Protection Methods

To counter or reduce the security threats received under this category, many protection methods are used. These protection methods are being discussed briefly in the coming lines.

1. Authorization

Authorization determines whether the service provider has granted access to the web service to the requestor. Basically, authorization confirms the service requestor's credentials. It determines if the service requestor is entitled to perform the operation, which can range from invoking the web service to executing a certain part of its functionality.

Authorization is performed by asking the user a legal login-id. If the user is able to provide a legal login-id, he/she is considered an authorized user.

2. Authentication

Authentication ensures that each entity involved in using a web service – the requestor, the provider, and the broker (if there is one) – is what it actually claims to be. Authentication involves accepting credentials from the entity and validating them against an authority.

Authentication is also termed as *password-protection* as the authorized user is asked to provide a valid password, and if he/she is able to do this, he/she is considered to be an authentic user.

3. Encrypted Smart Cards

Passwords in a remote log-in session generally pass over the network in unencrypted form, any hacker (or cracker) can simply record it and can use it later maliciously to corrupt data/files or to harm anyone etc. To counter such threats, newer approaches are suggested such as encrypted smart cards.

An encrypted smart card is a hand-held smart card that can generate a token that a computer system can recognise. Everytime a new and different token is generated, which even-though cracked or hacked, can not be used later.

4. Biometric Systems

The biometric systems form the most secure level of authorization. The biometric systems involve some unique aspect of a person's body such as finger-prints, retinal patterns etc. to establish his/her identity.

5. Firewall

A system designed to prevent unauthorized access to or from a private *network* is called ***Firewall***. Firewalls can be implemented in both *hardware* and *software*, or a combination of both. Firewalls are frequently used to prevent unauthorized *Internet* users from accessing private networks connected to the Internet, especially *intranets*. All messages entering or leaving the intranet pass through the firewall, which examines each message and blocks those that do not meet the specified *security* criteria.

FIREWALL

The system designed to prevent unauthorized access to or from a private network is called Firewall.

There are several types of firewall techniques :

- **Packet filter.** Looks as each *packet* entering or leaving the network and accepts or rejects it based on user-defined rules. Packet filtering is fairly effective and transparent to users, but it is difficult to configure. In addition, it is susceptile to *IP spoofing*.

- **Application gateway.** Applies security mechanisms to specific applications, such as FTP and *Telnet* servers. This is very effective, but can impose a performance degradation.
- **Proxy server.** Intercepts all messages entering and leaving the network. The proxy server effectively hides the true network addresses.
- **Circuit-level gateway.** Applies security mechanisms when a connection is established. Once the connection has been made, packets can flow between the hosts without further checking.

In practice, many firewalls use two or more of these techniques in concert.

A firewall is considered a first line of defense in protecting private information. For greater security, *data* can be *encrypted*.

10.13.1 Related Terms

Let us now talk about some terms related to it *i.e.*, some terms related to network security.

Cookies

A cookie is a message given to a Web browser by a Web server. The browser stores the message in a text file. The message is then sent back to the server each time the browser requests a page from the server.

The main purpose of cookies is to identify users and possibly prepare customized Web pages for them. When you enter a Web site using cookies, you may be asked to fill out a form providing such information as your name and interests. This information is packaged into a cookie and sent to your Web browser, which stores it for later use. The next time you go to the same Web site, your browser will send the cookie to the Web server. The server can use this information to present you with custom Web pages. So, for example, instead of seeing just a generic welcome page you might see a welcome page with your name on it.

COOKIES

Cookies are messages that a Web server transmits to a Web browser so that the Web server can keep track of the user's activity on a specific Web site.

The name *cookie* derives from UNIX objects called *magic cookies*. These are tokens that are attached to a user or program and change depending on the areas entered by the user or program.

Cookies do not act maliciously on computer systems. They are merely text files that can be deleted at any time – they are not plug ins nor are they programs. Cookies cannot be used to spread viruses and they cannot access your hard drive. This does not mean that cookies are not relevant to a user's privacy and anonymity on the Internet. Cookies cannot read your hard drive to find out information about you; however, any personal information that you give to a Web site, including credit card information, will most likely be stored in a cookie unless you have turned off the cookie feature in your browser. In only this way are cookies a threat to privacy. The cookie will only contain information that you freely provide to a Web site.

Cookies have *six* parameters that can be passed to them :

- The *name* of the cookie.
- The *value* of the cookie.
- The *expiration date* of the cookie - this determines how long the cookie will remain active in your browser.
- The *path the cookie is valid for* - this sets the URL path the cookie is valid in. Web pages outside of that path cannot use the cookie.

- The *domain the cookie is valid for* - this takes the path parameter one step further. This makes the cookie accessible to pages on any of the servers when a site uses multiple servers in a domain.
- The *need for a secure connection* - this indicates that the cookie can only be used under a secure server condition, such as a site using SSL.

Both Netscape and Microsoft Internet Explorer (IE) can be set to reject cookies if the user prefers to use the Internet without enabling cookies to be stored. In Netscape, follow the **Edit/Preferences/Advanced** menu and in IE, follow the **Tools/Internet Options/Security** menu to set cookie preferences.

Hackers and Crackers

Hacker is a slang term for a computer enthusiast, *i.e.*, a person who enjoys learning programming languages an computer systems and can often be considered an expert on the subject(s). Among professional programmers, depending on how it used, the term can be either complimentary or derogatory, although it is developing an increasingly derogatory connotation. The pejorative sense of hacker is becoming more prominent largely because the popular press has co-opted the term to refer to individuals who gain unauthorized access to computer systems for the purpose of stealing and corrupting data. Hackers, themselves, maintain that the proper term for such individuals is **cracker**. Although hackers still argue that there's a big difference between what they do and what crackers do, the mass media has failed to understand the distinction, so the two terms – *hack* and *crack* – are often used interchangeably.

HACKERS & CRACKERS

The **Crackers** are the malicious programmers who break into secure systems whereas **Hackers** are more interested in gaining knowledge about computer systems and possibly using this knowledge for playful pranks.

CyberLaw

Cyberlaw is a generic term which refers to all the legal and regulatory aspects of Internet and the World Wide Web. Anything concerned with or related to or emanating from any legal aspects or issues concerning any activity of netizens and others, in Cyberspace comes within the ambit of Cyberlaw. The growth of Electronic Commerce has propelled the need for vibrant and effective regulatory mechanisms which would further strengthen the legal infrastructure, so crucial to the success of Electronic Commerce. All these regulatory mechanisms and legal infrastructures come within the domain of Cyberlaw.

CYBERLAW

Cyberlaw is a generic term, which refers to all the legal and regulatory aspects of Inter- net and the World Wide Web.

Cyberlaw is important because it touches almost all aspects of transactions and activities on and concerning the Internet, the World Wide Web and Cyberspace.

India's IT Act and IT (Amendment) Act, 2008

In India the cyber laws are enforced through **Information Technology Act, 2000** (*IT Act 2000*) which was notified on 17 October 2000. It is based on the United Nation's Commission for International Trade related laws (UNCITRAL) model law.

IT ACT 2000's prime purpose was **to provide legal recognition to electronic commerce** and to facilitate filing of electronic records with the Government, *i.e.*, to provide the legal infrastructure for e-commerce in India.

