Chapter 13

Networks

Specimen Paper 3- 2017

1 A television station makes its programmes in studios on the ground and transmits them via satellites to receivers in viewers' homes.

(a) Describe how a programme is transmitted from the station's studio to a viewer's satellite receiver.

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(b) Explain **two** advantages to the viewer of using satellites to receive television programmes.

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(c) Explain **two** disadvantages to the viewer of using satellites to receive television programmes.

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2 A bank has a number of offices all over the world. Each office has a local area network (LAN). The LANs are connected together to create a wide area network (WAN) for use by its staff.

One of the office managers wants to improve the speed and efficiency of his office LAN. He wants to replace the existing copper cabling with an alternative communication method.

(a) Evaluate **three** alternative methods of transmission the manager could use including optical methods.

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(b) Describe the role of **three** types of server that might be found in an office LAN.

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(c) Explain how the bank could use encryption techniques to attempt to prevent its data from being read by unauthorised people.

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3 Shafiq has just logged on to a secure website.

(a) Describe how he knows that the website is secure.

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(b) Describe the steps that the web browser will go through to ensure that Shafiq has logged on to a secure website.

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4 **(a)** Describe what is meant by the use of biometrics when protecting devices from being accessed by unauthorised people.

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(b) Many people are becoming concerned that too much reliance is being placed on the use of biometrics to protect devices from being accessed by unauthorised people.

Evaluate the suitability of biometrics for this purpose.

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(chapter 11 + 13 Question)

June 2017 P31 & P33

5 A wide area network uses a number of different protocols.

(a) Describe each of the following wide area network (WAN) protocols.

(i) HDLC:

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(ii) Frame relay:

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(b) An updated version of a free operating system has to be downloaded quickly. The operating system is contained in a very large file. There is a choice of using 'BitTorrent' or file transfer protocol (FTP) for the download.

Explain, with reasons, which method of download would be preferable.

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June 2017 Paper 32

6 Companies must protect the data that is used and stored on their networks.

(a) Evaluate the use of a firewall in protecting the data on a company network.

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(b) Describe how a proxy server can help to protect a company network.

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7 A country is considering launching a satellite to enhance its internet connectivity.

Evaluate the use of satellites for this purpose.

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March 2017 P3

8 Global positioning systems (GPS) are used by navigation devices to allow drivers of cars to find locations and destinations.

(a) Describe how GPS signals from satellites are used by navigation devices to determine a location.

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(b) Describe the factors that could degrade a GPS signal, when it is transmitted to a navigation device, and affect the accuracy of the location found by that device.

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9 Packet switching is used to transfer data around networks.

Discuss the benefits and drawbacks of packet switching.

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November 2017 P32

10 A new online supermarket will have a very large amount of data about its customers, products and services that has to be kept safe. Complete back-ups of all its data are to be created at regular intervals. Jaswinder, the IT manager, is considering the options of using tape-based systems, hard disk-based systems or back-ups to the 'cloud' for storing the back-ups.

Evaluate the three options for storing the back-ups.

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11 Audio files can be digitised with different bit rates.

The bit rate of an audio file can appear to affect the quality of the sound when it is listened to.

Explain how you can affect the perceived quality of the sound stored in the audio file by changing the bit rate.

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12 A data protection act can contain principles that create rights for those people who have their data stored and processed by companies.

(a) Describe the rights that could be created by a data protection act.

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(b) Data controllers are appointed by companies to safeguard the rights of individuals whose data is stored.

Describe **two** criminal offences that may be committed by data controllers if they fail to abide by the principles of a data protection act.

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13 WiFi is often used to connect devices to the internet. In some buildings, WiFi signals may be degraded so that data transfer appears to be 'slow'.

Explain how you could try to ensure that the WiFi system suffers minimal signal degradation.

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November 2017 P33

14 A home network uses a router to connect to the internet.

(a) The router will act as a 'default gateway'.

Define 'default gateway'.

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(b) The router uses wireless technology to allow devices in the home to connect to it.

Discuss the benefits and drawbacks of using wireless technology to connect devices to the router.

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June 2018 p31

15 Discuss the benefits and drawbacks of the use of satellite technology in global positioning systems (GPS).

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16 networking of computers can give rise to a variety of issues.
Describe each of the following security issues and suggest how, other than using physical security methods, the risk from each may be reduced.

(a) DNS spoofing.

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(b) DoS attack.

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(c) ARP spoofing.

