

UNIT II

Computer Networks

(For Examination Question No. 3)

In This Unit

Chapter 11 COMPUTER NETWORKS – I

Chapter 12 COMPUTER NETWORKS – II

212. What is Single bit error ?

Ans. The term single bit error means that only one bit of a given data unit (such as byte character/data unit or packet) is changed from 1 to 0 or from 0 to 1 during transmission.

213. What is burst error ?

Ans. Burst error means that 2 or more bits in the data unit have changed from 1 to 0 or from 0 to 1 during transmission.

214. What is a *tracert* or *traceroute* command ?

Ans. This networking command **traceroute** traces the route through the Internet from the sending device to the destination computer. The signal generally goes from a computer to the Internet Service Provider (ISP) and then to their provider until it reaches a 'backbone' provider. It then eventually transfers to the destination 'backbone' provider and finally reaches to the destination computer.

The traceroute command lists all the hops the signal has visited from sending device to destination device.

215. What is the use of *Whois* networking command ?

Ans. The **whois** networking command is used to find the registration records for a specific domain name such as who is the owner of this domain name, when was it registered and till when it is valid, etc.

TYPE B

SHORT ANSWER QUESTIONS

[2, 3 Marks]

216. What is a network ? Why is it needed ?

Or

Mention one advantage of networking.

[Outside Delhi 2001]

Ans. 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.

217. Explain in brief the capabilities and services supported by LAN.

Ans. 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.

218. What are routers ?

Ans. 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.

219. What are major types of networks ? Explain.

Ans. Two major types of networks are :

- Server-based network (Client/Server 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. Big networks are client server networks.

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

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

Ans.

| 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. Routers are dedicated for routing network traffic. |
| In a Network, Hub is a common connection point for devices connected to the network. | Switch is a device in a network which unicasts packets in a network to the destination computer. | Routers are located at gateway and forwards data packets to closest networks on the best-route computed through its routing table. |

221. What are the enabling technologies of IoT systems ?

Ans. IoT system has been enabled through following technologies majorly :

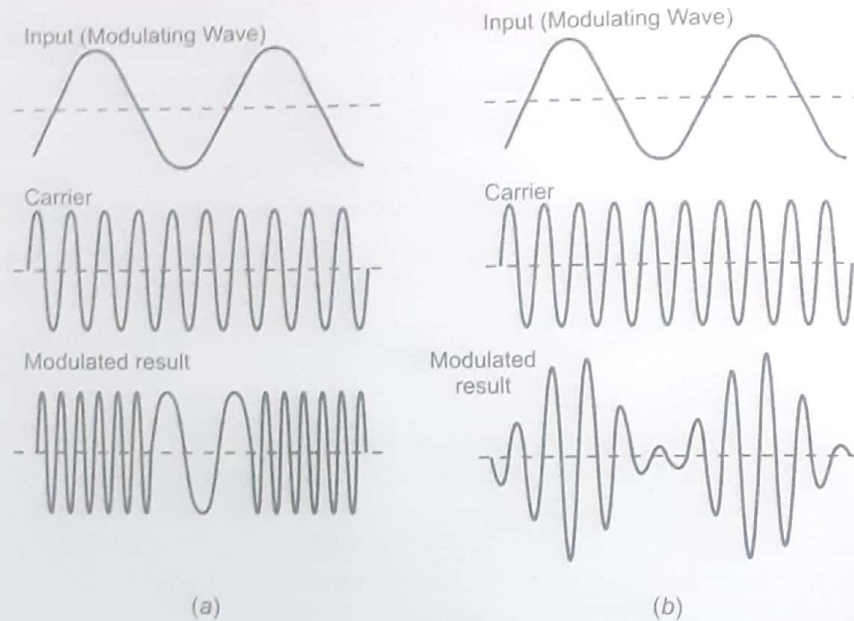
- (i) RFID (Radio Frequencies Identification)
- (ii) Sensors
- (iii) Network connectivity
- (iv) Smart technologies

222. What is the difference between working of switches and routers ?

Ans. The switches are found within LANs where there is a single path from source to the destination. Switches unicast the message to the destination computer directly and thus provide better bandwidth utilisation.

