Past Papers Topical

14. Communication & internet technologies

1 (a) Four descriptions and three protocols are shown below.
Draw a line to connect each description to the appropriate protocol.

Description	Protocol used
email client downloads an email from an email server	HTTP
email is transferred from one email server to another email server	POP3
email client sends email to email server	SMTP
browser sends a request for a web page to a web server	

[4]

(b) Downloading a file can use the client-server model. Alternatively, a file can be downloaded using the BitTorrent protocol.
Name the model used.

.....[1]

(c) For the BitTorrent protocol, explain the function of each of the following:
(i) Tracker

.....

.....[2]

(ii) Seed

.....

.....[2]

(iii) Swarm

.....

.....[2]

9608/31/M/J/17

2 (a) A web browser is used to request and display a page stored on an internet web server. Explain how each of the following items is used in this event.

(i) Packet:

.....

.....

.....[2]

(ii) Router:

.....

.....

.....[2]

(iii) TCP/IP:

.....

.....

.....

.....[2]

(b) The Internet can be used for video conferencing. Data can be transmitted over the Internet using either packet switching or circuit switching. (i) State two problems that could arise if video conferencing were to use packet switching.

Problem 1

.....

.....

Problem 2

.....

.....[2]

(ii) Explain what is meant by circuit switching.

.....

.....

.....

.....[2]

(iii) Explain how the use of circuit switching overcomes the problems you have identified in part (i).

.....

.....

.....

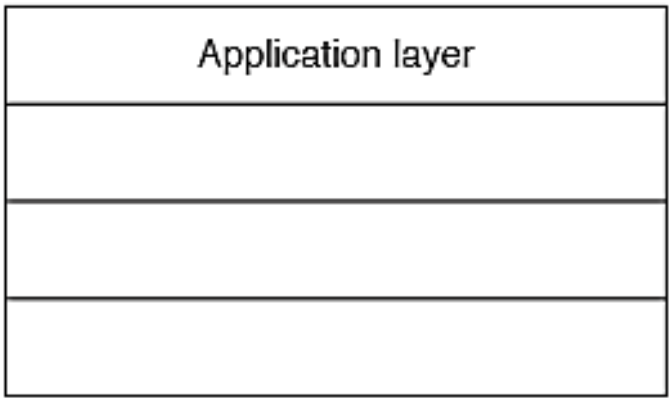
.....

.....

.....[3]

9608/32/M/J/17

3 The TCP/IP protocol suite can be viewed as a stack with four layers. (a) Complete the stack by inserting the names of the three missing layers.



[3]

(b) BitTorrent is a protocol used at the Application layer for the exchange of data.

(i) State the network model used with this protocol.

.....[1]

(ii) State the use of BitTorrent.

.....[1]

(iii) Explain how the exchange of data is achieved using BitTorrent.

.....

.....

.....

.....

.....

.....

.....

.....[4]

(c) State two additional protocols that are also used at the Application layer for the exchange of data. For each protocol, give an example of an appropriate exchange of data.

Protocol 1

.....

Example

.....

.....

Protocol 2

.....

Example

.....

.....[4]

4 (i) Protocols are essential for successful transmission of data over a network. The TCP/IP protocol suite operates on many layers.

State the appropriate layer for each protocol in the following table.

Protocol	Layer
TCP	
IP	
SMTP	

[3]

(ii) Peer-to-peer (P2P) file sharing uses the BitTorrent protocol. Explain how the BitTorrent protocol allows files to be shared.

.....

.....

.....

.....

.....

.....[3]

9618/31/M/J/24

5 The TCP / IP protocol suite has four layers: Transport, Application, Link, Internet

(a) Complete the diagram to show the correct order for these layers.

[2]

(b) Describe the function of the Transport layer.

.....

.....

.....

..... [2]

(c) Outline **one** protocol that is associated with the Application layer.

.....

.....

.....

..... [2]

9618/31/M/J/22

6. Data can be sent over networks using either circuit switching or packet switching.

Describe both methods of data transmission. Include a different advantage and disadvantage for each method.