The Act was later amended in December 2008 through the **IT (Amendment) Act, 2008**. It provided additional focus on Information Security. It has added several new sections on offences including Cyber Terrorism and Data Protection. **The Information Technology Amendment Act, 2008** (IT Act 2008) came into force from October 27, 2009 onwards. Major amendments of IT ACT (2008) included :

Digital Signatures	Authentication of electronic records by digital signatures gets legal recognition.
Electronic governance	E-Documents get legal recognition. Documents required as per law by any arm of the government may be supplied in electronic form.
Offences and Penalties	The maximum penalty for any damage to computers or computer systems is a fine up to ₹1 crore.
Amendments to other laws	Other related acts such as the Indian Penal Code, 1860, the Indian Evidence Act, 1872, the Bankers' Books Evidence Act, 1891, the Reserve Bank of India Act, 1934 were to be amended to align them with the IT Act.

Cyber Crimes

The Cambridge dictionary defines Cyber Crimes as Crimes committed with the use of computers or relating to computers, especially through the Internet. Universally, Cyber Crime is understood as *"an unlawful act where in the computer is either a tool or a target or both"*.

Cyber Crimes are different from conventional crimes as in cyber crimes; the cyber crime is committed in an electronic medium.

Classification of Cyber Crimes. The Information Technology Act deals with the following cyber crimes along with others :

1. Tampering with computer source documents. A person who knowingly or inten- tionally, conceals (hides or keeps secret), destroys (demolishes or reduces), alters (change in characteristics) or causes another to conceal, destroy, and alter any computer source code used for a computer, computer program, computer system or computer network, when the computer source code is required to be kept or maintained by law is punishable. For instance, hiding the C.D.ROM in which the source code files are stored, making a C File into a CPP File or removing the read only attributes of a file.

2. Hacking. Hacking is usually understood to be the unauthorized access of a computer system and networks. Whoever with the intent to cause or knowing that he is likely to cause wrongful loss or damage to the public or any person destroys or deletes or alters any information residing in a computer resource or diminishes its value or utility or affects it injuriously by means is said to commit hacking.

3. Publishing of information, which is obscene in electronic form. A person who publishes or transmits or causes to be published in the electronic form, any material which is lascivious, or if its effect is such as to tend to deprave and corrupt persons who are likely to read, see or hear the matter contained or embodied in it, is liable to punishment. The important ingredients of such an offence are publishing (make generally known or issue copies for sale to public), or transmitting (transfer or be a medium for), or causing to be published (to produced the effect of publishing), pornographic material in the electronic form.

4. **Child Pornography.** Child Pornography is a part of cyber pornography but it is such a grave offence that it is individually also recognized as a cyber crime.

5. **Accessing protected system.** Any unauthorized person who secures access or attempts to secure access to a protected system is liable to be punished with imprisonment and may also be liable to fine.

6. **Breach of confidentiality and privacy.** Any person who, secures access to any electronic record, book, register, correspondence, information, document or other material without the consent of the person concerned or discloses such electronic record, book, register, correspondence, information, document or other material to any other person shall be liable to be punished under the Information Technology Act.

10.13.2 IPR Issues

The term ***Intellectual Property (IP)*** reflects the idea that its subject matter is the product of the mind or the intellect. These could be in the form of Patents; Trademarks; Geographical Indications; Industrial Designs; Layout-Designs (Topographies) of Integrated Circuits; Plant Variety Protection and Copyright.

IP, protected through law, like any other form of property can be a matter of trade, that is, it can be owned, bequeathed, sold or bought. The major features that distinguish it from other forms are their intangibility and non-exhaustion by consumption.

Intellectual property rights are legal rights, which result from intellectual activity in the industrial, scientific, literary and artistic fields. These rights give statutory expression to the moral and economic rights of creators in their creations. Intellectual property rights safeguard creators and other producers of intellectual goods and services by granting them certain time-limited rights to control the use made of those productions. These rights also promote creativity and the dissemination and application of its results and encourage fair-trading, which contributes to economic and social development.

INTELLECTUAL PROPERTY

The **Intellectual Property** may be defined as a product of the intellect that has commercial value, including copyrighted property such as literary or artistic works, and ideational property.

10.14 VIRUSES

Computer virus is a malicious program that requires a host and is designed to make a system sick, just like a real virus. Viruses can spread from computer to computer, and they can replicate themselves. Some viruses are categorized as harmless pranks, while others are far more malicious. Broadly *three* types of viruses are :

1. File infectors – attach themselves to a program file.
2. Boot sector viruses – install themselves on the beginning tracks of a hard drive.
3. Macro viruses – infect data files.

Most viruses are spread by **e-mail attachment** and warn them to be suspicious of any files attached to unsolicited messages. The following are characteristics of a computer virus :

- It is able to replicate.
- It requires a host program as a carrier.
- It is activated by external action.
- Its replication ability is limited to the (virtual) system.

COMPUTER VIRUS

Computer Virus is a malicious program that requires a host and is designed to make a system sick, just like a real virus.

10.14.1 How Computer Viruses Spread ?

Computer viruses move from computer to computer by attaching themselves to files or boot records of disks and diskettes. These days it is not uncommon to find them in e-mail attachments and other programs that can be downloaded from the Internet.

A virus is a relatively passive agent that can travel from one file to another on the same computer if the infected file is executed, from computer memory to a file on disk, on a disk that is carried from one computer to another (some companies prohibit floppy drives, thereby preventing users from copying information onto their computers), on e-mail attachment executable files, and over a modem or network connection.

10.14.2 Damage that Viruses Cause

Viruses' main objective is to make your system unstable and cause harm to data. Mainly these cause damage in many ways :

- can destroy file allocation tables (FAT) and lead to the corruption of an entire file system, resulting in the need to fully reinstall and reload the system.
- can create bad sectors on the disk, destroying parts of programs and files.
- can decrease the space on hard disks by duplicating files.
- can format specific tracks on the disks or format the entire disk.
- can destroy specific executable files and alter data in data files, causing a loss of integrity in the data.
- can cause the system to hang so that it does not respond to any keyboard or mouse movements.

10.14.3 Trojan Horses

A Trojan horse is code hidden in a program such as a game or spreadsheet that looks safe to run but has hidden side effects. When the program is run, it seems to function as the user expects, but in actuality it is destroying, damaging, or altering information in the background. It is a program on its own and does not require a host program in which to embed itself. An example of a Trojan horse would be a Christmas executable that, when executed, pops up with an animated figure of Santa Claus and a caption saying "Merry Christmas." In the background, extra code could be deleting files or performing other malicious actions.

TROJAN HORSE

A **Trojan Horse** is code hidden in a program such as a game or spreadsheet that looks safe to run but has hidden side effects.

How Trojan Horses Spread

Trojan horses generally are spread through e-mail and exchange of disks and information between computers. Worms could also spread Trojan horses.

Damage Caused by Trojan Horses

The damage that Trojan horses cause is much the same as what a virus causes. Most of the time the users are unaware of the damage it is causing because of the Trojan horse's masking effect.

10.14.4 Worms

A worm is a program designed to replicate. The program may perform any variety of additional tasks as well.

The following are characteristics of a worm :

- It is able to replicate.
- It is self-contained and does not require a host.
- It is activated by creating process (it needs a multitasking system).
- If it is a network worm, it can replicate across communication links.

WORMS

A **Worm** is a program designed to replicate.

Worms are programs that run independently and travel from computer to computer across network connections. Worms may have portions of themselves running on many different computers. Worms do not change other programs, although they may carry other code that does.

How Worms Spread

Worms are autonomous agents capable of propagating themselves without the use of another program or intervention or action by a user. Worms are found primarily on computers that are capable of multitasking and are connected by a network.

Damage that Worms Can Cause

Most worms disrupt services and create system management problems. Some worms scan for passwords and other loopholes and then send the information back to the attacker. In some cases worms can install Trojan horses or viruses that cause damage to the systems.

