Communications & Networking Technologies

(Topologies)

Question 1

7) A company allows customers to stream music from its servers over the Internet. The company's internet connection is currently provided through copper cables. (a) Identify two pieces of hardware, other than the cables, that enable the servers to connect to the Internet. Describe the purpose of each device.

Device 1 .....

Purpose .....

.....

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Device 2 .....

Purpose .....

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..... [4]

(b) The company wants to upgrade their internet connection to fibre-optic cables. Give one benefit and one drawback to the company of upgrading to fibre-optic cables.

Benefit.....

.....

.....

Drawback .....

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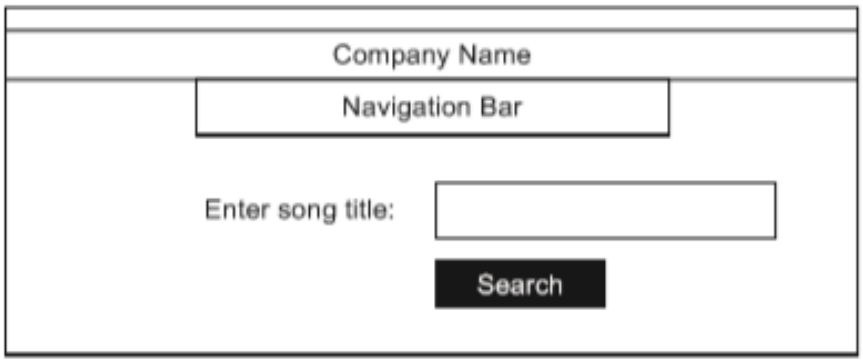
..... [2]

(c) A customer enters a song title into a web page to listen to the song. The design of the web page is shown:



The web page will make use of both client-side and server-side scripting.

(i) Explain how client-side scripting will be used in this web page.

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[3]

(ii) Explain how server-side scripting will be used after the customer clicks the 'Search' button.

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…… [2]

Question 2

1 Ana owns a small company with four employees. The office has a network containing several computers that run on a client-server model. There is one server that connects to the Internet using a router.

(a) Networks transmit data using various types of connection shown in the following table.

Complete the table.

Type of connection	Description
Fibre-optic	....
....	A communication device in Earth's orbit that receives and transmits data
Radio waves	....
....	Carries data as electrical signals and can consist of a twisted pair

[4]

(b) Explain how the client-server model enables the employees to access the same files from different computers.

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[2]

(c) Each computer in the network has a private IP address. Give two reasons why the computers do not have public IP addresses.

1 .....

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2 .....

..... [2]

Question 3

1) Devices connected to the Internet have IP (Internet Protocol) addresses. (a) Three IPv4 addresses are given. Circle either Valid or Invalid to indicate whether each address is valid or invalid. Explain your decision.

Address 1: 3A.21.2H.1 Valid / Invalid

Explanation .....

.....

Address 2: 299.53.2.2 Valid / Invalid

Explanation .....

.....

Address 3: 192.2.1.0 Valid / Invalid

Explanation .....

..... [3]

(b) A website can be accessed using either the Uniform Resource Locator (URL) or the IP address. Describe how a URL is converted into its matching IP address.

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..... [3]

(c) People use the Internet to stream media. Complete the following statements by filling in the names of the missing methods of bit streaming. ..... Bit streaming is used when watching a live stream of events that are currently taking place. The event is captured live with a video camera connected to a computer, and it cannot be paused or rewound. ..... Bit streaming is used when watching an event that has taken place in the past. Existing media are encoded to bit streaming format and uploaded to a server. It can be paused and rewound.

Question 4

Computers on the Internet have IP addresses. (a) IP addresses can be in either IPv4 or IPv6 format.

(i) Give an example of a valid IPv4 address.

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.....[1]

(ii) State why there is a need for IPv6 addressing.

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.....[1]

(iii) A computer's IPv6 address is: C100:2235::1000:25AA:AA50 Explain why this IPv6 address would be an invalid IPv4 address.

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..... [2]

(b) A company has computers in two separate buildings that communicate using the Internet over a Public Switched Telephone Network (PSTN).

(i) Describe the transmission of data using a PSTN.

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..... [2]

(ii) The company wants to install a dedicated line between the two buildings. Identify one benefit and one drawback of installing a dedicated line between the two buildings.

Benefit.....

.....

Drawback.....

..... [2]

(c) A network can use routers and gateways. Explain the role of routers and gateways in a network.

