1.3 – Computer networks, connections and protocols – Past Exam Questions

1.3 – Computer networks, connections and protocols	
Sub topic	**Guidance**
1.3.1 Networks and topologies	
☐ Types of network: o LAN (Local Area Network) o WAN (Wide Area Network) ☐ Factors that affect the performance of networks ☐ The different roles of computers in a client-server and a peer-to-peer network ☐ The hardware needed to connect stand-alone computers into a Local Area Network: o Wireless access points o Routers o Switches o NIC (Network Interface Controller/Card) o Transmission media ☐ The Internet as a worldwide collection of computer networks: o DNS (Domain Name Server) o Hosting o The Cloud o Web servers and clients ☐ Star and Mesh network topologies	**Required** ✓ The characteristics of LANs and WANs including common examples of each ✓ Understanding of different factors that can affect the performance of a network, e.g.: ▪ Number of devices connected ▪ Bandwidth ✓ The tasks performed by each piece of hardware ✓ The concept of the Internet as a network of computer networks ✓ A Domain Name Service (DNS) is made up of multiple Domain Name Servers ✓ A DNS's role in the conversion of a URL to an IP address ✓ Concept of servers providing services (e.g. Web server → Web pages, File server → file storage/retrieval) ✓ Concept of clients requesting/using services from a server ✓ The Cloud: remote service provision (e.g. storage, software, processing) ✓ Advantages and disadvantages of the Cloud ✓ Advantages and disadvantages of the Star and Mesh topologies ✓ Apply understanding of networks to a given scenario
1.3.2 Wired and wireless networks, protocols and layers	
☐ Modes of connection: o Wired • Ethernet o Wireless • Wi-Fi • Bluetooth ☐ Encryption ☐ IP addressing and MAC addressing ☐ Standards ☐ Common protocols including: o TCP/IP (Transmission Control Protocol/Internet Protocol) o HTTP (Hyper Text Transfer Protocol) o HTTPS (Hyper Text Transfer Protocol Secure) o FTP (File Transfer Protocol) o POP (Post Office Protocol) o IMAP (Internet Message Access Protocol) o SMTP (Simple Mail Transfer Protocol) ☐ The concept of layers	**Required** ✓ Compare benefits and drawbacks of wired versus wireless connection ✓ Recommend one or more connections for a given scenario ✓ The principle of encryption to secure data across network connections ✓ IP addressing and the format of an IP address (IPv4 and IPv6) ✓ A MAC address is assigned to devices; its use within a network ✓ The principle of a standard to provide rules for areas of computing ✓ Standards allows hardware/software to interact across different manufacturers/producers ✓ The principle of a (communication) protocol as a set of rules for transferring data ✓ That different types of protocols are used for different purposes ✓ The basic principles of each protocol i.e. its purpose and key features ✓ How layers are used in protocols, and the benefits of using layers; for a teaching example, please refer to the 4-layer TCP/IP model **Not required** × Understand how Ethernet, Wi-Fi and Bluetooth protocols work × Understand differences between static and dynamic, or public and private IP addresses × Knowledge of individual standards × Knowledge of the names and function of each TCP/IP layer

2022

3 A library has a LAN (Local Area Network).

(a) The LAN allows access by both wired and wireless devices.

Users have reported that the network sometimes runs very slowly.

(i) Explain why the number of devices using the network at the same time can affect the performance of the network.

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..... **[3]**

(ii) Identify **one** other factor that can affect the performance of the network.

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..... **[1]**

(b) Users can access websites from the library computers.

Complete the description of accessing websites using the given list of terms. Not all terms will be used.

0 1 127 128 255 256 Colon

Domain Name Server Embedded systems File server Full stop

Hyphen Internet protocol MAC address Router

Uniform Resource Locator Web server Clients

A website is hosted on a ..... . The computers that access the websites are called ..... .

The user enters the ..... into a web browser. The web browser sends a request to the ..... for the matching IP (Internet Protocol) address. If found the IP address is returned. A request is then sent to this IP address.

An IPv4 address is made of 4 groups of digits. Each group can be between the denary values ..... and ..... . The groups of digits are separated by a ..... .