Circuit switching

.....

.....

.....

.....

Advantage

.....

.....

.....

Disadvantage

.....

.....

.....

Packet switching

.....

.....

.....

.....

.....

Advantage

.....

.....

Disadvantage

.....

.....[8]

9618/32/M/J/23

7 (a) State **two** examples of where it would be appropriate to use packet switching.

.....

.....

.....

..... [2]

(b) Give **four** differences between circuit switching and packet switching.

1 .....

.....

2 .....

.....

3 .....

.....

4 .....

..... [4]

9618/32/M/J/24

8.

(a) Outline why protocols are essential for communication between computers.

.....

.....

.....

..... [2]

(b) State the names of **two** different protocols associated with the sending and receiving of emails between computers.

Sending .....

Receiving ..... [2]

(c) Explain the meaning of the phrase:
BitTorrent protocol provides peer-to-peer file sharing.

.....

.....

.....

.....

.....

..... [3]

9618/32/O/N/21.

9 (a) Explain how packet switching is used to transfer messages across the internet.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [5]

(b) Outline the function of a router in packet switching.

.....

.....

.....

.....

.....

..... [3]

9618/32/O/N/22

10 (a) Explain why a protocol is used in communication between computers.

.....

.....

.....

..... [2]

(b) The TCP/IP protocol implementation can be viewed as a stack.
Complete the diagram for the TCP/IP protocol stack.

Transport
Link

[2]

(c) Describe the purpose of the IMAP protocol.

.....

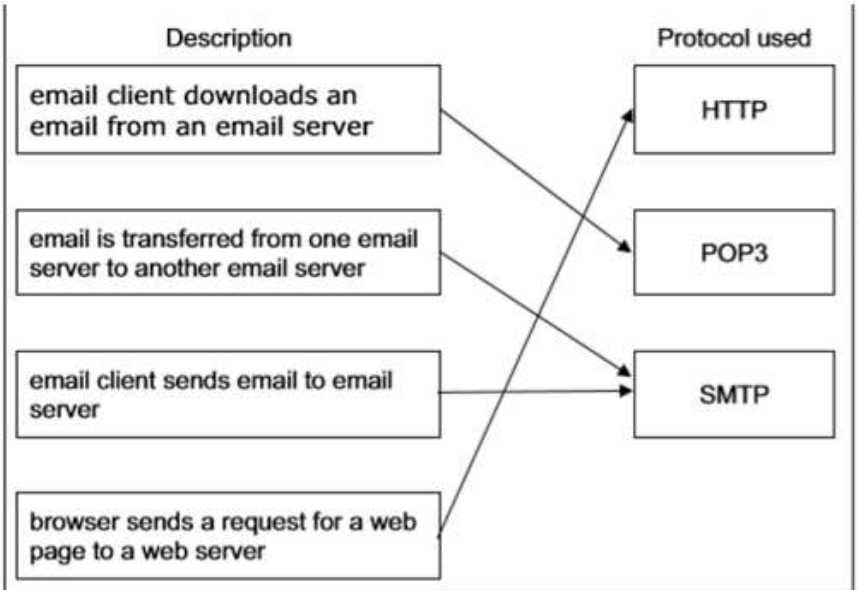
.....

.....

..... [2]

Answers

Q 1

(a)		1 mark for correct arrow from each description
(b)	peer-to-peer	1

(c) (i)	**Tracker**: central server that:
	stores details of other computers that have all / part of file to be downloaded
	// has data on those peers downloading and uploading file
	// shares IP addresses with other clients in swarm allowing them to connect
		1
		
		1

(ii)	**Seed**: peer computer that has 100% of file // is uploading downloaded content	1 1
(iii)	**Swarm**: all the connected peer computers that have all or part of the file to be downloaded / uploaded // share a torrent	1 1
		Total: 11