10.14.5 Spam

Spam refers to electronic junk mail or junk newsgroup postings. Some people define spam even more generally as any unsolicited e-mail. Merriam-Webster dictionary defines spam as *unsolicited usually commercial e-mail sent to a large number of addresses.*

SPAM

Spam refers to electronic junk mail or junk newsgroup postings.

Avoiding Spam

- One way to help avoid Spam or junk mail is to create a filter that finds and does something to e-mail that you suspect is *Spam.*
- Another tip is not to register yourself with true id to sign up for things on the Internet. These places often share that e-mail address with other companies that then send you spam.

10.14.6 Virus Prevention

Virus prevention is not a difficult task. All you need to be is extra careful and ensure to follow the following guidelines to lead virus free computing life.

- Never use a "foreign" disk or CD without scanning it for viruses.
- Always scan files downloaded from the internet or other sources.
- Never boot your PC from a floppy unless you are certain that it is virus free.
- Write protect your disks.

- Use licensed software.
- Password protect your PC to prevent unattended modification.
- Make regular backups.
- Install and use antivirus software.
- Keep antivirus software up to date.

10.15 E-COMMERCE PAYMENT TRANSACTIONS USING ONLINE BANKING

Online banking allows a user to execute financial transactions via the Internet. Online banking is also known as "internet banking" or "web banking". An online bank offers customers just about every service traditionally available through a local branch, including deposits, which is done online or through the mail, and online bill payment.

Advantages

- Convenience is a major advantage of online banking
- In effect, consumers can perform banking transactions 24 hours-a-day, seven-days a week.
- Online banking is fast and efficient.
- Funds can be transferred between accounts almost instantly, especially if the two accounts are held at the same banking institution.

Disadvantages of Online Banking

- For a novice online banking customer, using systems for the first time may present challenges that prevent transactions from being processed.
- Although online banking security is continually improving, such accounts are still vulnerable when it comes to hacking.
- Consumers are advised to use their data plans, rather than public Wi-Fi networks when using online banking, to prevent unauthorized access.
- Additionally, online banking is dependent on a reliable internet connection. Connectivity issues from time-to-time may make it difficult to determine if banking transactions have been successfully processed.
- On occasion, consumers may prefer face-to-face interactions for more complex banking issues.

10.15.1 Mobile Banking

When you perform or use the banking services via a mobile, it is called **mobile banking**. Difference between online banking and mobile banking is that Mobile banking is done via a *mobile banking app* while the online baking is done via *secure website* of the bank. Some popular mobile apps used today are :

- **State Bank Freedom (State Bank of India App).** This is the official *State Bank of India* mobile banking application.
- **iMobile Android App (ICICI Bank App).** This is the official *ICICI Bank* mobile banking application.

Check Point

10.6

1. What is hacking ?
2. What are cookies ?
3. What is cracking ? How is it different from hacking ?
4. What is Cyber Crime ?
5. When was IT Act enforced in India ?
6. What is Spam ?

- A network is a collection of interlinked computers by means of a communication system.
- The networks facilitate resource sharing, increased reliability, reduced costs, and increased and fast communication.
- Today's Internet has evolved from ARPANET (Advanced Research Projects NETwork) of U.S. Department of Defense along with some other networks such as NSFnet and other private networks.
- Internet is a worldwide network of computer networks.
- InterSpace is said to be the future of Internet.
- InterSpace is a client/server software program that allows multiple users to communicate online with real-time audio, video and text chat in dynamic 3D environments.
- Switching techniques are used for transmitting data across networks.
- Various switching techniques are : **circuit switching** (where complete physical connection is setup prior to communication), **message switching** (which follows store and forward principle for complete messages), and **packet switching** (which follows store and forward principle for packets – a message is divided into fixed sized packets).
- A network can have any of these transmission media or connecting media : twisted pair cable, coaxial cable, optical fibre, microwave, radiowave, satellite etc.
- On the basis of geographical spread, networks can be classified into LAN (Local Area Network), WAN (Wide Area Network), and PAN (Personal Area Network).
- Small computer networks that are confined to a localised area e.g., an office, a building etc., are called LANs.
- MANs are the networks spread over a city.
- A WAN is a group of computers that are separated by large distances and tied together. It can even be a group of LANs that are spread across several locations and connected together to look like a big LAN.
- The pattern of interconnection of nodes in a network is called topology.
- Most popular topologies are star, bus, ring, and tree.
- A modem is a computer peripheral that allows you to connect and communicate with other computers via telephone lines.
- RJ-45 (Registered Jack-45) is an eight-wire connector, which is commonly used to connect computers on LANs – especially Ethernets.

- *Ethernet is a LAN architecture developed by Xerox Corp along with DEC and Intel. It uses either a bus or star topology and supports data transfer rates of upto 10 Mbps.*
- *Computers part of Ethernet are connected through a special card called Ethernet card.*
- *A hub is a hardware device used to connect several computers together. Hubs can be either active hubs or passive hubs.*
- *A switch is a device that is used to segment networks into different subnetworks called subnets or LAN segments.*
- *A backbone network is a network that is used as a backbone to connect LANs together to form a WAN.*
- *A repeater is a device that amplifies a signal being transmitted on the network.*
- *A bridge is a device that links two networks together.*
- *A router is a device that works like a bridge but can handle different protocols.*
- *A gateway is a device that connects dissimilar networks.*
- *A protocol is a set of standardized rules for data packets, techniques for detecting and correcting errors and so on.*
- *Some most common protocols are : HTTP (Hyper Text Transfer Protocol), FTP (File Transfer Protocol), TCP/IP (Transmission Control Protocol / Internet Protocol).*
- *Wireless communication is simply data communication without the use of landlines.*
- *Mobile computing means that the computing device is not continuously connected to the base or central network.*
- *GSM (Global System for Mobile communications) uses narrowband TDMA, which allows eight simultaneous calls on the same radio frequency.*
- *TDMA (Time Division Multiple Access) technology divides a radio frequency into time slots and then allocates allots to multiple calls.*
- *WLL (Wireless in Local Loop) is a system that connects subscribers to the public switched telephone network (PSTN) using radio signal as a substitute for other connecting media.*
- *SMS (Short Message Service) is the transmission of short text message to and from a mobile phone, fax machine and/or IP address.*
- *Email (Electronic Mail) is sending and receiving messages by computer.*
- *Online textual talk, in real time, is called chatting.*
- *A two-way videophone conversation among multiple participants is called video-conferencing.*
- *Remote login (Telnet) is the process of accessing a network from a remote place without actually being at the actual place of working.*
- *The World Wide Web (WWW) is a set of protocols that allows you to access any document on the net (short for internet) through a naming system based on URL's (Uniform Resource Locators).*
- *A Web Browswer is a WWW client that navigates through the World Wide Web and displays web pages. A Web Server is a WWW server that responds to the requests made by web browsers.*
- *A URL (Uniform Resource Locator) specifies the distinct address for each resource on the Internet. An Internet address which is character based is called a Domain Name.*
- *A location on a net server is called a Web Site. A document that uses HTTP is called a Web Page.*
- *The system designed to prevent unauthorized access to or from a private network is called Firewall.*
- *Cookies are messages that a Web server transmits to a Web browser so that the Web server can keep track of the user's activity on a specific Web site.*
- *The crackers are malicious programmers who break into secure systems whereas hackers are more interested in gaining knowledge about computer systems and possibly using this knowledge for playful pranks.*
- *Viruses are malicious program that damage data and files and cause harm to computer system.*
- *Viruses can be trojan horses, worms and other infective programs.*
- *Spams are unsolicited mails.*
- *Online banking allows a user to execute financial transactions via the Internet.*
- *Difference between online banking and mobile banking is that Mobile banking is done via a mobile banking app while the online baking is done via secure website of the bank.*
- *E-wallet is a similar electronic service used for payments.*

