

## MARKING SCHEME FOR COMPUTER NETWORKS

1.

	Statement	Bus	Star	Mesh	
	all devices connect to one central device		1		
	all devices connect to a central cable	✓			
	multiple paths for the packets to travel			<b>*</b>	
	robust against damage because if any line fails, the rest of the network retains full functionality		1	*	
	most likely to lose data through collisions	<b>*</b>			
(b)(i)	mark for:  to be visible to and accessible by other devices or	n the inte	ernet		1
b)(ii)	1 mark each:				2
	<ul> <li>IPv4 has 4 groups of digits whilst IPv6 has 8 g</li> <li>IPv4 is usually represented in denary whilst II in hexadecimal</li> <li>IPv4 groups are between 0 and 255 whilst IPv</li> <li>IPv4 is 32 bits whilst IPv6 is 128 bits</li> </ul>	Pv6 is us			
i(a)	1 mark each:				4
	<ul> <li>Identification of server in the bank scenario</li> <li>Description e.g. Receives requests, processes</li> <li>Identification of client in bank scenario</li> <li>Description e.g. Sends request to the server, response</li> </ul>			the	

3.

2.



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

4.

3(b)

1 mark for characteristic1 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



	(c)(i)	1 mark each to max 2:	2
		<ul> <li>Receives packets from internet</li> <li>Analyses the destination IP address of each packet</li> <li>Forwards the packet towards its destination</li> <li> using the routing table</li> <li>Maintains/updates the routing table</li> <li>Finds the most efficient route to the destination</li> </ul>	
	(c)(ii)	1 mark each to max 2:	2
		<ul> <li>The PSTN consists of many different types of communication lines</li> <li> therefore the digital data may need to be converted into a different form/analogue signal</li> <li>Data is transmitted in both directions at the same time // duplex data transmission</li> <li>Using a PSTN the communication passes through different switching centres/ISPs</li> </ul>	
5.		· I	• 
	(a)(i)	1 mark for:	1
		Dedicated/bespoke services/storage on a remote server only available to company	
	(a)(ii)	1 mark each to max 3:	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	
	5(b)	1 mark each:	2
		<ul> <li>Sending computer transmits packets directly to switch/router/central device</li> <li>Switch/router/central device checks destination address of packet and forwards directly to that device</li> </ul>	
	i(c)(i)	1 mark each to max 2:	2
		<ul> <li>Jamming signal is transmitted by the sending device</li> <li>Transmission is aborted</li> <li>The sending device waits a random time before trying to send data again</li> <li> if further collisions occur the wait time is increased</li> </ul>	



	(c)(ii)	1 mark each to max 2:	2
		<ul> <li>Random time increased each time so can be infinite waiting</li> <li>May be constant jamming signal so nothing ever sends</li> <li>Certain nodes cannot be prioritised</li> <li>High power consumption</li> <li>Only suitable for short distance network // limited distance</li> <li>Not scalable // more nodes means exponentially longer waiting times</li> </ul>	
	5(d)	1 mark for:	1
		Static means the IP for that device does not change <b>and</b> Private means it can only be accessed/seen/used within the LAN	
6.			
	(a)	1 mark for each bullet point (max 2)	2
		<ul> <li>A WAN covers a large geographical area</li> <li>External/public infrastructure is used</li> <li>Non-dedicated hardware</li> </ul>	
	(b)	1 mark for correct media 1 mark for matching description e.g.	4
		<ul> <li>Fibre optic</li> <li>Transmits data as pulses of light</li> </ul>	
		<ul> <li>Radio waves / microwaves</li> <li>Transmits electromagnetic waves on different frequencies</li> </ul>	
	(c)	1 mark for each bullet point (max 4)	4
		<ul> <li>Data is compressed before transmitting</li> <li>The video and audio are transmitted continuously as a series of bits</li> <li>The video is uploaded to a media server</li> <li>On download, the media server sends the data to a buffer</li> <li>The buffer stores data from server until the receiving device can process it</li> <li>The receiving device receives the bit stream from the buffer</li> </ul>	



(d)(i)	1 mark for public IP address and 1 mark for private IP address:	2
	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	
(d)(ii)	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	2
	which hides the complexity of network     and allows for easier maintenance of the network	
(a)	1 mark for each bullet point (max 3)	3
	<ul> <li>Receives packets from internet / external network</li> <li>Implements a firewall</li> <li>Analyses the destination IP address of each packet</li> <li>Forwards the packet towards its destination // send packets onto local network or external network</li> <li>using the routing table</li> <li>Maintains / updates the routing</li> <li>Allocates private IP addresses</li> <li>Finds the most efficient route to the destination</li> <li>Changes the packet format for transmission over the next network //</li> <li>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.</li> </ul>	



(b)	Switch: 1 mark for each bullet point (max 1)	3
	<ul> <li>To allow two or more devices to communicate with one another</li> <li>To connect individual devices to each other</li> <li>To receive transmissions and forward them to their destination</li> </ul>	
	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	
	<ul> <li>To allow the central device to send / receive radio signals / Wi-Fi signals</li> <li>To allow wireless enabled devices to connect to a wired network</li> </ul>	
	Bridge:1 mark for each bullet point (max 1)	
	<ul> <li>To connect two LANs / segments with the same protocol</li> <li>To transmit data between two networks with the same protocol</li> </ul>	
(c)	1 mark for each bullet point (max 2)	2
	<ul> <li>The students cannot access their files without a reliable internet connection</li> <li>The amount of space for no payment may be limited so students will have to purchase more space if needed</li> <li>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</li> </ul>	
'(a)	1 mark for each bullet point (max 2)	2

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

b)(i)

mark for server only connected to router
mark for two laptop computers connected only to router

Server

Router

Laptop 1

Laptop 2



(b)(ii)	1 mark for each bullet point (max 2)	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	
(b)(iii)	1 mark for each use (max 2) and 1 mark for corresponding expansion (max 2)	4
	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	
	<ul> <li> by localising network communications // by dividing data between segments</li> </ul>	
	so that devices are not flooded with data	
	because data sent between devices on the same subnet stays within the subnet	
(c)	1 mark for each bullet point (max 3)	3
	To monitor the communications channel	
	<ul> <li>To send data only when there is no data being transmitted / the line is</li> </ul>	
	quiet / idle	
	To detect a collision and then stop transmissions of further data //	
	transmit a <b>jamming</b> signal	
	To calculate a <b>random</b> wait time / back-off time	
	then retransmit the data after that random wait time	
	<ul> <li>Increase random time if multiple collisions</li> </ul>	



9.

1/:1	4 manufacture and builted a circle (manufacture)	
)(i)	<ul> <li>1 mark for each bullet point (max 4)</li> <li>The disc is spun at high speed</li> <li>A laser is shone onto the disc to read / write</li> </ul>	4
	using optical head to move it into position	
	<ul> <li> it follows the spiral track from the centre outwards</li> <li>When writing the laser burns pits to represent the data</li> </ul>	
	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	
)(ii)	1 mark for each bullet point (max 3)	3
	<ul> <li>The computer and optical disc reader/writer send and receive at different speeds</li> <li>A buffer allows temporary storage of the data</li> </ul>	
	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	
	<ul> <li> so the optical disc reader/writer is not overloaded</li> <li> and so that data is transferred to optical disc reader/writer from the buffer at the slower rate</li> </ul>	