The routers connect LANs and these can be multiple paths from source to destination when data is travelling via routers. Routers maintain a special table, a routing table, based on which they compute the best or the most efficient path/route to reach to a destination through connected networks.

223. Identify the types of modulation from the figures given below :



Ans. (a) Frequency Modulation (b) Amplitude Modulation

224. Which characteristic of the modulated signal carries the actual message/information ?

Ans. In amplitude modulation, the message signal will be present in the amplitude of the transmitted signal and in frequency modulation; the message signal will be present in the instantaneous frequency of the transmitted signal.

The amplitude in amplitude modulation and frequency in frequency modulation easily carry the information as the rest of the characteristics remain unchanged *i.e.*, frequency, and phase remain the same in amplitude modulation and amplitude and phase in frequency modulation.

225. What is collision in a network ? How does it impact the performance of a network ?

Ans. In a computer network, collision is a specific condition that occurs when two or more nodes on a network transmit data at the same time. In case of a collision, the data gets garbled and cannot be read. Also, it may hamper the overall performance of the network as collisions often lead to more retransmissions which clog the network and deteriorate the overall performance of the network.

226. What measures do wireless networks employ to avoid collisions ?

Ans. The wireless networks employ a protocol called CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance) to avoid collisions in the network.

It is a multiple access method in which carrier is sensed first and a node attempts to avoid collisions by transmitting only when it senses that carrier is idle *i.e.*, no other node is transmitting data.

CSMA/CA is used by wireless networks as they cannot detect collisions, hence they avoid it.

227. Explain the two types of duplex communication.

Ans. There are mainly two types of duplex communication :

- (i) **Full duplex.** In this type of transmission, two bit streams can be simultaneously transmitted over the links at the same time, one going in each direction, *i.e.*, sending as well as receiving the data.
- (ii) **Half duplex.** In this type of transmission, data can flow in only one direction at a time *i.e.*, either sending or receiving of data at a time.

228. The wireless networks employ strategies to avoid collisions. Why can't they detect collisions ?

Ans. Collisions occur when multiple transmissions take place at the same over a network. Wireless networks are half duplex in nature, *i.e.*, they cannot listen while transmitting (and while listening, they cannot transmit – only one operation at a time). Hence they cannot find out if any other transmission is taking place simultaneously, and thus cannot detect collisions.

229. What is CSMA/CA ? How does it work ?

Ans. Carrier Sense Multiple Access/Collision Avoidance (CSMA/CA) is a media access protocol that is used on multiple access wireless networks.

With CSMA/CA, a device listens for an opportunity to transmit its data, *i.e.*, CARRIER SENSE. If the carrier is free, the sending device does not immediately transmit data. Rather, it first transmits a signal notifying other devices (*i.e.*, a warning packet) that it is transmitting for so much time before actually sending the data. The other device refrains from transmitting data for the specified time limit. This means data packets will never collide, although warning packets might.

230. What are basic methods of checking errors in the data being transmitted over networks ?

Ans. There are many methods of checking or detecting errors in the data transmitted.

Three simplest ones are :

- (i) Single dimensional parity checking
- (ii) Two dimensional parity checking
- (iii) Checksums

231. What types of errors may occur in the data transmitted over networks ?

Ans. The errors that may occur in the data transmitted over networks, can be one or more of following types:

- (i) **Single-bit error.** This type of error occurs if only one bit of the transmitted data got changed from 1 to 0 or from 0 to 1 during transmission.
- (ii) **Multiple-bit error.** This type of error occurs if two or more nonconsecutive bits in data got changed from 0 to 1 or from 1 to 0 during transmission.
- (iii) **Burst Error.** This type of error occurs if two or more consecutive bits in data got changed from 0 to 1 or from 1 to 0 during transmission.