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17 Companies use a range of physical security methods to try to prevent unauthorised access to the company data stored on their networks.

Evaluate the use of physical security methods in attempting to prevent unauthorised access to the stored data.

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June 2018 p32

18 Telecommunication companies often prefer to use fibre optic cables to transmit data.

Discuss the benefits and drawbacks of using fibre optic cables for data transmission.

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June 2018 p33

19 Video is streamed over networks and the internet at different bit rates. Fig. 1 shows a summary of the bit rates that are usually required for various video resolutions. Fig. 2 shows the bandwidths that are typically available over different mobile (cell) phone connections

Output video resolution (pixels)	Bit rate (Mbits/s)
320 × 240	0.4
480 × 270	0.7
1024 × 576	1.5
1280 × 720	2.5
1920 × 1080	4.0

Fig. 1

Type of mobile connection to network/internet	Typical maximum bandwidth available for download (Mbits/s)
3G mobile connection	0.31
4G mobile connection	15
Bluetooth® 1.1 connection	0.5
Wi-Fi (IEEE 802.1g) wireless connection	54

Fig. 2

Using all the information in Fig. 1 and Fig. 2, explain how the viewing experience of a streamed video displayed on a mobile (cell) phone screen of resolution 1024 × 576 pixels is affected by bit rate and available bandwidth.

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20 Fig. 3 shows a switched network with computers at **A**, **B**, **C** and **D**.

S1, S2, S3, S4, S5 and S6 are switches. A message is being sent between computers at **A** and **B**.

The whole message is sent at once along the route shown by the arrows.

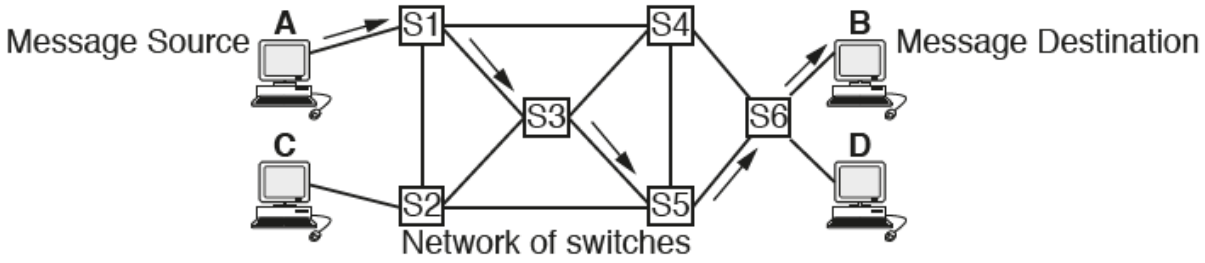

Fig. 3

(a) Explain, with reference to Fig. 3, why this method of sending a message by the route shown is often called 'store and forward'.

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(b) Describe **two** advantages of using the 'store and forward' method to send a message over this network.

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21 Discuss the benefits and drawbacks of using satellites for television and radio broadcasting.

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March 2018 p32

22 Analyse the impact of network bandwidth on video-conferencing.

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23 Fig. 1 shows a diagram of interconnected computer networks that use internet protocol (IP) to communicate. A file is being sent as six data packets from network A to network H. Nodes B to G are routers used to connect the networks.