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..... [4]

(d) The company has an email server. Identify three other types of server.

1 .....

2 .....

3..... [3]

Question 5

Customers of a bank can access their account information by logging in on the bank's website.

(a) The bank has a client-server model of networked computers.

(i) Describe, using the bank as an example, the key features of a client-server model.

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..... [3]

(ii) Give two other examples of applications that can use the client-server model.

1 .....

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2.....

..... [2]

(b) The bank's customers log in to the website using a web application. Explain why the web application uses server-side scripting.

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..... [3]

(c) The bank is upgrading its local area network (LAN) copper cables to fibre-optic cables.

(i) State two benefits to the bank of upgrading to fibre-optic cable from copper cable.

1 .....

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2 .....

..... [2]

(ii) State two drawbacks of upgrading to fibre-optic cables.

1 .....

.....

2 .....

..... [2]

Question 6

(e) Dominic sends his videos to his colleagues over the Internet using bit streaming.

(i) Describe how the video is sent using bit streaming.

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..... [4]

(ii) Circle either Real-time or on-demand to identify whether the video will be sent using real-time or on-demand bit streaming. Justify your choice.

Real-time / on-demand Justification

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..... [2]

Question 7

(c) The self-checkout machines connect to a server that stores all the data for the supermarket. This is a client-server network.

(i) Describe, using an example for the supermarket, the client-server network model.

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..... [4]

Question 8

1 Four communication media and five features are shown.

Draw one or more lines from each communication media to the appropriate feature(s).

Communication media	Feature
Fibre-optic cable	Can be twisted pair or co-axial
Radio waves	Transmits light pulses
Copper cable	Large range of wavelengths
Satellite	Least likely to have interference
	Wireless transmission

[6]

Question 9

A college has a client-server network.

(a) The college has a file server and other servers. State the purpose of two other servers in the college network.

Server 1 .....

Server 2 ..... [2]

(b) The students use the network to access the Internet. One student stated, 'The Internet and the World Wide Web are the same thing'.

Tick (✓) one box to indicate whether this statement is true or false.

True // False

Justify your choice.

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.....[5]

(c) Students use the college's learning resource website. Several of the web pages include PHP script. Describe the sequence of events when a student requests a web page with embedded server-side code.

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.....[4]

Question 10

(d) (i) State whether this JavaScript code will be run client-side or server-side.

.....[1]

(ii) Explain the difference between client-side scripting and server-side scripting.

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.....[3]

Question 11

Computer **A** needs to access a web page.

(a) State how Computer **A** could access the web page without using a Domain Name Service (DNS).

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.....[1]

(b) **(i)** The following table shows four IPv6 addresses.

State if each address is valid or invalid.

IP address	Valid or invalid
21E5:69AA:FFFF:1:E100:B691:1285:F56E	
::255.255.255.255	
59FB::1005:CC57:6571	
56FE::2159:5BBC::6594	

[4]

(ii) The following table shows four statements about either public or private IP addresses.

Tick (✓) **one** box in each row to indicate whether each statement refers to a public or a private IP address.

Statement	Public	Private
192.168.2.1 is an example of this type of address		
Assigned by the Internet Service Provider (ISP)		
IP address cannot be duplicated in different networks		
Network Address Translation (NAT) is necessary to access the Internet directly		

[4]

(c) One type of transmission media is copper cable. Give two additional types of transmission media.

1 .....

2 ..... [2]

Question 12

2 Gopal types the Uniform Resource Locator (URL) of a website into a web browser.

(a) The following sequence (1 to 5) describes the steps that take place. There are three missing statements.

1 Gopal types into the web browser.

2 .....

3 DNS looks up the URL in table

4 .....

5 .....

Three statements **A**, **B** and **C** are used to complete the sequence.

A	DNS finds corresponding IP address
B	Web browser sends URL to Domain Name Service (DNS)
C	DNS returns IP address to web browser

Write one of the letters **A** to **C** in the appropriate rows (2, 4 and 5) to complete the sequence. [2]

(b) Describe the purpose of an IP address.

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..... [2]

(c) A telecommunications operator has installed fibre-optic cables in Gopal's neighbourhood.

(i) Give three benefits of fibre-optic cable over copper cable.

1.....

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2 .....

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3 .....

..... [3]

(ii) Give two drawbacks of fibre-optic cable over copper cable.

1 .....

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2 .....