2

(a)(i)	Packet: Both web page and web page request are split into packets Each packet is sent individually from device to device	 1 1	**2**
(a)(ii)	Router: Transmit packets Contain connections to many other routers When packets arrive at router, router decides where next to send packet 1 mark for any valid point		**Max 2**
(a)(iii)	TCP/IP: Is the protocol Rules for communication between web server and browser	 1 1	**2**

(b)(i)	**Two** from: Picture and sound not synchronised 1 Interruptions // video not continuous 1 Can be degraded by other competing traffic 1	**Max 2**
(b)(ii)	Dedicated communications channel between the two communicating devices 1 Established prior to start of communication // removal of links at end of communication 1	**2**
(b)(iii)	In packet switching, packets can take different routes and may not arrive in order Will arrive in order (only one route) As packets can take many different routes / share paths with others can be delayed Dedicated circuit has full bandwidth No loss of synch 1 mark for any valid point	**Max 3**

9608/32/M/J/17
Q3

(a)	Option 1 / Option 2 Application Layer / Application Layer **Transport** / **Transport (Layer)** 1 **Internet** / **Network (Layer)** 1 **Network Interface** / **(Data) Link (Layer)** 1	**3**
(b)(i)	Peer-to-peer	**1**
(b)(ii)	File sharing	**1**
(b)(iii)	Any four points from the following: • Torrent descriptor file is made available • File to be shared is split into pieces • BitTorrent client software made available to other peers / users / computers Allowing them to work as seeds or leeches. A peer can act as a 'seed' – used to upload pieces of a file Peer downloading file can get pieces from different seeds simultaneously • Once a peer has a piece of the file it can become a seed for the parts downloaded Leeches download much more than they upload • Central server called a tracker keeps records of all the peers ('swarm') and the parts of the file they have Can pause and restart at any time.	**Max 4**

(c)	Any two protocols from:		Max 4
	HTTP/HTTPS ...	1	
	Used for transfer of web pages from server to client	1	
	FTP ...	1	
	Used for interactive file transfer	1	
	SMTP ...	1	
	Used for sending email messages	1	
	POP3 ...	1	
	Used for incoming email messages	1	

4 (i)

1 mark for each layer — 3

Protocol	Layer
TCP	Transport
IP	Internet/Network
SMTP	Application

(ii)

Any three points from: — 3

- BitTorrent client software made available
- One computer must keep a complete copy of the torrent/file to be shared
- Torrent/file is split into small pieces
- A computer joins (a swarm) by using the BitTorrent software to load a torrent descriptor file
- The computer can now download a piece of the file
- Once a computer has a piece it can become a seed and upload (to other members of the swarm)
- Pieces of the torrent are both downloaded and uploaded (by each member of the of the swarm)
- A server called a tracker keeps records of all the computers in the swarm
- The tracker shares their IP addresses allowing them to connect to each other

9618/31/M/J/24

Q 5 (a)

Two marks for all protocols in correct position
One mark for at least two protocols in correct position

2

Application
Transport
Internet
Link

5(b)

One mark per mark point (**Max 2**)

2

MP1 The transport layer is responsible for delivery of data from the source host to the destination host
MP2 It is where data is broken up into packets **and** sent to the internet layer
MP3 Adds the sequence number to the packet header
MP4 It establishes end to end contact
MP5 It ensures data arrives error free // It retransmits packets if lost.

5(c)

One mark for name of protocol and one mark for expansion (**Max 2**)

2

HTTP(S) – responsible for correct transfer of files / hypertext documents that make up web pages on the world wide web

FTP – used when transferring files from a server to a client on a network

POP3 – handles the receiving of emails

IMAP – handles the receiving of emails

SMTP – handles the sending of emails

BitTorrent – provides peer-to-peer file sharing

9618/31/M/J/22

6.

