<table>
<tr><th>Qu</th><th>Pt</th><th>Marking guidance</th><th>Total marks</th></tr>
<tr><td>1</td><td>1</td><td>All marks AO2 (analyse)

1 mark per valid IP address

<table>
<tr><td>The Router 1 port labelled A</td><td>192.168.x.y
where:
• x is in range 192 to 207
• y is in range 0 to 255
R. 192.168.192.0
R. 192.168.207.255</td></tr>
<tr><td>The Router 1 port labelled B</td><td>192.168.x.y
where:
• x is in range 64 to 79
• y is in range 0 to 255
R. 192.168.64.0
R. 192.168.79.255</td></tr>
<tr><td>The computer labelled C</td><td>192.168.x.y
where:
• x is in range 64 to 79
• y is in range 0 to 255
R. 192.168.64.0
R. 192.168.79.255
R. same response as for part B</td></tr>
</table></td><td>3</td></tr>
</table>

<table>
<tr><th>Qu</th><th>Pt</th><th>Marking guidance</th><th>Total marks</th></tr>
<tr><td>1</td><td>2</td><td>Mark is AO2 (analyse)

C; (255.255.240.0)

R. more than one lozenge shaded</td><td>1</td></tr>
</table>

Qu	Pt	Marking guidance	Total marks
1	3	**Mark is AO1 (understanding)** There are not enough (unique) addresses in IPv4 // IPv4 addresses are running out // to provide more addresses; Eliminate need for NAT / network address translation // facilitates true end-to-end connectivity; Simplified / more efficient routing is possible; Improved facilities for multicasting; Automatic configuration possible without DHCP; Allows bigger packet sizes; Devices can move / roam between location and keep the same IP address; Improved support for prioritising traffic by type; **Max 1**	**1**

Qu	Pt	Marking guidance	Total marks
1	4	**Mark is AO1 (understanding)** Star; **A.** physical star, star topology, star network	**1**

<table>
<tr><th>Qu</th><th>Pt</th><th>Marking guidance</th><th>Total marks</th></tr>
<tr><td>1</td><td>5</td><td>
2 marks for AO1 (knowledge) and 4 marks for AO1 (understanding)
<table>
<tr><th>Level</th><th>Description</th><th>Mark Range</th></tr>
<tr><td>3</td><td>A detailed, coherent, description of CSMA/CA that includes the use of RTS / CTS and that conveys good understanding of how the protocol works. Whilst there may be some omissions from the description it contains no misunderstandings.</td><td>5–6</td></tr>
<tr><td>2</td><td>An adequate description of CSMA/CA, including at least three points from the list below. The description is logically organised so that it makes sense when read as a whole and therefore demonstrates a reasonable understanding of how the protocol works. The description may or may not include the use of RTS / CTS.</td><td>3–4</td></tr>
<tr><td>1</td><td>A small number of points relevant to of CSMA/CA have been recalled (in this case award one mark per point, up to a maximum of two from lists below). However, the structure of the response, or lack of it, demonstrates only a very limited understanding, if any, of the protocol used.</td><td>1–2</td></tr>
</table>
Indicative Content

Computer with data to send monitors / listens for (data signal).
If (data) signal present / another transmission in progress then continue to wait.
When no (data) signal present computer sends a Request to Send / RTS. A. if no valid points made about RTS / CTS in response then accept ‘when no data signal is present computer starts to transmit data’, but since no marks awarded for RTS / CTS then marks are limited to max Level 2.
Two computers could start transmitting simultaneously <u>if they both detect there is no data signal.</u>
<u>Receiver / WAP</u> responds (to RTS) with a Clear to Send / CTS signal.
A. router
RTS / CTS signal blocks any other transmissions from nodes in range (for a specified time).
If / when CTS received then start to transmit. A. by implication as BOD if the student states that the computer will begin to transmit after the receiver sends the CTS.
If CTS not received continue to wait (until transmission ends).
Receiver sends acknowledgement / ACK <u>after (all) data received</u>
After transmitting (the transmitter) waits to receive acknowledgement packet (to confirm data received and not corrupted).
If no acknowledgement / ACK received (within reasonable time period) then:

wait a time period.
then listen again / retransmit.

The acknowledgement / ACK also notifies other computers that they can transmit again // after the time specified in the CTS passes, other nodes can transmit.
Waiting periods are (often) random. A. an example waiting period that is random.
Collisions cannot be detected by transmitter.

</td><td>6</td></tr>
</table>

<table>
<tr><th colspan="2">Question</th><th></th><th>Marks</th></tr>
<tr><td>2</td><td>1</td><td>
All marks AO1 (understanding)

Award 1 mark for each comparison made (row in the table below). The student only needs to state one side of the comparison to be awarded the mark. Stating both sides is not worth two marks.