[7]

(c) The wired connection is an Ethernet connection. Ethernet is considered a standard.

Explain why Ethernet is a standard.

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..... **[2]**

(d) The network has several routers.

Identify **three** tasks carried out by a router.

1 .....

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2 .....

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3 .....

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[3]

(e) The library does not use encryption when data is transmitted through the network.

Give **two** reasons why the library should use encryption.

1 .....

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2 .....

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[2]

(f) Protocols are used to transmit data through the network and over the internet.

Identify **one** protocol that can be used to perform each of the following tasks:

Send an email .....

Access a website securely .....

[2]

Sample Paper

7 The owners of a large bakery have a Local Area Network (LAN) with a star topology. They order their supplies over the Internet. When data is transmitted from the bakery to the supplier, network protocols are used.

(a) Define what is meant by a 'network protocol'.

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..... **[1]**

(b) TCP/IP is a set of protocols based on layers.

(i) With regards to network protocols, define what is meant by a 'layer'.

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..... **[1]**

(ii) Describe **one** advantage of using layers to construct network protocols.

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..... **[2]**

(c) Give **two** reasons why the bakery may use a star network topology for their LAN.

1 .....

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2 .....

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[2]

10 A law company currently use a Local Area Network (LAN) linked to a Wide Area Network (WAN). They want to upgrade their system to utilise cloud storage.

(a) Define what is meant by a Wide Area Network.

..... **[1]**

(b) Explain **two** advantages to the law company of storing their data in the Cloud.

1 .....

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2 .....

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[4]

2021

7 A university has buildings in two sites that are 5 miles apart.

(a) Describe the difference between a LAN and a WAN.

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..... **[2]**

(b) Site A has 4 classrooms. Site B has 2 classrooms. The network on each site between the classrooms is a star topology using a switch. The two sites are connected over the Internet.

Complete the network diagram for **site A** of the University.

[2]

(c) Site B has a higher network performance than site A.

(i) Explain how each of the following can contribute to the performance of a network.

Wifi frequency .....

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Interference .....

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Number of concurrent users .....

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Type of network traffic .....

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[4]

(ii) Identify **one** other factor that can contribute to the performance of a network.

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..... **[1]**

(e) Data transmitted over the network uses different protocols.

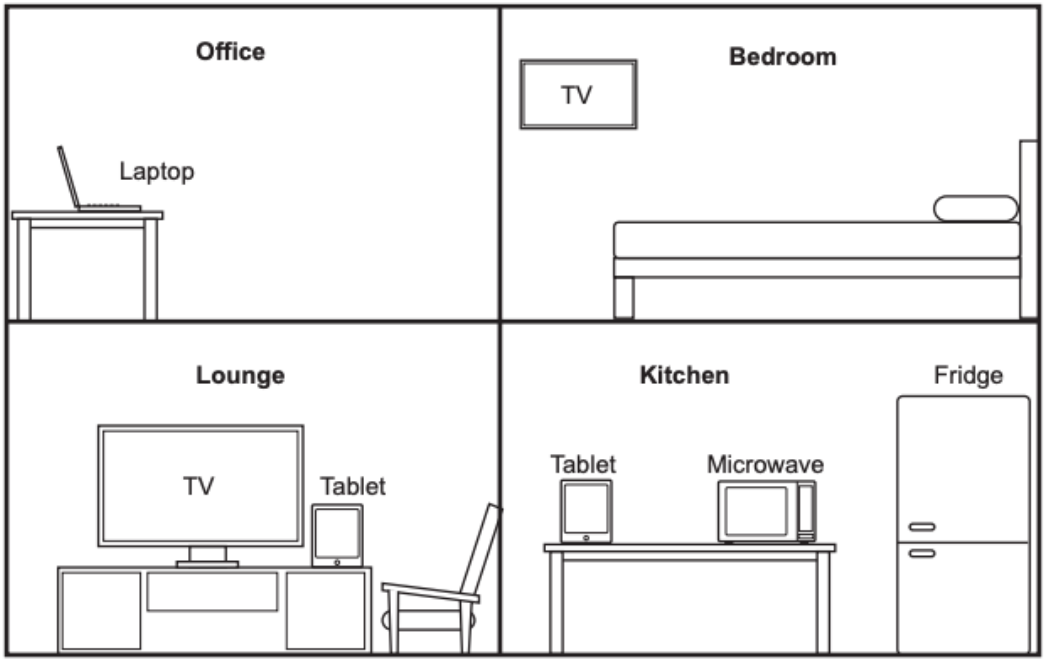
Tick **one** box in each row to identify whether the protocol is related to email, transferring files or accessing websites.