232. What do you understand by parity checking ?

Ans. Parity checking is a method of error detection that can check 1 or 2 bit errors (but not all of these). In parity checks, a parity bit is added to the end of a string of binary code to indicate whether the number of bits in the string with the value 1 is even or odd.

There can be *two* types of parity bits :

- **Even parity bit** where the parity bit is set to 1 if the number of bits is odd. The extra parity bit will make the number of 1s even.
- **Odd parity bit** where the parity bit is set to 1 if the number of bits is even. The extra parity bit will make the number of 1s odd.

For example, if we have data as 0101010 , then

- With even parity it becomes 01010101 (because 0101010 has 3 bits that are 1, so using even parity the parity bit is 1 to make the number of 1's as an even number)
- With odd parity it becomes 01010100 (since the number of 1's are already 3, no need to add another 1 to make it odd, hence the parity bit is 0)

Data is transmitted along with the parity bit. The receiver recalculates the parity from the data part only extracting the parity bit and then compares the calculated parity bit with the received parity bit. If they match, the data is considered to be correct and accepted.

233. *What are the steps followed in checksum generator ?*

Ans. The sender, which is the checksum generator, follows these steps :

- (a) The units are divided into k sections each of n bits.
- (b) All sections are added together using 1's complement to get the sum.
- (c) The sum is complemented and becomes the checksum.
- (d) The checksum is sent with the data.

234. *What are checksums ?*

Ans. Checksum is an error detection technique used for checking errors in the received data.

In this technique, at the transmitter's end, as the device transmits data, it takes the sum of all of the data elements (K segments of transmitted data) it is transmitting to create an aggregate sum. This sum is called the **datasum**. The overflow carries generated by the additions are added back into the *datasum*. The transmitting device then sends a form of this **datasum** appended to the end of the block. This new form of the *datasum* is called the **checksum**.

At the receiver end, as the data elements are received, they are added a second time in order to recreate the *datasum*. Once all of the data elements have been received, the receiving device compares its calculated *datasum* with the checksum sent by the transmitting device.

If both these match, the data is considered error-free and accepted, otherwise rejected.

235. *What is routing ? Explain briefly.*

Ans. Routing is the process of selecting paths to move information across networks from the source network to the destination network.

When a data packet reaches a router, the router selects the best route to the destination network from its routing table and forwards the data packet to the neighbouring router as per the selected best route. This way each router keeps passing the data packet(s) to its neighbouring router on best route to the destination and finally the data packet reaches its destination.

236. *What is routing table ? What type of information is stored in a routing table ?*

Ans. Routing table is a table maintained by each router where it records the next hop for the best route to a destination. Routing information such as the *destination network*, *metric* (such as cost), and *next hop* etc., are stored on a routing table.

237. *What is network congestion ? What are the symptoms of network congestion ?*

Ans. Network congestion is a specific condition in a network when more data packets are coming to network devices than they can handle and process at a time.

Networks identify the congestion situation through the following symptoms :

- (i) excessive packet delay
- (ii) loss of data packets
- (iii) retransmission.

238. *What are protocols ? What is the significance of protocols in networks ?*

Ans. A **protocol** is a system of rules that allow two or more entities of a communications system to transmit information via any kind of variation of a physical quantity. For example, there are protocols for the data interchange at the hardware device level and protocols for data interchange at the application program level.

Network protocols govern the end-to-end processes of timely, secure network communication. Network protocols incorporate all the processes, requirements and constraints of initiating and accomplishing communication between computers, servers, routers and other network enabled devices.

239. *Write a brief note on TCP/IP suite.*

Ans. Transmission Control Protocol/Internet Protocol, TCP/IP is a set of rules (protocols) governing communications among all computers on the Internet. More specifically, TCP/IP dictates how information should be packaged (turned into bundles of information called packets), sent, and received, as well as how to get to its destination.

