // transmit a jamming signal • To calculate a random wait time / back-off time • ... then retransmit the data after that random wait time • Increase random time if multiple collisions	3

9.

i)(i)	1 mark for each bullet point (max 4) • The disc is spun at high speed • A laser is shone onto the disc to read / write • ... using optical head to move it into position • ... it follows the spiral track from the centre outwards • When writing the laser burns pits to represent the data • When reading the laser reflects from pits and lands • The reflection from a pit and a land is different • ... the differences are interpreted as 1 or 0	4
ii)	1 mark for each bullet point (max 3) • The computer and optical disc reader/writer send and receive at different speeds • A buffer allows temporary storage of the data • ... so that the computer can transfer data to the buffer at the higher speed • ... and is not held up waiting for data to transfer // so the computer can carry on with other tasks • ... so the optical disc reader/writer is not overloaded • ... and so that data is transferred to optical disc reader/writer from the buffer at the slower rate	3