8

Circuit switching max **four** marks
Any **two** from

- a dedicated circuit
- circuit is established before transmission starts // circuit is released after transmission ends
- data is transferred using the whole bandwidth
- all data is transferred over the same route

Two from

- Advantage – data /frames arrive in order and do not need to be reassembled
- Disadvantage – nobody else can use the same circuit even if it is idle //less secure as only one route used

Packet switching max **four** marks
Any **two** from

- data is split into packets
- each packet is given its own route
- the routing for a packet depends on the congestion
- packets may not arrive in the order sent

Two from

- Advantage – packets can be rerouted if there are problems// more secure as harder to intercept messages
- Disadvantage – time taken to reassemble packets at the destination

9618/32/M/J/23

7(a)	**One** mark per mark point (**Max 2**) MP1 Packet switching is most commonly used on data networks such as the internet to send large data files that don't need to be live streamed MP2 Packet switching is used when it is necessary to be able to overcome failed/faulty lines by rerouting. MP3 Packet switching is used when it is necessary for the communication to be more secure. MP4 Packet switching is used for high volume data transmission. MP5 Packet switching is used when it isn't necessary to use all the bandwidth. MP6 Specific examples e.g. email, text messages, documents, VOIP etc. (up to **two** marks).	**2**

7(b)	**One** mark per mark point (**Max 4**) MP1 Circuit switching uses a dedicated channel to make communication, whereas packet switching forms data into packets to transmit over a digital network. MP2 The dedicated path for circuit switching must be established before the transfer of data can commence, which is not the case with packet switching (as it doesn't require a dedicated path). MP3 Data in packet switching is split into packets, in circuit switching the message remains intact. MP4 All of the transmission in circuit switching follows the same path whereas different packets in packet switching can take different routes. MP5 The message is received in the same order in which it is sent with circuit switching, but with packet switching, the packets can be received out of order (for assembly at the destination). MP6 Circuit switching is implemented at the physical layer while packet switching is implemented at the network layer. MP7 Circuit switching uses the whole bandwidth of the channel used, packet switching can share bandwidth. MP8 Circuit switching communication ends with an error but packet switching allows packets to be re-sent. MP9 Circuit switching is a simpler process than packet switching.	**4**

9618/32/M/J/24

8.

(a)	**One** mark per mark point (**Max 2**) MP1 Protocols provide a standard set of rules that enables **successful** data transfer between devices. MP2 Allows communication between devices on different platforms. MP3 Makes communications independent of software and hardware.	**2**
(b)	**One** mark per mark point MP1 Sending - SMTP MP2 Receiving – POP3 // IMAP // Post Office Protocol 3	**2**
(c)	**One** mark per mark point (**Max 3**) MP1 BitTorrent allows the sharing of files between thousands of users who are connected together over the **internet**. MP2 It allows **more** users to share files with each other than would be the case with a peer-to-peer network. MP3 Users share files **directly** with each other // the users' computers are acting as peers MP4 … no web server / central device is used // all users are of equal status.	**3**

9

(a)	**One** mark for each correct marking point **(Max 5)** • A large message is divided up into a group of smaller chunks of the same size called **packets** • The packet has a header and a payload • The header contains a source **IP** address, destination **IP** address (and sequence number) • Each packet is dispatched independently • … and may travel along different routes / paths • The packets may arrive out of order • … and are reassembled into the original message at the destination • If packets are missing / corrupted a re-transmission request is sent.	5
(b)	**One** mark for each correct marking point **(Max 3)** • The router examines the packet's header • It reads the IP address of the destination (from the packet header) • A router has access to a routing table • …containing information about, e.g., available hops / netmask / gateway used • … and the status of the routes along the route • … the router decides on the next hop / best route • … and sends the packet on its next hop.	3

9618/32/O/N/22

10

(a)	**One** mark per point (**Max 2**) • Protocols set a standard for communication • Protocols enable communication/compatibility between devices from different manufacturers/platforms • If two devices were sending messages to each other but using different protocols, they would not be able to communicate properly	2
(b)	**One** mark for each correct answer **Application (Layer)** *Transport* **Internet/Network (Layer)** *Link*	

(C) One mark per point (**Max 2**) **2**

- used by email clients to **retrieve** email messages // a pull protocol
- from a mail server (over a TCP/IP connection)
- Keeps the server and client in sync (by not deleting the original email). // allows a copy of the email to be downloaded from the mail server.