The TCP/IP Internet protocols consist of :

- **Transmission Control Protocol (TCP)**, which uses a set of rules to exchange messages with other Internet points at the information packet level.
- **Internet Protocol (IP)**, which uses a set of rules to send and receive messages at the Internet address level.

TCP/IP is able to integrate and interacts with additional Internet protocols that include the UDP (User Datagram Protocol), Hypertext Transfer Protocol (HTTP) and File Transfer Protocol (FTP), each with defined sets of rules to use with corresponding programs elsewhere on the Internet.

240. *Write a short note on IPv4 addressing.*

Ans. An IPv4 address consists of a series of 32 binary bits (ones and zeros). The 32 bits are grouped into four segments of 8 bits called **octets**. Each octet is presented as its decimal value, separated by a decimal point or period. This format is referred to as **dotted-decimal notation**. When a host is configured with an IPv4 address, it is entered as a dotted-decimal number, such as 192.168.1.5.

241. *Discuss how IPv4 is different from IPv6.*

Ans. Internet Protocol (IP) is a set of technical rules that define how computers communicate over a network. There are currently *two* versions : **IP version 4 (IPv4)** and **IP version 6 (IPv6)**.

IPv4 was the first version of Internet Protocol to be widely used and still accounts for most of today's Internet traffic. There are just over 4 billion IPv4 addresses. While that is a lot of IP addresses, it is not enough to last forever.

IPv6 is a newer numbering system to replace IPv4. It was deployed in 1999 and provides far more IP addresses, which should meet the need well into the future.

The major difference between IPv4 and IPv6 is the number of IP addresses. Although there are slightly more than 4 billion IPv4 addresses, there are more than 16 billion-billion IPv6 addresses.

| | Internet Protocol version 4 (IPv4) | Internet Protocol version 6 (IPv6) |
|---------------------|--|---|
| Address size | 32-bit number | 128-bit number |
| Address format | Dotted decimal notation : 192.168.0.202 | Hexadecimal notation: 3FFE:0400:2807:8AC9::/64 |
| Number of addresses | 2^{32} | 2^{128} |

242. What is Ping network tool ?

Ans. The network tool *ping* sends signals (packets) to another computer on the Internet to see if they send a return or an 'echo.' If all the signals time out, *i.e.*, no response is received, the computer may be disconnected from the Internet or at least unreachable from the server.

This feature only checks if a computer is connected to the Internet, it cannot verify the validity of an e-mail address. It also cannot check a specific web page, but you can check the main server to see if it is connected, *e.g.*, the command

```
ping www.edupillar.com/aboutus/
```

is not valid, but the command

```
ping www.edupillar.com
```

is valid.

243. What is the purpose of using router ?

[CBSE OD 99]

Ans. 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 (by finding the best possible alternate route), if the destination is unknown to itself.

244. What is the job of a switch ?

Ans. A switch is responsible for filtering *i.e.*, transforming data in a specific way and for forwarding packets of message bring transmitted, between LAN segments.

A switch does not broadcast the messages, rather it unicasts the message to its intended destination.

245. What is VoIP ?

[CBSE SP I, 12; D III]

Ans. VoIP (Voice Over Internet Protocol) is communication protocols and transmission technologies for delivery of voice communications and multimedia sessions over Internet Protocol (IP) networks, such as the Internet. Also, we can say, VoIP are IP telephony, Internet telephony and broadband telephony.

246. What do you mean by IP Address ? How is it useful in Computer Security ? [CBSE SP I, D 12]

Ans. An Internet Protocol (IP) address is a numerical identification and logical address that is assigned to devices connected in a computer network.

In a network every machine can be identified by a unique IP address associated with it and thus help in providing network security to every system connected in a network.

247. How is Coaxial cable different from Optical Fibre ? [CBSE D 08]

Or

Compare optical fiber and coaxial transmission media. [CBSE OD 05]

Or

Write one difference between coaxial and optical cable. [CBSE OD 04]

Or

Compare coaxial and optical fiber cable. [CBSE D 02]

Ans. 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.