Objective Type Questions

OTQs

Multiple Choice Questions

1. Two devices are in network if
   (a) a process in one device is able to exchange information with a process in another device
   (b) a process is running on both devices
   (c) the processes running of different devices are of same type
   (d) none of the mentioned

2. What is a stand alone computer ?
   (a) A computer that is not connected to a network
   (b) A computer that is being used as a server
   (c) A computer that does not have any peripherals attached to it
   (d) A computer that is used by only one person

3. Central Computer which is powerful than other computers in the network is called as _____ .
   (a) Client (b) Server (c) Hub (d) Switch

4. Network in which every computer is capable of playing the role of a client, or a server or both at same time is called
   (a) peer-to-peer network (b) local area network
   (c) dedicated server network (d) wide area network

5. In peer-to-peer network, each computer in a network is referred as
   (a) server (b) client (c) peer (d) sender

6. Which transmission media is capable of having a much higher bandwidth (data capacity) ?
   (a) Coaxial (b) Twisted pair cable
   (c) Untwisted cable (d) Fibre optic

7. Which type of transmission media is the least expensive to manufacture?
   (a) Coaxial (b) Twisted pair cable
   (c) CAT cable (d) Fibre optic

8. Which of these components is internal to a computer and is required to connect the computer to a network ?
   (a) Wireless Access Point (b) Network Interface card
   (c) Switch (d) Hub

9. A device that forwards data packet from one network to another is called a
   (a) Bridge (b) Router (c) Hub (d) Gateway

10. Which of the following is the fastest media of data transfer ?
    (a) Co-axial Cable (b) Untwisted Wire
    (c) Telephone Lines (d) Fibre Optic

11. Hub is a
    (a) Broadcast device (b) Unicast device (c) Multicast device (d) None of the above

12. Switch is a
(a) Broadcast device
(b) Unicast device
(c) Multicast device
(d) None of the above

13. The device that can operate in place of a hub is a :
(a) Switch (b) Bridge (c) Router (d) Gateway

14. A repeater takes a weak and corrupted signal and _____ it.
(a) Amplifies
(b) Regenerates
(c) Resembles
(d) Reroutes

15. What factors should be considered when selecting the appropriate cable for connecting a PC to a network ? (*Choose two*)
(a) type of system bus
(b) motherboard model
(c) distance of cable run
(d) speed of transmission
(e) computer manufacturer

16. What are two advantages of using UTP cable in a networking environment ? (*Choose two*)
(a) is stiffer than STP
(b) is less expensive than fiber
(c) is easier to install than coaxial
(d) provides longer distances than coaxial provides
(e) is less susceptible to outside noise sources than fiber is

17. Which cable connectors are used to connect a cable from a router's console port to a PC?
(a) RJ-11 (b) RJ-12 (c) RJ-45 (d) none

18. What are two advantages of using fiber-optic cabling instead of UTP ? (*Choose two.*)
(a) lower cost
(b) easier to install
(c) allows longer distances
(d) less effected by external signals
(e) easier to terminate the cable ends

19. Which network topology requires a central controller or hub ?
(a) Star (b) Bus (c) Mesh (d) Tree

20. Which topology requires a multipoint connection on a single cable?
(a) Star (b) Bus (c) Mesh (d) Tree

21. Which of the following topologies contains a backbone cable running through the whole length of the network?
(a) Star (b) Bus (c) Mesh (d) Tree

22. Which of the following devices can be used at the centre of a star topology?
(a) Router (b) Repeater (c) Modem (d) Hub

23. If a computer connected to a star topology fails, the entire network will _____
(a) also fail
(b) work unaffectedly
(c) only server will work
(d) none of these

24. A combination of bus and star topologies is called a _____ topology.
(a) Combination (b) Hybrid (c) Mesh (d) Tree

25. Internet is an example of _____ topology.
(a) Star (b) Bus (c) Mesh (d) Bus

26. Data is converted in a form so as to travel over telephone lines using this device.
(a) Modem (b) Hub (c) Switch (d) Router

27. Network device that regenerates and retransmits the whole signal is _____.
(a) Modem (b) Hub (c) Repeater (d) Bridge

28. Network device which connects networks of similar types (same protocols).
(a) Hub (b) Router (c) Bridge (d) Gateway

29. Network device which connects dissimilar networks (different protocols).
(a) Hub (b) Router (c) Bridge (d) Gateway

30. Networks devices that sends the data over optimizing paths through connected hops is
(a) Hub (b) Router (c) Bridge (d) Gateway

Fill in the Blanks

1. A computer network that spans a relatively large geographical area is called _____ .
2. WAN stands for _____ .
3. Wired networks' communication media is called _____ media.
4. Wireless networks' communication media is called _____ media.
5. _____ is a protocol which allows users to download E Mail messages from mail server to a local computer.
6. _____ is a protocol that allows to send/upload email message from local computer to an email server.
7. A network of networks is known as _____ .
8. In a network, a machine is identified by unique address called _____ .
9. The physical address assigned by NIC manufacturer is called _____ address.
10. A MAC address consumes _____ bytes or _____ bits.
11. A network with a dedicated server is called a _____ network.
12. A computer, part of a computer network is called a _____.
13. A network having a span within a building is called a _____.
14. A network having a span of city, is called a _____.
15. The _____ is a central connection point where all network cables are concentrated.
16. The _____ is a network device that can connect the network segments based on the same protocol.
17. The _____ is a network device that navigates the data packets over large networks through the most efficient route.
18. The _____ is a network device that connects dissimilar networks.
19. The _____ is a networking device that regenerates or recreates a weak signal into its original strength and form.
20. The _____ topology has a central line and all nodes are connected to it.
21. The _____ topology has a central controller.
22. The tree topology is said to be a combination of _____and _____ topologies.
23. In _____ topology, there exists multiple paths between any two nodes of the network.
24. The _____ is a small network created by linking many personal devices.

True/False Questions

1. A LAN is connected to large geographical area.
2. A client is the computer that asks for the action in a network.
3. A computer is identified by 64 bit IP address.
4. Every object on the Internet has a unique URL.
5. A stand alone computer may also be referred to as host.
6. Big networks can be of peer-to-peer types.
7. MAC address is a 48 bit address.
8. A switch can work is place of a hub.
9. A gateway is like a modem.
10. LAN is the biggest network geographically.
11. LAN is the smallest network geographically.
12. PAN is the smallest network geographically.
13. The Internet is an example of WAN.
14. The bus topology is the simplest topology.
15. The star topology ensures that the network will work even when a node fails.
16. An amplifier and a repeater do the same thing.
17. A hub broadcasts the received signal to all its connected devices.
18. A switch is an intelligent hub.
19. Repeater and router precisely do the same thing.
20. A hub can be replaced with a switch.
21. A router can be replaced with a bridge.

NOTE : Answers for OTQs are given at the end of the book.

Solved Problems

1. *What is a network ? Why is it needed ?* **Or**

   Mention one advantage of networking. **(Outside Delhi 2001)**

   Solution. A network is an interconnected collection of autonomous computers that can share and exchange information. Major reasons that emphasize on the need of networks are :

   (*i*) *Resource Sharing*. Through a network, data, software and hardware resources can be shared irrespective of the physical location of the resources and the user.

   (*ii*) *Reliability*. A file can have its copies on two or more computers of the network, so if one of them is unavailable, the other copies could be used. That makes a network more reliable.

   (*iii*) *Reduced Costs*. Since resources can be shared, it greatly reduces the costs.

   (*iv*) *Fast communication*. With networks, it is possible to exchange information at very fast speeds.