Protocol	Email	Transferring files	Accessing websites
POP			
FTP			
SMTP			
HTTPS			

[4]

2020

2 Hope has a network in her house. The main devices are shown in the diagram.



(a) State whether Hope's network is a LAN or a WAN. Justify your choice.

Choice .....

Justification .....

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[3]

(b) Devices on the network do not currently have Internet access.

Identify **one** device that Hope can use to connect her home network to the Internet.

..... **[1]**

(c) The network has one wireless access point in the kitchen that transmits data on the 5 GHz frequency.

(i) When the laptop is in the kitchen, it has better network performance.

Explain why the laptop's network performance is lower in the bedroom.

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..... **[2]**

(ii) State **two** ways Hope could improve the wireless network performance in the bedroom.

1 .....

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2 .....

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[2]

(d) Explain why Hope's network uses a peer-to-peer model and not a client-server model.

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[3]

(e) Some of Hope's files are stored on the cloud.

Describe the benefits and drawbacks to Hope of storing her files on the cloud.

Benefits

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Drawbacks

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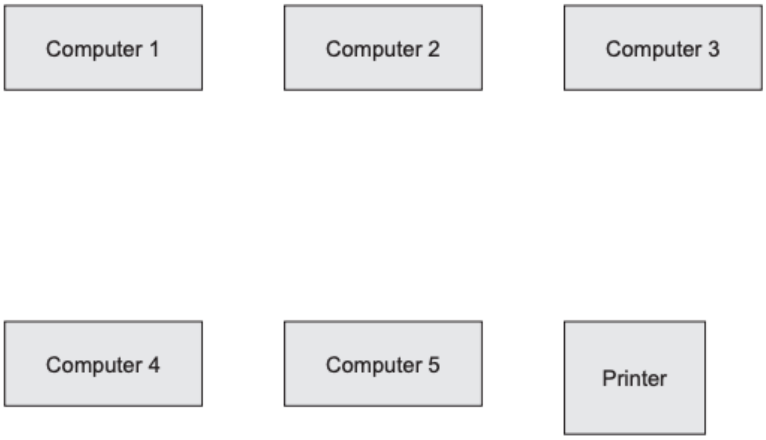
[6]

6 Naomi's office has five computers connected into a Local Area Network (LAN). There is also one printer that all the devices can print to.

(a) The LAN is set up as a mesh topology.

Draw connections to show one way that the devices could be connected using a mesh topology.



[2]

(b) Ethernet cables are used within the office building.

Tick **one** box in each row to identify if the statement about Ethernet is True or False.

Statement	True	False
Ethernet is a protocol		
Ethernet uses wireless data transmission		
Ethernet can transmit data at speeds of up to 100 Gbits per second		
Ethernet is a protocol within the TCP/IP stack		

[4]

(c) Computer 1 enters the URL www.ocr.org.uk into a web browser. This is then converted into the IP address of the webserver that hosts the website.

(i) Explain how the URL www.ocr.org.uk is converted into the IP address.

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..... **[3]**

2019

4 An office has a LAN (Local Area Network). The office has four employees who each have a laptop. The office also has one server and one networked printer.

(a) The office is set up as a star network with a switch at the centre. All devices are connected to the network using cables.

(i) Draw the devices and connections in the office star network. All devices must be clearly labelled.

[3]

(ii) Describe the role of the switch in the office network.

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..... **[2]**

(b) The office introduces a WAP (Wireless Access Point) to allow network access to wireless devices.

The office manager has noticed that the performance of the network has recently decreased.

(i) Describe how introducing wireless access could have slowed down the network.

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..... **[2]**

(ii) Identify **two** other factors that can affect the performance of a network.

1 .....

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2 .....