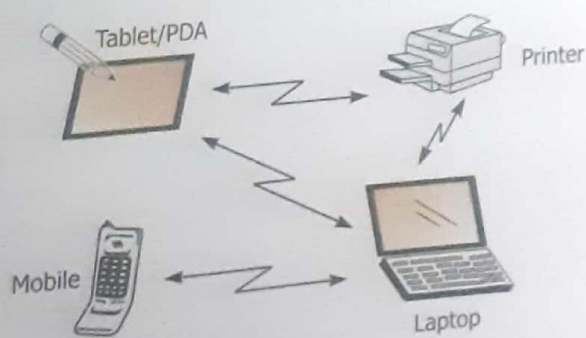
248. Write an advantage and a disadvantage of using Optical fibre cable. [CBSE D 03 ; OD 03]

Ans. Advantage. It is very fast and reliable.

Disadvantage. It is an expensive communication medium.

249. What is a PAN ?

Ans. PAN refers to *Personal Area Network*. A PAN is the network of various IT devices within the range of an individual person (typically within 10 meters).



A Personal Area Network (PAN)

250. What is TCP/IP ?

Ans. TCP/IP is the base communication protocol of the Internet. IP part of TCP/IP uses numeric IP addresses to join network segments and to ensure that the packets reach to their intended destinations, and it uses TCP part of TCP/IP provides reliable delivery of messages between networked computers.

251. What is modulation ? Name three modulation techniques.

Ans. Modulation is the process of sending data on a wave, three types of modulation techniques are used :

- AM (Amplitude Modulation),
- FM (Frequency Modulation),
- PM (Phase Modulation).

252. *Mention one advantage of networking.*

[CBSE OD 01]

Ans. 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.

253. *What are the different types of networks ?*

Or

Briefly describe the difference between LAN, MAN and WAN.

[CBSE QB 98]

Ans. 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 the 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.

254. *Name two communication channels used in networking and explain any one.* [CBSE OD 01]

Or

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

Ans. 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.

255. *What is a network ? Why is it needed ?*

Or

Explain in brief of networking needs and goals.

[CBSE QB 98]

Or

Why do we need to network our systems ?

[CBSE QB 98]

Ans. 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.

256. *What is a server ? What is its role ?*

Ans. A computer that facilitates the sharing of data, software, and hardware resources on a network, is called server. Since resource sharing is the key purpose of a network, a server plays this key role.

There can be *two* types of servers :

- **Non-dedicated Servers.** It is a workstation on a small network that can double up as a server.
- **Dedicated Server.** On bigger networks, a computer is reserved for the cause of serving which is called a dedicated server.

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

Ans. 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.

258. *What are repeaters and routers ?*

Ans. 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 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. It maintains a table called routing table to find the best possible route and sends the traffic to connected first router on the determined route.

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

259. *What are bridges ? How do they differ from repeaters ?*

Ans. A *bridge* is a device that lets you link two networks together. *Bridges* are smart enough to know which computers are on which side of the bridge, so they only allow those messages that need to get to the other side to cross the bridge. This improves performance on both sides of the bridge. As a packet arrives at the bridge, the bridge examines the physical destination address of the packet. The bridge then decides whether or not to let the packet cross.

So bridges differ from *repeaters* in their capability of deciding whether a particular message is to be communicated on other side or not whereas a *repeater* just amplifies the signal and pass it to other side.

260. *What are the components required for networking ?*

Ans. Whenever we talk about network it includes the hardware and software that made up the network.

Some of the typical components of network are as follows :

- (a) **Nodes (Workstations).** The term nodes refers to the computers that are attached to a network and are seeking to share the resources of the network.
- (b) **Server.** A computer that facilitates the sharing of data, software and hardware resources (e.g., printers, modems) on the network, is termed as server.
- (c) **Network Interface Unit (NIU).** It is a device that is attached to each of the workstation and the server, and helps the workstation establish the all important connection with the network.
- (d) **Communication channels.** The medium that connects two or more workstations is the communication channel. Many different types of media are in use e.g., copper conductors in the form of twisted pair or coaxial cables are by far the most common. Optical fibre is another very attractive transmission medium.