2. *What are major types of networks and explain ?*

   Solution. ⇨ Server-based network

   ⇨ Peer-to-peer network

Server-based networks provide centralized control of network resources and rely on server computers to provide security and network administration.

Peer-to-peer network, computers can act as both servers sharing resources and as clients using the resources.

3. *What are the types of Transmission media ?*

Solution. Signals are usually transmitted over some transmission media that are broadly classified in to *two* categories.

(*a*) *Guided Media.* These are those that provide a conduit from one device to another that include twisted-pair, coaxial cable and fiber-optic cable. A signal traveling along any of these media is directed and is contained by the physical limits of the medium. Twisted-pair and coaxial cable use metallic that accept and transport signals in the form of electrical current. Optical fiber is a glass or plastic cable that accepts and transports signals in the form of light.

(*b*) *Unguided Media.* This is the wireless media that transport electromagnetic waves without using a physical conductor. Signals are broadcast either through air. This is done through radio communication, satellite communication and cellular telephony.

4. *What is a communication channel ? What choices do you have while choosing a communication channel for a network ?*

Solution. Communication channels mean the connecting cables that link various workstations. There are *three* basic types of cables :

(*i*) *Twisted-Pair Cables.* These cables consist of two insulated copper wires twisted around each other. These are also used for short and medium range telephone communication.

(*ii*) *Coaxial Cables.* A coaxial cable consists of one or more small cables in protective covering. These are more expensive than twisted pair cables but perform better.

(*iii*) *Fiber-optic Cables.* These cables are made of plastic or glass and are about as thick as human hair. These cables are highly durable and offer excellent performance but are expensive.

Above given media are guided media. Unsigned communication media are microwaves, radiowaves and sattellites.

5. *What is NIC ?*

Solution. NIC stands for Network Interface Card. It is also known as Network Adapter. It is in the form of add-in card and is installed in a computer so that the computer can be connected to a network.

Each NIC has a MAC address which helps in identifying the computer on a network.

6. *What is MAC address ?*

Solution. The address for a device as it is identified at the Media Access Control (MAC) layer in the network architecture. MAC address is usually stored in ROM on the network adapter card and is unique.

7. *What is the difference between bit rate and baud rate.*

Solution. Bit rate is the number of bits transmitted during one second whereas baud rate refers to the number of signal units per second that are required to represent those bits.

$$\text{baud rate} = \text{bit rate}/N$$ where N is no-of-bits represented by each signal shift.

8. *What is Bandwidth ?*

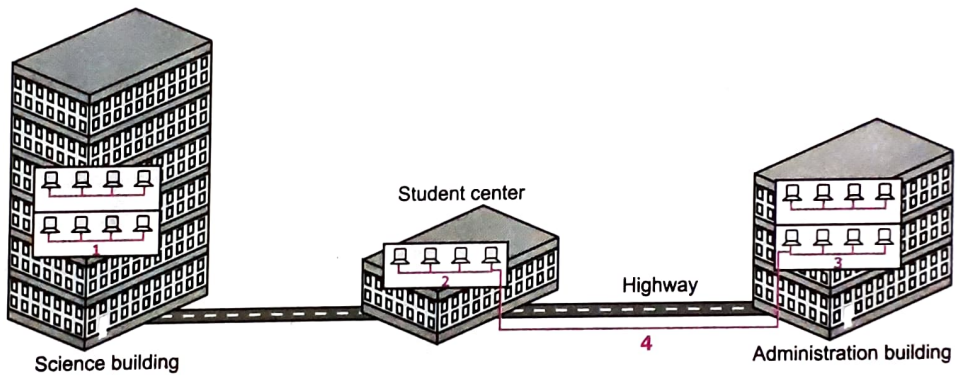
Solution. Every line has an upper limit and a lower limit on the frequency of signals it can carry. This limited range is called the bandwidth.

9. *What are the different types of networking / internetworking devices?*

Solution. Different types of networking/internetworking devices are :

- *Repeater.* Also called a regenerator, it is an electronic device that operates only at physical layer. It receives the signal in the network before it becomes weak, regenerates the original bit pattern and puts the refreshed copy back in to the link.
- *Bridges.* These operate both in the physical and data link layers of LANs of same type. They divide a larger network in to smaller segments. They contain logic that allow them to keep the traffic for each segment separate and thus are repeaters that relay a frame only the side of the segment containing the intended recipent and control congestion.
- *Routers.* They relay packets among multiple interconnected networks (*i.e.*, LANs of different type). They operate in the physical, data link and network layers. They contain software that enable them to determine which of the several possible paths is the best for a particular transmission.
- *Gateways.* They relay packets among networks that have different protocols (*e.g.*, between a LAN and a WAN). They accept a packet formatted for one protocol and convert it to a packet formatted for another protocol before forwarding it. They operate in all seven layers of the OSI model.

10. *Govt. of Delhi has computer networks inside each of its buildings. It has now interconnected the networks of Administration building and of Student center building. The networks so formed are marked below as numbers. Mention which types of networks is each of these ?*



Solution.

Network number	Type of network
1, 2, 3	LAN
4	WAN (it is connecting only networks 2 and 3)

11. *What is the difference between Hub, Switch, and Router?*

Solution.

Hub	Switch	Router
Hub is the least expensive, least intelligent and least complicated of the three. It broadcasts all data to every port which may cause serious security and reliability concern.	Switches work similarly like Hubs but in a more efficient manner. It creates connections dynamically and provides information only to the requesting port.	The router is smartest and most complicated out of these three. It comes in all shapes and sizes. Routers are similar like little computers dedicated for routing network traffic.
In a Network, Hub is a common connection point for devices connected to the network. Hub contains multiple ports and is used to connect segments of LAN.	Switch is a device in a network which forwards packets in a network.	Routers are located at gateway and forwards data packets.

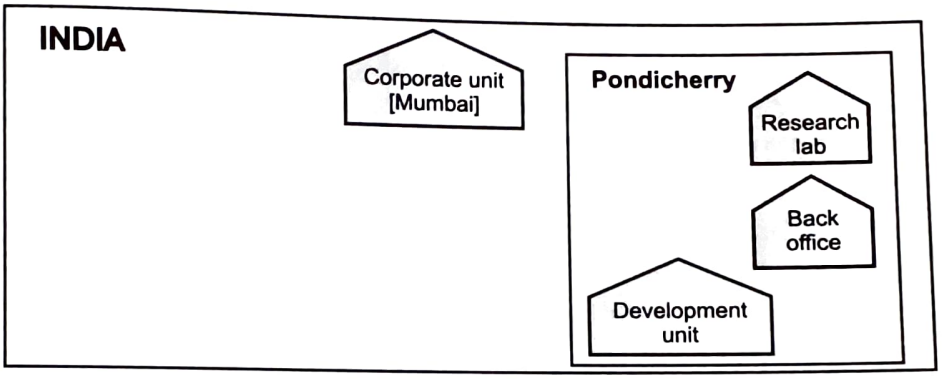
12. (a) *What is a Hub ?*

(b) *Expand the following terms with respect to Networking :*

(i) MODEM (ii) WLL (iii) FTP (iv) TCP/IP

(c) *How is Coaxial cable different from Optical Fibre ?*

(d) *"Bias Methodologies" is planning to expand their network in India, starting with three cities in India to build infrastructure for research and development of their chemical products. The company has planned to setup their main office in Pondicherry – at three different locations and have named their offices as "Back Office", "Research Lab" and "Development Unit". The company has one more Research office namely "Corporate Office" in "Mumbai". A rough layout of the same is as follows :*



Approximate distance between these offices is as follows :

From	To	Distance
Research Lab	Back Office	110 Mtr
Research Lab	Development Unit	16 KM
Research Lab	Corporate Unit	1800 KM
Back Office	Development Unit	13 KM

In continuation of the above, the company experts have planned to install the following number of computers in each of their offices :

Research Lab	158
Back Office	79
Development Unit	90
Corporate Unit	51

(i) *Suggest the kind of network required (out of LAN, MAN, WAN) for connecting each of the following office units :*

- Research Lab and Back Office
- Research Lab and Development Unit

(ii) *Which one of the following devices will you suggest for connecting all the computers with in each of their office units ?*

- Switch/Hub
- Modem
- Telephone

(*iii*) *Which of the following communication media, you will suggest to be procured by the company for connecting their local office units in Pondicherry for very effective (High Speed) communication ?*

- Telephone Cable
- Optical Fibre
- Ethernet Cable

(*iv*) *Suggest a cable/wiring layout for connecting the company's local office units located in Pondicherry. Also, suggest an effective method/technology for connecting the company's office unit located in Mumbai.* (Delhi 2008)

Solution.