..... [2]

Question 13

16 Ava needs to view a website and she knows the Uniform Resource Locator (URL).

(a) Complete the series of steps that take place.

Write the **letter** of the appropriate statement in each space.

A	DNS finds corresponding IP
B	DNS looks up URL in table
C	Ava types the URL into a web browser

1 .....

2 Web browser sends URL to Domain Name Service (DNS)

3 .....

4 .....

5 DNS returns IP address to web browser

[2]

(b) **(i)** An IPv4 address has been entered as 12.258.3

Give **two** reasons why this IP address is invalid.

1 .....

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2 .....

.....

[2]

(ii) An IPv6 address has been entered as 15EF:5L63::2014:BB::60AA

Give **two** reasons why this IP address is invalid.

1 .....

.....

2 .....

.....

[2]

(c) The table shows four descriptions of IP addresses.

Tick (✔) **one** box in each row to identify whether each description applies to a public or private IP address.

Description	Public	Private
The address can be reached over the Internet.		
The address is more secure.		
The address can only be accessed through the same LAN.		
The address can be duplicated in different networks.		

[4]

Question 14

The network manager of a Local Area Network (LAN) has replaced the Ethernet cables with a wireless network.

(a) Give three benefits of a wireless network compared to a wired network.

1 .....

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2 .....

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3 .....

..... [3]

(b) Give one drawback of a wireless network compared to a wired network.

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.....[1]

Question 15

The design of a web-based application can require the use of client-side scripting.

(a) Describe what is meant by client-side scripting.

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.....[2]

(b) A user requests a web page by keying the Uniform Resource Locator (URL) into the address bar of their web browser.

The requested page contains a client-side script.

Describe the sequence of steps leading to the display of the web page on the computer screen.

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.....[4]

Question 16

6 Downloading a file from a website is an example of a client-server application.

(a) Describe what is meant by the term **client-server** for this application.

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.....[2]

(b) The following sequence of steps (1 to 5) describes what happens when someone uses their personal computer (PC) to request a web page. The web page consists of HTML tags and text content only. Four of the statements from **A**, **B**, **C**, **D**, **E** and **F** are used to complete the sequence.

A	Browser software interprets the script, renders the page and displays.
B	Browser software renders the page and displays.
C	Browser software compiles the script, renders the page and displays.
D	The web server retrieves the page.
E	The Domain Name Service (DNS) uses the domain name from the browser to look up the IP address of the web server.
F	The web server sends the web page content to the browser.

Write one of the letters A to F in the appropriate row to complete the sequence.

1. The user keys in the Uniform Resource Locator (URL) into the browser software.
2. .....
3. .....
4. .....
5. .....

[4]

Question 17

7 Access to World Wide Web content uses IP addressing.

(a) State what IP stands for.

.....[1]

(b) The following table shows four possible IP addresses.

Indicate for each IP address whether it is valid or invalid and give a reason.

Address	Denary / Hexadecimal	Valid or Invalid	Reason
3.2A.6AA.BBBB	Hexadecimal		
2.0.255.1	Denary		
6.0.257.6	Denary		
A.78.F4.J8	Hexadecimal		

[4]

(c) Describe **two** differences between public and private IP addresses.

1 .....

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2 .....

.....[2]

Question 18

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

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……[2]

(b) Three methods of connecting devices include fibre-optic cables, copper cables and radio waves. The table below gives descriptions relating to these connection methods.

Tick (✓) one box on each row to show the method that best fits each description.

Description	Fibre-optic cable	Copper cable	Radio waves
Wireless medium			
Twisted-pair is an example			
Uses light waves			
WiFi			
Fastest transmission medium			

[5]

(c) Bit streaming is used for both real-time and on-demand services.

Describe one difference between real-time and on-demand bit streaming.

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……[2]

(d) A device needs an IP address to connect to the Internet. IPv4 is the more common type of IP address.

Describe, using an example, the format of an IPv4 address.

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……[3]

(e) A computer user keys in the Uniform Resource Locator (URL) of a web page into a web browser.

Describe how the browser uses the Domain Name Service (DNS) to display the web page.

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…… [4]

Question 19

6) A user watches a video available on a website. The website uses on-demand bit streaming.

Describe how it is possible to watch the video without it continually pausing.

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……[4]

Question 20

(a) Telephone calls can be made by using:

- conventional telephones (using the Public Service Telephone Network (PSTN) over a wired network
- a computer, equipped with speakers and microphone, connected to the Internet

Put a tick (✓) in the correct column to match each description to the appropriate communication method.