<table>
<tr><th>Peer-to-Peer</th><th>Client-Server</th></tr>
<tr><td>Each computer has equal status // each computer can act as (both) a client and a server
R. “user” for “computer”</td><td>One or more computer(s) nominated as server(s), other computers are clients</td></tr>
<tr><td>Resources stored on / shared from any computer
A. examples of resources
NE. data can be sent between clients</td><td>Clients access resources from server(s) // resources are stored on the server(s)
A. examples of resources</td></tr>
<tr><td>No centralised management of security // security can be managed individually on each computer (by the user)</td><td>Centralised management of security // must login to access server(s)</td></tr>
<tr><td>The same resource can be made available or shared from multiple computers // no reliance on central server</td><td>Resources cannot be accessed if server(s) turned off // reliance on central server(s) // the server(s) must always be turned on</td></tr>
<tr><td>Hardware and software on computers is general purpose // not optimised for providing services</td><td>Hardware and software on server(s) can be optimised for providing services</td></tr>
</table>

Max 3
</td><td>3</td></tr>
</table>

<table>
<tr><th colspan="2">Question</th><th></th><th>Marks</th></tr>
<tr><td>2</td><td>2</td><td>
All marks AO1 (understanding)

Small number of users / devices;
NE. small network
Likely that the users will trust each other // unlikely that confidential data that requires security will be stored // no requirement for complex security; (A. examples eg access rights, types of user)
Individual users will have ability to choose which files/resources they share and with who;
Will avoid additional cost of buying server;
R. cheaper without further explanation
No additional expertise required to set up / manage server(s) // easier to setup as no server to configure;
R. easier to set up / maintain without further explanation

Max 3
</td><td>3</td></tr>
</table>

<table>
<tr><th>Qu</th><th>Pt</th><th>Marking guidance</th><th>Total marks</th></tr>
<tr><td>3</td><td>1</td><td>

All marks AO1 (understanding)

<table>
<tr><th>Level</th><th>Description</th><th>Mark Range</th></tr>
<tr><td>4</td><td>A line of reasoning has been followed to produce a coherent, relevant, substantiated and logically-structured response. The response covers both areas indicated in the guidance below and, in each area, there is sufficient detail to show that the student has a good level of understanding.</td><td>10–12</td></tr>
<tr><td>3</td><td>A line of reasoning has been followed to produce a coherent, relevant, substantiated and logically structured response which shows a good level of understanding of at least one area indicated in the guidance below and some understanding of the other area or a reasonable understanding of both areas.</td><td>7–9</td></tr>
<tr><td>2</td><td>A limited attempt has been made to follow a line of reasoning and the response has a mostly logical structure. A reasonable level of understanding has been shown of one area or some understanding of both areas.</td><td>4–6</td></tr>
<tr><td>1</td><td>A few relevant points have been made but there is no evidence that a line of reasoning has been followed.</td><td>1–3</td></tr>
</table>

Guidance – Indicative Content

Area 1: How data is stored on and read from a magnetic hard disk drive

<table>
<tr><th>Key Points</th><th>Additional Points</th></tr>
<tr><td>Disk is coated in a magnetisable material // iron / cobalt-based material

Magnetising a spot in one direction could represent 0 and the other direction could represent 1 A. any plausible way of representing two values

Disk divided into rings called tracks

Tracks divided into sectors / blocks

Read/write head moves in / out (radially) (to correct track)

Wait until correct sector / block passes under read/write head

Disk spins at high speed

Read/write head senses magnetic field and converts to 0s and 1s</td><td>Whole block read together

Data stored in buffer while being read

Can be many disks inside drive known as platters

Disk and drive are a sealed unit

Data near outside edge of disk stored less densely // disk has constant angular velocity

Files stored in hierarchical structure / directories

Free / used space indicated in file allocation table

Mirroring / striping / RAID may be used for automatic backup // to protect against drive failure</td></tr>
</table>

</td><td>12</td></tr>
</table>

A good understanding could be demonstrated by covering many of the points in the 'Key Points' column of the table, conveying the fundamental method by which magnetic hard disks work, but may omit some detail. Referencing points in the 'Additional Points' column could compensate for any omissions in the 'Key Points' column, but is not required.

Area 2: How the TCP/IP stack is used in the file server

- Four layers of stack are Application, Transport, Network/Internet and Link/Physical.
- File will be passed down/through each layer in turn.

Layer	Key Points	Additional Points
Application	File server software will operate in the Application Layer File transfer may use FTP protocol	Alternative protocols are SMB, NFS
Transport	Establishes end-to-end connection between file server and computer Receives file / data on a port from the application layer // adds source and destination port numbers to segment Splits file / data into segments Adds checksum to segment // adds error detection information to segment // deals with transmission errors // retransmits lost / corrupted segments **A.** packet for segment	Performs flow control Performs congestion control Adds sequence number to segment May use TCP or UDP protocol
Network / Internet	Adds source and destination IP addresses to datagram **R.** routes data across network **A.** packet for datagram	Encapsulates each TCP/IP segment into an IP datagram Add time to live Uses subnet mask to determine if destination is on same subnet
Link / Physical	Physical interface to network communications medium // writes (encoding of) data to communications medium (**A.** cable for medium) Uses device drivers // uses network interface card Adds hardware / MAC address of destination / router / gateway / source	

Points cannot be credited unless they are linked to the appropriate layer.

		A good understanding could be demonstrated by covering many of the points in the 'Key Points' column of the table, including naming all four layers and making a range of accurate points about at least three of them. Referencing points in the 'Additional Points' column could compensate for any omissions in the 'Key Points' column, but is not required.	

Qu	Pt	Marking guidance	Total marks
3	2	**All marks AO1 (understanding)** **Advantage (1 mark):** • lower power consumption • faster access times // faster transfer rate // lower latency **NE.** faster • smaller (physically) • generate less heat // require less cooling • lower failure rate // less susceptible to damage from impact // not affected by magnetic fields **A.** more reliable **R.** quieter **R.** portable **Disadvantage (1 mark):** • higher cost (per megabyte) • higher error rate (over time) // more blocks become unusable over time in an SSD **R.** lower capacity	**2**