(*a*) A *hub* is a hardware device used to connect several computers together.

(*b*) (*i*) MODEM - MOdulator DEModulator

(*ii*) WLL - Wireless in Local Loop

(*iii*) FTP - File Transfer Protocol

(*iv*) TCP/IP - Transfer Control Protocol/Internet Protocol.

(*c*) Coaxial cables have solid wire core surrounded by one or more foil or wire shields whereas optical fibres consist of thin strands of glass or glass like materials.

Coaxial cables transmit electrical signals whereas Optical fibres transmit light signals or laser signals.

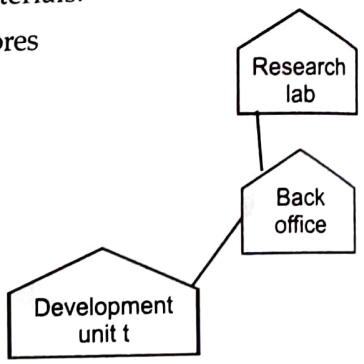
(*d*) (*i*) Between Research Lab and Back office – LAN

Between Research Lab and Development unit – MAN

(*ii*) Switch/hub (*iii*) Optical fibre

(*iv*) Suggested layout is shown in adjacent figure.

Technology for connecting to Mumbai office – *Sattellite.*



13. *Software Development Company has set up its new center at Raipur for its office and web based activities. It has 4 blocks of buildings named Block A, Block B, Block C, Block D.* [CBSE Sample Paper 2019-20]

Number of Computers

Block A	25
Block B	50
Block C	125
Block D	10

Shortest distances between various Blocks in meters

Block A to Block B	60 m
Block B to Block C	40 m
Block C to Block A	30 m
Block D to Block C	50 m

(*i*) *Suggest the most suitable place (i.e., block) to house the server of this company with a suitable reason.*

(*ii*) *Suggest the type of network to connect all the blocks with suitable reason.*

(*iii*) *The company is planning to link all the blocks through a secure and high speed wired medium. Suggest a way to connect all the blocks.*

(*iv*) *Suggest the most suitable wired medium for efficiently connecting each computer installed in every block out of the following network cables :*

- Coaxial Cable
- Ethernet Cable
- Single Pair Telephone Cable.

Solution. (*i*) Block C, It has maximum number of computers.

(*ii*) LAN (*iii*) Star topology (*iv*) Ethernet cable

14. (*a*) *What is the difference between Message Switching technique and Packet Switching technique ?*

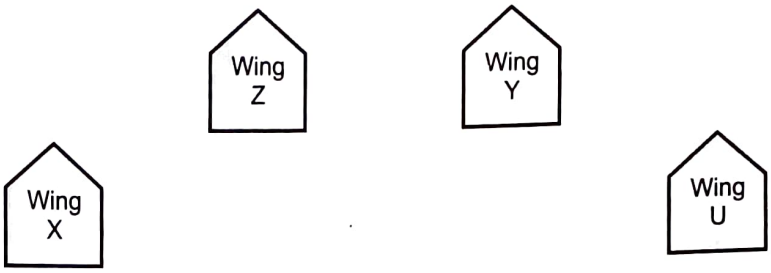
Or (CBSE D 2016C)

Differentiate between packet switching and message switching technique in network communication. (Delhi 2011)

(*b*) *Expand the following terminologies :* (*i*) TCP/IP (*ii*) XML (*iii*) CDMA (*iv*) WLL

(*c*) *Write two applications of Cyber Law.*

(*d*) *The Great Brain Organisation has set up its new Branch at Srinagar for its office and web based activities. It has 4 Wings of buildings as shown in the diagram :*



Center to center distances between various blocks

Wing X to Wing Z	50 m
Wing Z to Wing Y	70 m
Wing Y to Wing X	125 m
Wing Y to Wing U	80 m
Wing X to Wing U	175 m
Wing Z to Wing U	90 m

Number of Computers

Wing X	50
Wing Z	30
Wing Y	150
Wing U	15

(*i*) *Suggest the most suitable cable layout of connections between the Wings, and topology.*

(*ii*) *Suggest the most suitable place (i.e., Wing) to house the server of this organisation with a suitable reason, with justification.*

(*iii*) *Suggest the placement of the following devices with justification : (1) Repeater (2) Hub/Switch*

(*iv*) *The organization is planning to link its head office situated in Delhi with the offices at Srinagar. Suggest an economic way to connect it ; the company is ready to compromise on the speed of connectivity. Justify your answer.* (Delhi 2005)

Solution.

(*a*) **Message Switching.** In this form of switching no physical copper path is established in advance between sender and receiver. Instead when the sender has a block of data to be sent, it is stored in first switching office, then forwarded later, one jump at a time.

Packet Switching. With message switching there is no limit on block size, in contrast packet switching places a tight upper limit on block size.

(*b*) (*i*) Transmission Control Protocol/Internet Protocol

(*ii*) eXentensible Markup Language

(*iii*) Code-Division Multiple Access

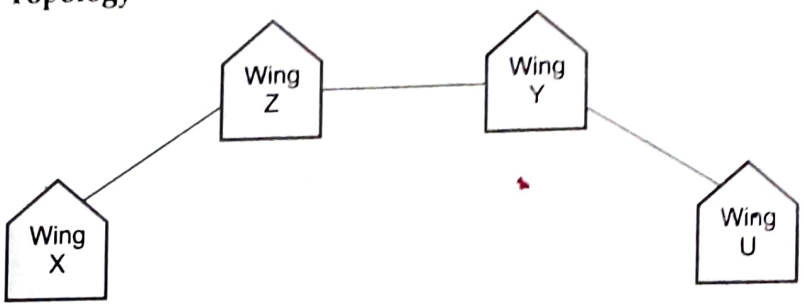
(*iv*) Wireless in Local Loop.

(*c*) Two applications of cyber law are :

(*i*) Digital transactions

(*ii*) Activities on Internet.

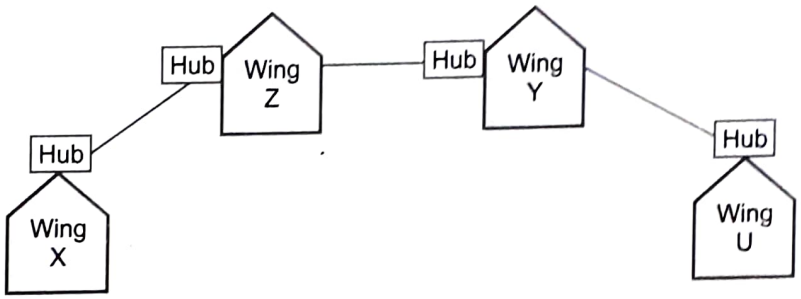
(*d*) (*i*) **Bus Topology**



(*ii*) The most suitable place to house the server is **Wing Y** as it has the most number of computers thus cabling cost will be reduced and most traffic will be local.