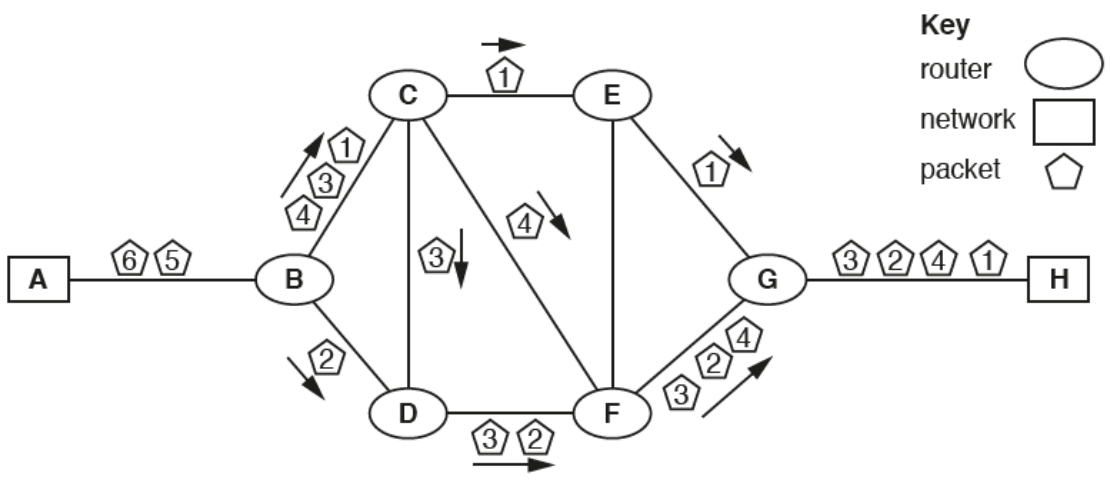

Fig. 1

(a) Explain why the packets arriving at network H are in a different order from when they were sent by network A.

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(b) Explain the role of the routers B to G in sending the packets from network A to network H.

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24 There are a number of different types of protocols.

(a) PPP is a network protocol.

Describe what is meant by PPP.

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(b) Email is used to send and retrieve messages between email clients and email servers. One network protocol in common use for email access is Internet Message Access Protocol (IMAP).

Describe the features of IMAP that make it suitable for email access on smartphones.

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November 2018 p32

25 Fig. 3 shows a diagram of interconnected computer networks that use internet protocol (IP) and packet switching to communicate. A large file is sent from network A to network H. Nodes B to G are routers used to connect the networks. During the sending of the file from network A, network I also starts to send a much larger video file to network H.

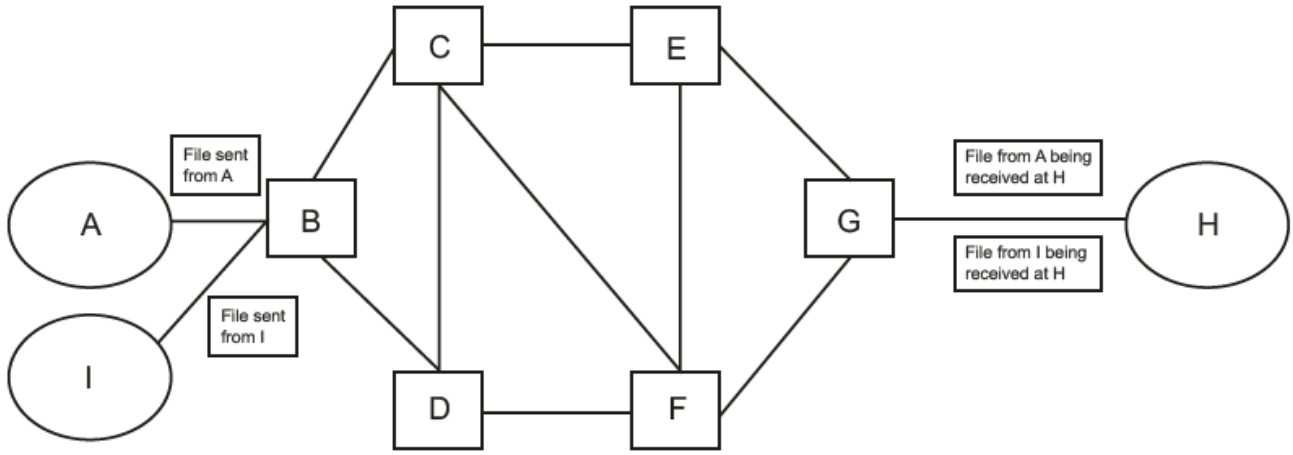

Fig. 3

(a) Explain, in detail with reference to the diagram, how the file from network A and the file from network I travel through the network from router to router and start to arrive at network H at the same time.

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(b) Explain why router C does not always send the packets to router D.

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26 Evaluate the use of the infra-red method of data transmission in wireless communications.

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November 2018 p33

27 Evaluate the use of Bluetooth® wireless technology for communication between devices.

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March 2019

28 Evaluate the use of quantum cryptography when transmitting confidential data over public networks.

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29 Evaluate ways of combatting spyware.

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30 An international organisation provides communication services over the internet. It enables customers to communicate messages confidentially between their offices in different countries. It uses message, circuit and packet switching technologies for the communications.
Describe the differences between these three technologies as used in communicating these messages.

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June 2019 P31 & 33

31 Evaluate the use of physical security in combatting IT crime.

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32 Describe how data is transmitted using fibre optic technology.

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June 2019 p32

33 A packet switched network has routers at nodes labelled A, B, C, D, E, F, G and H. Each router stores its own 'routing table' which shows how it is connected to the other routers.