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[2]

5 The IP address 192.149.119.226 is linked to the website with a URL of https://www.ocr.org.uk

(a) When https://www.ocr.org.uk is entered into a browser, the website homepage is loaded.

Describe the relationship between the website URL (https://www.ocr.org.uk), the IP address and the webserver.

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..... **[5]**

(b) Computers access the Internet using the TCP/IP model.

(i) The TCP/IP model uses layers including the application layer and transport layer.

Explain why the TCP/IP model uses layers.

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..... **[2]**

(ii) TCP/IP is one example of a protocol.

Give the name of **one** appropriate protocol for each task in the table.

Task	Protocol for this task
Sending an email from one mail server to another	
Transmitting a file from a client to a server	
Viewing a website using a web browser	
Downloading an email to your computer	

[4]

2018

2 A house has computers in each room and a central router. Every room allows both Ethernet and WiFi connections to the router.

(a) Identify if the house network is a LAN (local area network) or a WAN (wide area network). Justify your choice.

Network type: .....

Justification: .....

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[3]

(b) The following table has descriptions of Ethernet and WiFi.

Tick (✓) **one** box in each row to identify if the description is more appropriate for Ethernet or WiFi.

Description	Ethernet	WiFi
A wired connection		
More likely to be affected by interference		
Data can be transmitted at a faster speed		
Wireless transmission		
Shorter transmission range before data is lost		

[5]

(c) **(i)** Describe the purpose of the router in the house's network.

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..... **[2]**

(ii) Identify **two** additional items of network hardware, apart from cables and a router, that may be used within the house network.

1 .....

2 .....

[2]

(d) A user enters a uniform resource locator (URL) into a web browser on one of the computers in the house. A system is then used to find the IP address of the web server associated with the URL.

(i) Name the system which matches URLs to IP addresses on the web.

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..... **[1]**

5 When connecting computers into a network, the use of appropriate protocols are important.

(a) Explain what is meant by a protocol.

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..... **[2]**

(b) For each of the scenarios below, identify the most appropriate protocol to be used and explain the function of the protocol.

(i) A user wants to transfer a file directly from his computer to his friend's computer.

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..... **[2]**

(ii) A customer wants to securely log into her bank's website to check her account balance.

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..... **[2]**

(c) Explain the difference between how the IMAP (Internet message access protocol) and SMTP (simple mail transfer protocol) protocols are used.

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..... **[2]**

2017

(b) OCR Accounts have a set of laptops that will form the network.

(i) Identify **one** hardware device that would be needed to connect the laptops to the Internet.

..... **[1]**

(ii) Identify **two** additional pieces of hardware that OCR Accounts could use to set up the network and describe what each piece of hardware would be used for within the network.

1 .....

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2 .....

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[4]

2016 – Legacy Papers

7 A company, OCR Supermarkets, has supermarket stores throughout the country. The computers for each store connect to the central office using a Wide Area Network (WAN).

(a) Identify **two** differences between a WAN and a LAN (Local Area Network).

Difference 1: .....

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Difference 2: .....

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[2]

(b) OCR Supermarkets use a client-server network to connect the checkout computers to the store's server.

Describe **two** benefits to OCR Supermarkets of using a client-server network instead of a peer-to-peer network.

Benefit 1: .....

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Benefit 2: .....

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[4]

The supermarket manager's computer can access the Internet and the World Wide Web.

(c) Explain the difference between the Internet and the World Wide Web.

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..... **[2]**

2015

9 A bank uses a local area network to connect all the computers in its head office.

(a) State **two** ways the local area network can be used to monitor the work of employees.

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2 .....

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[2]

(b) Computers in the network can be identified using both IP addresses and MAC addresses.

Describe **two** differences between IP addresses and MAC addresses.

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..... **[4]**

2014

1 Zoe is organising a LAN-party. Her friends will each bring a computer to the party so that they can play games against each other.

(a) Describe what is meant by a Local Area Network (LAN).

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..... **[2]**

(b) Zoe plans to use the star topology in the LAN.

Describe the star topology.

You may use a diagram.

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..... **[2]**

(c) State **two other** topologies that can be used when creating a LAN.

1 .....

2 .....

[2]