Description	Conventional telephone using PSTN	Internet-based system
connection only in use whilst sound is being transmitted		
dedicated channel used between two points for the duration of the call		
connection maintained throughout the telephone call		
encoding schemes and compression technology used		
lines remain active even during a power outage		

[5]

(b) Distinguish between the Internet and the World Wide Web (WWW).

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.....[3]

(c) Name the hardware device that is being described:

(i) A device that transfers data from one network to another in an intelligent way. It has the task of forwarding data packets to their destination by the most efficient route.

.....[1]

(ii) A device used between two dissimilar LANs. The device is required to convert data packets from one protocol to another.

.....[1]

(iii) A device or software that provides a specific function for computers using a network. The most common examples handle printing, file storage and the delivery of web pages.

.....[1]

Question 21

(a) Explain the term bit streaming.

.....

.....

.....

.....[2]

(b) A person watches a film streamed from a website on a tablet computer.

(i) Give two benefits of using bit streaming for this purpose.

1 .....

.....

2 .....

..... [2]

(ii) State two potential problems of using bit streaming for this purpose.

1 .....

.....

2 .....

..... [2]

(c) Explain the terms on-demand bit streaming and real-time bit streaming.

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.....[4]

Question 22

(a) The table shows four statements about IP addresses.

Tick (✓) to show which of the statements are true.

Statement	True (✓)
The IP address consists of any number of digits separated by single dots (.)	
Each number in an IP address can range from 0 to 255	
IP addresses are used to ensure that messages and data reach their correct destinations	
Public IP addresses are considered to be more secure than private IP addresses	

[2]

(b) Consider the URL:

http://cie.org.uk/computerscience.html

(i) Give the meaning of the following parts of the URL.

http .....

.....

.....

cie.org.uk .....

.....

.....

computerscience.html .....

.....

.....

[3]

(ii) Sometimes the URL contains the characters %20 and ?.

Describe the function of these characters.

%20 .....

.....

? .....

..... [2]

Question 23

A company operates a chemical plant, which has a number of processes. Local computers monitor these processes and collect data.

The computers transfer these data to a central computer 50 km away. A telecommunications company (telco) provides cables.

Engineers at the telco had to decide which type of cable to use. They considered the use of either copper cable or fibre optic cable.

State two benefits of each type of cable. Each benefit must be clearly different.

Benefits of copper cable

1 .....

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2 .....

.....

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Benefits of fibre optic cable

1 .....

.....

2 .....

..... [4]

Question 24

(a) (i) Describe what is meant by a client-server model of networked computers.

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.....[2]

(ii) Give two benefits of using the client-server model.

1 .....

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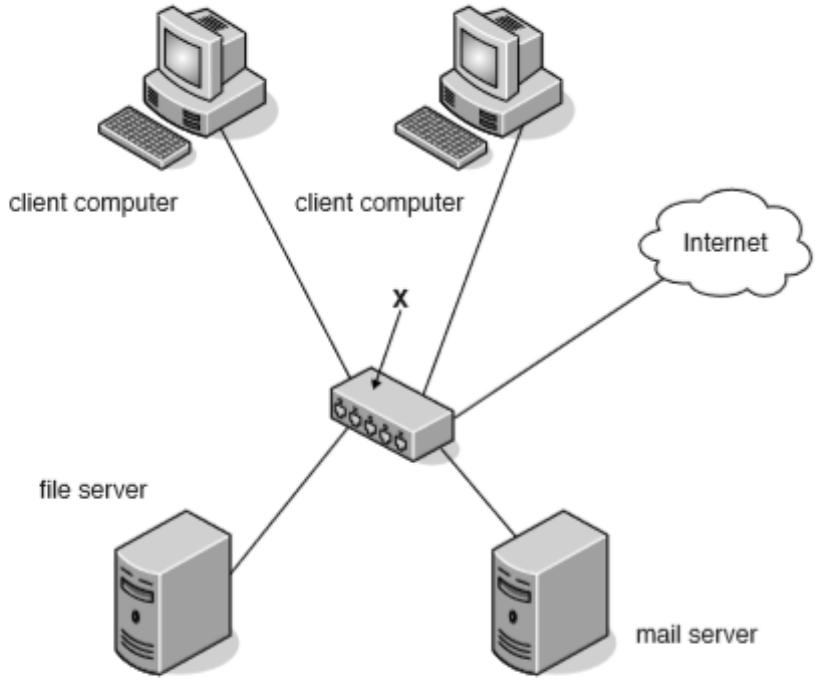
2 .....