Router	Connected to routers:			
A	B			
B	A	C	D	
C	B	D	E	F
D	B	C	F	
E	C	F		
F	C	D	E	G
G	F	H		
H	G			

(a) Complete the diagram by drawing routers C, D, E, F and G with connection lines to show how the routers are inter-connected to communicate with each other.

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(b) Router A regularly sends out packets to check that router H is reachable. When H receives a packet from A it sends a packet back to confirm that it is reachable.

Assume that each router takes zero-time units to receive, process and resend a packet and that each packet takes six-time units to travel from one router to the next.

(i) Describe the shortest route that a packet can take from router A to router H.

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(ii) Calculate the shortest time taken for router A to receive an acknowledgement from router H confirming that H is reachable.

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(c) **(i)** Assuming that the packets visit each router only once, calculate the longest time it could take for router A to receive an acknowledgement from router H confirming that H is reachable.

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(ii) Describe the route that the packets would take.

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(d) An additional router, J, is to be added to reduce the time for packets to travel from router A to router H to a minimum. However, no further connections can be directly made to routers A and H.

(i) Describe where J would be placed to reduce the travel time to a minimum.

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(ii) Calculate the new minimum time that it would take for A to receive an acknowledgement that H was reachable.

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34 Computing devices use network interface cards.

(a) Describe the role of a network interface card.

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(b) Describe how a network interface card is involved in the sending and receiving of data.

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35 Homer uses headphones to listen to the audio from movies playing on his television. Homer is trying to decide whether to use Bluetooth or cables to connect his headphones to the TV while he watches the movies.
Choose, with reasons, the most appropriate of these methods so that Homer can hear the soundtrack while watching movies.

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36 Evaluate the use of anti-virus software and anti-spyware in combatting IT crime.

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37 Many countries have enacted laws to govern the use of personal data.

Analyse the need for data protection laws.

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November 2019 p31& p33

38 **(a)** Describe **three** different networking protocols that would be used for data transfer on a LAN.

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A company has devices that use WiFi to connect to its LAN.

(b) Describe how data is transmitted between a device and a wireless access point.

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(c) Some of the company's devices can connect to other devices using Bluetooth instead of WiFi. Compare and contrast the use of Bluetooth with WiFi for data transfer.

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39 Discuss the benefits and drawbacks of using ethernet cables containing copper within a computer network.

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40 **(a)** Describe the **benefits** of using back-ups to prevent loss of data from computer systems.

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(b) Describe the **drawbacks** of using back-ups to prevent loss of data from computer systems.

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41 A school uses a proxy server to distribute web pages to work stations.

Describe the role of this proxy server.