(*iii*) (1) As per suggested layout separate repeaters need not be installed as each building/wing will be having a hub that acts as a repeater.

(2) One hub per wing.



(*iv*) An economic way of connecting is Dial-up or broadband as it can connect two computers at an economic rate though it provides lesser speed than other expensive methods.

15. *What are the different types of networks ? What is the geographical scope of LAN, MAN and WAN ?*

Solution. Networks vary widely in their size, complexity and geographical spread. On the basis of geographical spread, networks can be classified into three categories :

(*i*) *Local Area Networks* (*LANs*). These are computer networks confined to a localised area such as an office or a factory.

(*ii*) *Metropolitan Area Networks* (*MANs*). These are the networks that link computer facilities within a city.

(*iii*) *Wide Area Networks* (*WANs*). These are the networks spread over large distances, say across countries or even continents. It can even include a group of LANs connected together.

16. *What are the important topologies for networks ?*

Solution. Important network topologies are :

- **BUS topology.** In this each computer is directly connected to primary network cable in a single line.

  Advantage. Inexpensive, easy to install, simple to understand, easy to extend.

- **STAR topology.** In this all computers are connected using a central hub.

  Advantage. Can be inexpensive, easy to install and reconfigure and easy to trouble shoot physical problems.

- **RING topology.** In this all computers are connected in loop.

  Advantage. All computers have equal access to network media, installation can be simple, and signal does not degrade as much as in other topologies because each computer regenerates it.

17. *Explain in brief the capabilities and services supported by LAN.*

Solution. Small computer networks that are confined to a localised area (*e.g.*, an office, a building or a factory) are known as *Local Area Networks* (LANs). The key purpose of a LAN is to serve its users in resource sharing. The hardware as well as software resources are shared through LANs. For instance, LAN users can share data, information, programs, printer, hard-disks, modems etc. One node has a printer connected to it and other nodes on the LAN can communicate with it in order to print files and hence allowing expensive peripherals to be shared among number of users.

18. *What is the purpose of using router ?* (CBSE Outside Delhi 1999)

Solution. A router can work like a bridge and can also handle different protocols. A router can locate the destination required by sending the traffic to another router, if the destination is unknown to itself.

19. (*a*) *Give two examples of PAN and LAN type of networks.* (CBSE Delhi 2016)

(*b*) *Differentiate between PAN and LAN types of networks.* (CBSE Outside Delhi 2016)

Solution.

(*a*) **PAN :** *Examples*

(*i*) Network formed by connecting smartphones of family members to laptop via bluetooth.

(*ii*) Network formed by connecting devices like printer, laptop, smartphone, digital recorder etc.

LAN : *Examples*

(*i*) Network formed by computers in an office.

(*ii*) Network formed by computers in a bank.

(*b*) PAN expands to *Personal Area Network.*

LAN expands to *Local Area Network.*

A PAN is a computer network organized around an individual person where a small network is formed by connecting various devices of the individual *e.g.*, a laptop, a printer, a smartphone, digital recorder etc.

LAN interconnects some stand-alone computers within a confined physical area upto a kilometer, *e.g.*, a LAN inside a university or a LAN inside a hospital etc.

20. *What are two types of modems ?*

Solution. Modems come in *two* varieties :

1. ***Internal modems*** are the modems that are fixed within the computer.
2. ***External modems*** are the modems that are connected externally to a computer as other peripherals are connected.

21. *Write two advantages of 4G over 3G Mobile Telecommunication Technologies in terms of speed and services.* (CBSE Delhi 2016)

Solution. Speed. 4G offers peak download speeds of more them 10 Mbps while 3G offers peak download speeds around 3.1 Mbps.

Services. Using QoS, Quality of service technology, 4G can prioritize services to offer flawless performance, *e.g.*, VoIP is prioritized over other data to offer flawless calling experience.

22. *What do you mean by network topology ? What are the most popular topologies ?* (CBSE Question Bank)

Solution. Topology refers to the way in which the workstations attached to the network are interconnected. The most popular topologies are :

▲ Bus or Linear ▲ Ring ▲ Star ▲ Tree

1. *Bus or Linear Topology.* In this topology, all devices on network are connected to a single continuous cable called a bus. Transmission from any station travels the length of the bus in both directions and can be received by all other stations. The destination device, on identifying the address on data packet copies the data onto its disk. When the data packet reaches at either end the terminator on that end absorbs the signal, removing from the bus.

   This topology can be used for smaller networks.

2. *Ring Topology.* A LAN using the ring topology is connected in the closed loop. The data packets transmitted, circulate along the ring. The destination station copies the packet content on recognizing its address on the packet. After a packet travels a full circle, it is removed at the source station.

3. *Star Topology.* In this topology each workstation is directly linked to a central node. Devices can be easily plugged or unplugged to the central node, as need dictates. Any communication between the stations must pass through the central node.

4. *Tree Topology.* In this topology the network is shaped as an inverted tree with the central root branching and sub-branching to the extremities of the network. Transmission in this topology takes place in the same way as in bus topology.

23. *What is a modem ? What is its function ?*

Solution. A modem is a computer peripheral that connects a workstation to other work-stations via telephone lines and facilitates communications. It is short form for Modulation / Demodulation.

Modem converts digital signals to A/F (Audio Frequency) tones which are in the frequency range that the telephone lines can transmit and also it can convert transmitted tones back to digital information.

24. (*a*) *Differentiate between Internet and Intranet.* (Delhi 2006)

(*b*) *Expand the following terms :* (*i*) *CDMA* (*ii*) URL (*iii*) HTTP (*iv*) WAN

(*c*) *Write one advantage of STAR topology as compared to BUS topology.*

(*d*) *UNIVERSITY OF CORRESPONDENCE in Allahabad is setting up the network between its different wings. There are 4 wings named as Science (S), Journalism (J), ARTS (A) and Home Science (H).*

Distance between various wings

Wing A to Wing S	100 m
Wing A to Wing J	200 m
Wing A to Wing H	400 m
Wing S to Wing J	300 m
Wing S to Wing H	100 m
Wing J to Wing H	450 m

Number of Computers

Wing A	150
Wing S	10
Wing J	5
Wing H	50

(*i*) *Suggest a suitable Topology for networking the computer of all wings.*

(*ii*) *Name the wing where the Server to be installed. Justify your answer.*

(*iii*) *Suggest the placement of Hub/Switch in the network.*

(*iv*) *Mention in economic technology to provide internet accessibility to all wings.*

Solution.

(*a*) The Internet is a worldwide network of computer networks around the globe. Internet uses a set of protocols called TCP / IP. Internet is not owned by anybody.

On the other hand Intranet is network, which is privately owned. Intranet also uses same set of protocols as Internet.

(*b*) (*i*) **CDMA** – Code-Division Multiple Access (*ii*) **URL** – Uniform Resource Locator
(*iii*) **HTTP** – Hyper Text Transfer Protocol (*iv*) **WAN** – Wide Area Network

(*c*) Fault Diagnosis is relatively easy in STAR topology as compared to BUS topology

(*d*) (*i*) Star Topology can be used to network the computer of all wings.

(*ii*) The Sever should be installed in Wing A, as Wing A has maximum number of computer and installing the server in this wing will help to reduce the network traffic.

(*iii*) Hub/Switch will be required in all the Wings

(*iv*) The economic way to provide internet accessibility to all wings is to use the proxy server at wing A and connect to the internet through a dial-up network.

