1.5 Networks and Topologies: 30-minute Pack

OCR J277 · Calculators not allowed · about 30 minutes

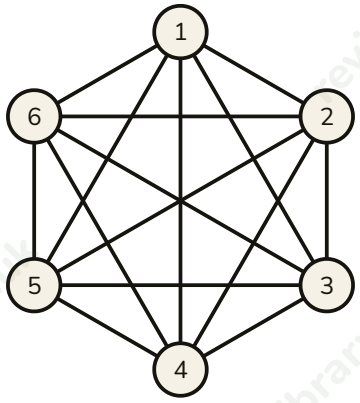
Total Marks

Name: _____ Date: ____ / ____ / _____

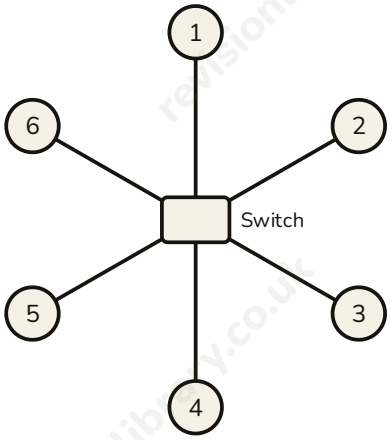
Answer ALL questions. Show all your working.

1 A network administrator is connecting 6 computers together in a server room.

Connecting 6 computers: full mesh vs star topology



Full mesh (every pair directly connected)



Star (all connected via one switch)

(a) Calculate the number of cables needed to connect all 6 computers in a full mesh topology, where every computer has a direct connection to every other computer. Show your working. **(2)**

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(b) State the number of cables needed to connect the same 6 computers using a star topology with one central switch. **(1)**

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(c) Give one reason, other than the cost of cabling, why a school computer network is more likely to use a star topology rather than a full mesh topology. **(2)**

(Total for Question 1 is 5 marks)

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2 A small graphic design studio in Bristol, run by Priya, has 4 employees who each need to share files between their own computers.

(a) Define the term client-server network. **(1)**

(b) Define the term peer-to-peer network. **(1)**

(c) State one advantage of a client-server network over a peer-to-peer network. **(1)**

(d) Recommend, with a justification linked to the studio, which network model Priya's studio should use. **(2)**

(Total for Question 2 is 5 marks)

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3 Name the protocol described in each case.

(a) Transfers web page data between a web server and a browser, without encryption. **(1)**

(b) Transfers web page data between a web server and a browser, using encryption. **(1)**

(c) Used to transfer files between a client and a server. **(1)**

(d) Used to send an email from a client to a mail server, or between mail servers. **(1)**

(e) Used by an email client to download messages and store a copy locally, normally removing them from the server. **(1)**

(f) Used by an email client to view and synchronise messages that remain stored on the mail server, allowing access from several devices. **(1)**

(g) The suite of protocols that governs how data is broken into packets, addressed, transmitted, routed and reassembled across the internet. **(1)**

(Total for Question 3 is 7 marks)

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4 Every device on a network is given an IP address, which is stored and processed in binary.

(a) Convert the 8-bit binary number 11010110 to denary. Show your working. **(2)**

(b) Convert your answer to part (a) into hexadecimal. **(2)**

(c) The final octet of an IPv4 address has the denary value 47. Convert 47 to 8-bit binary. **(2)**

(Total for Question 4 is 6 marks)

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5 Every network interface card is manufactured with a unique MAC address.

(a) State what a MAC address is used for. **(1)**

(b) Give two ways in which a MAC address is different from an IP address. **(2)**

(c) A MAC address is 48 bits long and is usually written in hexadecimal. Calculate how many hexadecimal digits are needed to represent 48 bits, and explain your answer. **(2)**

(Total for Question 5 is 5 marks)

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Mark scheme · 1.5 Networks and Topologies: 30-minute Pack

Question 1

(a) correct method shown, e.g. 6 x 5 / 2 or a complete systematic count of pairs **M1**

(a) 15 cao **A1**

(a) Answer: 15

(b) 6 **B1**

(b) Answer: 6

(c) valid point, e.g. it is much easier to add, remove or trace a faulty device **B1**

(c) developed with detail, e.g. because each device connects independently to the switch, a fault can be traced to a single cable/device without needing to check every connection between every pair of devices as would be needed in a mesh **B1**

(c) Answer: Easier to install/manage and to diagnose faults, since each device has one independent connection to the switch rather than many interlinked connections.

Question 2

(a) a network in which one or more dedicated server(s) provide services/resources (e.g. files, printing) to other devices, called clients, which request them **B1**

(a) Answer: A network where dedicated server(s) provide services/resources that other devices (clients) request and use.

(b) a network where all devices (peers) have equal status and can each act as both client and server, sharing resources/files directly without a dedicated central server **B1**

(b) Answer: A network where all connected devices have equal status and share resources directly, without a dedicated server.

(c) any one of: centralised management of security/user accounts/backups; easier to keep data consistent as it is stored in one place; easier to scale to many users (oe) **B1**

(c) Answer: Centralised management (e.g. of user accounts, security and backups) is possible from one server.

(d) recommendation of either peer-to-peer or client-server **B1**

(d) justification linked to the studio and consistent with the recommended model, e.g. peer-to-peer is cheaper without a dedicated server and manageable for only 4 employees; or client-server centralises shared design files and backups for the 4 employees **B1**

(d) Answer: Peer-to-peer, because with only 4 computers it is cheap and simple to set up without needing a dedicated server or IT specialist. Alternatively, client-server would centralise shared design files and backups for the 4 employees.

Question 3

(a) HTTP **B1**

(a) Answer: HTTP

(b) HTTPS **B1**

(b) Answer: HTTPS

(c) FTP **B1**

(c) Answer: FTP

(d) SMTP **B1**

(d) Answer: SMTP

(e) POP3 **B1**

(e) Answer: POP3

(f) IMAP **B1**

(f) Answer: IMAP

(g) TCP/IP **B1**

(g) Answer: TCP/IP

Question 4

(a) correct place-value method shown, e.g. 128+64+16+4+2 **M1**

(a) 214 cao **A1**

(a) Answer: 214

(b) ft their (a) divided by 16, showing quotient and remainder **M1**

(b) D6 cao (ft) **A1**

(b) Answer: D6

(c) correct method shown, e.g. 32+8+4+2+1 **M1**

(c) 00101111 cao (8 bits shown) **A1**

(c) Answer: 00101111

Question 5

(a) a unique identifier assigned to a device's network hardware, used to address data to that specific physical device on a local network **B1**

(a) Answer: To uniquely identify a device's network hardware so data can be addressed to that specific device on a local network.

(b) a MAC address is fixed/permanent, set by the manufacturer, whereas an IP address can change/be reassigned (e.g. by DHCP) **B1**

(b) a MAC address identifies a specific physical device, whereas an IP address identifies a device's logical location/position on a network **B1**

(b) Answer: MAC address is permanent and set by the manufacturer, identifying the physical device; IP address can change and identifies the device's logical network location.

(c) correct method, 48 / 4, since each hex digit represents 4 bits **M1**

(c) 12 hex digits cao **A1**

(c) Answer: 12 hex digits

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