..... [2]

(b) The diagram shows a computer network with connection to the Internet.



Name the hardware device labelled **X**.

.....[1]

(c) A web page offers a link for users to request another web page. The requested web page contains HTML code and JavaScript code.

Put each statement in the correct sequence by writing the numbers 1 to 5 in the right-hand column.

Statement	Sequence number
The requested web page is displayed on the client computer	
The user clicks on the hyperlink and the web page is requested from the web server	
The requested web page content is transmitted to the client computer	
The client computer processes the JavaScript code using the web browser software	
The web server locates the requested web page	

Question 25

Describe one key difference between each of the following:

(i) **circuit switching** and **packet switching**

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..... [2]

(ii) **baseband** and **broadband**

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..... [2]

(iii) **ring** and **star network topologies**

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..... [2]

Question 26

(b) Data from a computer are sent to peripherals by using either serial or parallel data transmission.

Explain the difference between serial data transmission and parallel data transmission.

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..... [2]

Question 27

A technician has recently created a wired local area network (LAN). The LAN is made up of three computers, a router and a printer.

The network uses two different types of communication. The LAN uses baseband and its connection to the Internet uses broadband.

(a) Explain what is meant by baseband and broadband.

baseband .....

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.....

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.....

broadband .....

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.....

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.....[4]

(b) Column **A** shows **three** types of data transmission. Column **B** shows definitions. Column **C** shows examples.

Draw lines to:

- link up each term in column **A** with its correct definition in column **B**
- cross out the unused definition in column **B**
- link up the **three** remaining definitions in column **B**, with the appropriate example in column **C**

A	B	C
Simplex	Data transmission in both directions at the same time	Telephone conversation
Half duplex	Data transmission in one direction only	Data transmission check
Full duplex	Data transmission from different sources sent at the same time in both directions	Two-way radio communication
	Data transmission in both directions, but only in one direction at a time	Global positioning satellite signals

[6]

Question 28

(a) (i) Describe circuit switching and packet switching.

circuit switching .....

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packet switching .....

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.....[4]

(ii) Which of the above methods is used for Internet telephone calls (VoIP)?

.....[1]

(iii) Explain the benefits and drawbacks of making Internet telephone calls.

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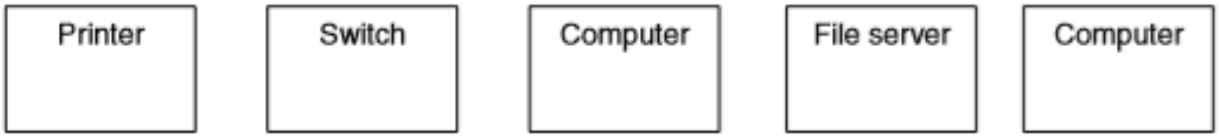
.....[3]

(b) (i) The following components are to be wired as a star network.

Draw the wired connections to complete this star network topology.



[3]

(ii) Give **one** advantage of a star network topology over a bus network topology.

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.....[1]

Question 29

(a) Describe **one** benefit and **one** drawback of using each of the following network topologies:

Bus

Benefit .....

.....

.....

Drawback .....

.....

.....

Star

Benefit .....

.....

.....

Drawback .....

.....

.....

Ring

Benefit .....

.....

.....

Drawback .....

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..... [6]

(b) Discuss the different types of hardware needed to operate a local area network (LAN) and a wide area network (WAN).

LAN .....

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WAN .....

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..... [3]

Question 30

(a) There are 3 network topologies on the left and 7 statements about networks on the right.

Draw a line connecting each statement to the appropriate network topology.

	If the central hubs fails, the whole network fails
Bus	Works well under heavy loading
	Poor performance under heavy loading
Star	If one connection fails, the other terminals are not affected
	Less cabling required
Ring	Different communication media can be used for different nodes
	Can be used for wide area networks

[7]

Question 31

(b) State two pieces of hardware, apart from the PCs, which would be needed in order to enable two computers to communicate. Justify your answers.

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Question 32

4 (a) Define the term protocol. [2]

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(b) (i) Explain what is meant by the terms packet switching and circuit switching. [5]

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(ii) State one advantage and one disadvantage of using packet switching. [2]

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