25. (*a*) *Name two transmission media for networking.*

(*b*) *Expand the following terms* : (*i*) XML (*ii*) GSM (*iii*) SMS (*iv*) MAN (Outside Delhi 2006)

(*c*) *Differentiate between Hackers and Crackers ?*

(*d*) *INDIAN PUBLIC SCHOOL in Darjeeling is setting up the network between its different wings. There are 4 wings named as SENIOR(S), JUNIOR(J), ADMIN(A) and HOSTEL(H).*

Distance between various wings

Wing A to Wing S	100 m
Wing A to Wing J	200 m
Wing A to Wing H	400 m
Wing S to Wing J	300 m
Wing S to Wing H	100 m
Wing J to Wing H	450 m

Number of Computers

Wing A	10
Wing S	200
Wing J	100
Wing H	50

(*i*) *Suggest a suitable Topology for networking the computer of all wings.*

(*ii*) *Name the wing where the server is to be installed. Justify your answer*

(*iii*) *Suggest the placement of Hub/Switch in the network.*

(*iv*) *Mention an economic technology to provide internet accessibility to all wings.*

Solution.

(*a*) (*i*) Coaxial Cable (*ii*) Microwave

(*b*) (*i*) **XML** – Extensible Markup Language

(*ii*) **GSM** – Global System for Mobile

(*iii*) **SMS** – Short Message Service

(*iv*) **MAN** – Metropolitan Area Network

(*c*) Programmers who gain knowledge about computer system for playful pranks are known as Hackers where as Crackers are malicious programmers who break into secure systems.

(*d*) (*i*) Star Topology can be used to network the computer of all wings.

(*ii*) The Sever should be installed in Wing S, as Wing S has maximum number of com- puter and installing the server in this wing will help to reduce the network traffic.

(*iii*) Hub/ Switch will be required in all the Wings

(*iv*) The economic way to provide internet accessibility to all wings is to use the proxy server at wing S and connect to the internet through a dial-up network.

26. *Differentiate between XML and HTML.* (Outside Delhi 2011)

Solution. In HTML (HyperText Markup Language), both tag semantics and the tag set are fixed whereas, XML (eXtensible Markup Language) is a meta-language for describing markup languages, XML provides facility to define tags and the structural relationships between them. All the semantics of an XML document will either be defined by the applications that process them or by stylesheets.

27. *Jai is an IT expert and a freelancer. He recently used his skills to access the Administrator password for the network server of Megatech Corporation Ltd. and provided confidential data of the organisation to its Director, informing him about the vulnerability of their network security. Out of the following options (i) to (iv), which one most appropriately defines Jai ?* (CBSE D 2017)

Justify the reason for your chosen option :

(i) Hacker (ii) Cracker (iii) Operator (iv) Network Admin

Solution. **Hacker.** A computer hacker breaks into computer system for gaining knowledge about possible vulnerabilities and finding possible solutions.

28. *Define the following : (i) Data channel (ii) Baud (iii) bps (iv) Bps (v) Bandwidth.*

Solution. (*i*) A data channel is the medium used to carry information or data from one point to another.

(*ii*) Baud is the unit of measurement for the information carrying capacity of a communication channel. It is synonymous with bps (bits per second).

(*iii*) bps – bits per second. It refers to a thousand bits transmitted per second.

(*iv*) Bps – Bytes per second. It refers to a thousand bytes transmitted per second.

(*v*) Bandwidth – It refers to the difference between the highest and lowest frequencies of a transmission channel. This term is also sometimes used to refer to the amount of information travelling through a single channel at any one point of time.

29. *What are repeaters and routers ?* (CBSE Question Bank 1998)

Solution. **REPEATER.** A *repeater* is a device that amplifies a signal being transmitted on the network. It is used in long network lines, which exceed the maximum rated distance for a single run.

Over distance, the cables connecting a network lose the signal transmitted. If the signal degrades too much, it fails to reach the destination. Or if it does arrive, the degradation of the message makes it useless. *Repeaters* can be installed along the way to ensure that data packets reach their destination. *Repeaters* are of two kinds — *amplifier* and *signal repeater*.

The *first* merely amplifies all incoming signals over the network. However, it amplifies both the signal and any concurrent noise. The *second* type collects the inbound packet and then retransmits the packet as if it were starting from the source station.

ROUTER. A device that works like a bridge but can handle different protocols, is known as a *router*. For example, a router can link Ethernet (ethernet is a very popular and widely accepted method of linking local stations to one another (*i.e.*, a LAN) for sharing data, program and equipment resources.) to a mainframe.

If the destination is unknown to a router it sends the traffic (bound to unknown destination) to another router (using logical addresses) which knows the destination.

A router differs from a bridge in a way that former uses logical addresses and the latter uses physical addresses.

30. *A teacher provides "http://www.XtSchool.com/default.aspx" to his/her student to identify the URL and domain name.* (CBSE Sample Paper 2017-18)

Solution. **URL :** http://www.XtSchool.com/default.aspx

Domain name : XtSchool.com

31. *How is TELNET service of internet useful ?*

Solution. Telnet, the most widely used remote logic program in the world, is used to extract the raw power of Internet. Using telnet a student in Delhi can access a server at America. A major chunk of scientists on the internet are accessing and utilizing the power of super computers by telneting.

32. *What are cookies ?* (Outside Delhi 2011)

Or

What is the significance of cookies stored on a computer ? (CBSE Sample Paper 2017-18)

Solution. Cookies are messages that a web server transmits to a web browser so that the web server can keep track of users activity on a specific web site.

33. *Give the advantages of E-mail and World Wide Web services provided by INTERNET.*

Solution. **Advantages of E-MAIL**

(*i*) Low cost. Electronic mail is an extremely cost-effective way to move information around, especially when it must be moved quickly. A three page letter to U.S.A. can cost Rs. 200 through courier, or about Rs. 100 to fax. The same letter can be sent by e-mail for the cost of one local call.

(*ii*) Speed. Electronic mail can be delivered almost as fast as the wire can carry it.

(*iii*) Waste reduction. E-mail goes a long way toward reducing the clutter of paper in the modern office, not to mention saving many trees.

(*iv*) Ease of use. It is easy to send an e-mail. You don't have to retype it three times, find an envelope, go to the corner to buy a stamp, and then find a mail box.

(*v*) Record maintenance. Because all messages are files, you can automatically maintain a record of communications with someone else.

(*vi*) Patience. E-mail waits until you read it. It doesn't have the jangling urgency of a phone call.

34. *What are protocols ? Give some examples of different types of protocols used.*

Solution. A **protocol** means the rules that are applicable for a network or we can say that the common set of rules used for communication in a network. Different types of protocols are :

(*i*) HTTP : Hyper Text Transfer Protocol

(*ii*) FTP : File Transfer Protocol.

(*iii*) SLIP : Serial Line Internet Protocol.

(*iv*) PPP : Point to Point Protocol.

(*v*) TCP/IP : Transmission Control Protocol/Internet Protocol.

(*vi*) NTP : Network Time Protocol.

(*vii*) SMTP : Simple Mail Transfer Protocol.

(*viii*) POP : Post Office Protocol.

(*ix*) IMAP : Internet Mail Access Protocol. (Delhi 2011)

35. *What is VoIP ?*

Solution. VoIP (Voice over IP) refers to a way to carry telephone calls over an IP data network. It offers a set of facilities to manage the delivery of voice information over Internet in digital form.

36. (*a*) *Give one advantage and one disadvantage of optical fibre cable and coaxial cable used in communication.*

(*b*) *Differentiate between Tree and Bus topologies of network.*

(*c*) *What do email and FTP mean ?* (CBSE 2000)

(*d*) *What is the difference between a repeater and a bridge ?*