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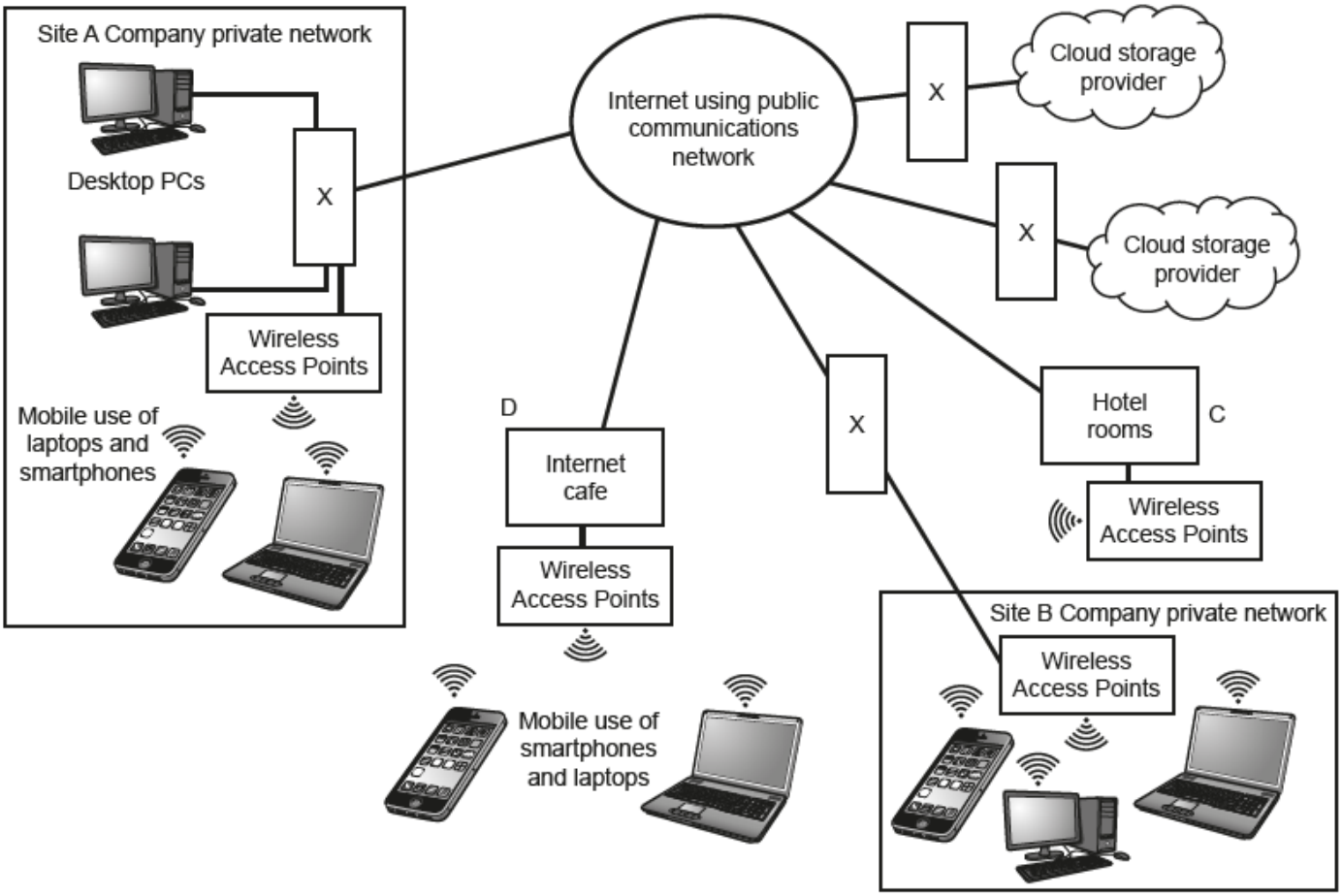
42 A company has two sites, A and B. Its staff work in either of the two sites and can access their files offsite because the company uses cloud computing technology for storing files.
The connections at the locations marked X provide security for the company's data.



(a) Explain the role of the hardware and software that would be at locations marked as X.

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(b) Explain why staff are discouraged from accessing their files from locations C and D.

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November 2019 p32

43 Describe the benefits of using lasers to transmit data between devices.

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44 A bank stores details of customer accounts on its computer system. Customers and staff can access the accounts by logging in to the bank's website.

(a) Describe the security methods that could be used to ensure that the person logging in is authorised to do so.

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(b) The bank insists that its staff use a VPN when accessing the accounts from outside the bank's intranet. Describe the network protocols that could be used by this VPN.

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June 2020 p31 & 32

45 Ultra-high definition television is available from video streaming services over the internet.

(a) Describe the features of ultra-high definition television systems that improve the viewing experience.

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(b) Analyse how the different types of transmission media used by internet service providers affect the availability of ultra-high definition television to their customers.

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46 A company is concerned that their personnel files may be viewed and used by unauthorised people. The company uses access rights (permissions) to protect their files when they are stored on their network and encryption when the files are sent to other companies by email.

(a) Explain how the use of different access rights (permissions) applied to files can be used to control access to files.

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(b) Describe the advantages of the different encryption methods for protecting files when sending them over public telecommunications systems.

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47 Telecommunication companies are using fibre optic cables to supply internet services direct to people's homes because fibre optic cables are cheaper than copper cables.

(a) Explain the reasons, other than cost, why companies prefer to use fibre optic cabling.

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(b) Describe **three** disadvantages of using fibre optic cables.

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48 Describe the security issues that may arise when computers are networked.

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49 List **five** principles that should be included in a data protection act.

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June 2020 p32

50 A company has a local area network (LAN) that can be accessed by its staff using their desktop computers, laptops and mobile devices. The desktop computers use a wired connection but the laptops and mobile devices connect via wireless access points (WAPs).

Describe the drawbacks of using WAPs to access the network.

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51 Describe how a digital television signal is broadcast from a satellite to a receiver for display on a television set in a home.

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March 2020

52 Describe how peer-to-peer file sharing can be carried out using the BitTorrent protocol.

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53 Evaluate, by weighing up the advantages and disadvantages, the use of wireless communications in the home.

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