261. *What are protocols ?*

[CBSE QB 98]

Ans. A protocol means the rules that are applicable for a network. A Protocol defines standardized formats for data packets, techniques for detecting and correcting errors and so on.

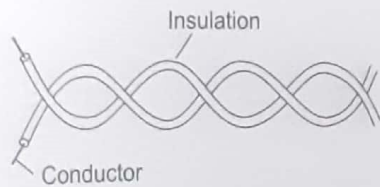
Thus for effective use of a network it must follow some standardized protocols. There are various protocols that are used in various types of networks. For example, TCP/IP (Transmission Control Protocol/Internet Protocol) etc. TCP/IP is the native protocol of internet, HTTP, HTTPs, IMAP, POP etc.

262. *What are the various physical media used for the data transmission in a network system ?*

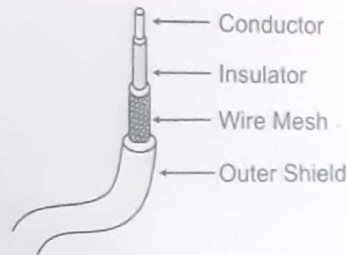
[CBSE QB 98]

Ans. The various physical media used for data transmission in a network system as follows :

Twisted Pair Cable. The most common form of wiring in data communication application is the twisted pair cable. As a *voice grade medium* (VGM), it is the basis for most internal office telephone wiring. It consists of two identical wires wrapped together in a double helix. The main advantages of twisted pair cable are its simplicity and ease of installation. It is physical flexible, has a low weight and can be easily connected.



Twisted pair cable



Coaxial cable

Coaxial Cable. This type of cable consists of a solid wire core surrounded by one or more foil or wire shields, each separated by some kind of plastic insulator. The inner core carries the signal, and the shield provides the ground. While it is less popular than twisted pair, it is widely used for television signals. In the form of (CATV) cable, it provides a cheap means of transporting multi-channel television signals around metropolitan areas. It is also used by large corporations in building security systems.

Optical Fibers. Optical fibers consist of thin strands of glass or glass like material which are so constructed that they carry light from a source at one end of the fiber to a detector at the other end. The light sources used are either light emitting diodes (LEDs) or laser diodes (LDs). The data to be transmitted is modulated onto the light beam using frequency modulation techniques. The signals can then be picked up at the receiving end and demodulated. The band width of the medium is potentially very high. For LEDs, this ranges between 20 and 150 mbps and higher rates are possible using LDs.

The main advantages of optical fibres over other media is their complete immunity to noise, because the information is travelling on a modulated light beam.

263. What is the Geographical scope of LAN, MAN and WAN ? [CBSE QB 98]

Ans. LAN (local area network), it is confined to relatively small areas such as a building or a group of buildings, for example a university campus. WAN (wide area network), this network spans a large area—possibly several continents. (e.g., the Internet)

MAN (metropolitan area networks), it is between LAN and WAN i.e., spanning a small city or town., i.e., upto tens of kilometers.

264. What are the facilities provided by the SERVER in a Network environment ? [CBSE QB 98]

Ans. In a network, sometimes all the sharable stuff, (like files, data, software etc.) is stored on the server. Network can have more than one server also. Each server has the unique name and provides different facilities.

For example, the server exclusively working for serving files-related requests like storing files, deciding about their access privileges and regulating the amount of space

allowed for each user etc., is known as *file server*. Similarly, there may be *printer server* and *modem server*. The *printer server* takes care of the printing requirements of a number of workstations and the *modem server* helps a group of network users use a modem to transmit long distance messages.

265. *What are hubs ? How are active hubs different from passive hubs ?*

Or

What is a hub ? What are its types ?

Ans. A hub is a hardware device used to connect several computers together.

Basically, hubs are multi-slot concentrators into which a number of multi-port cards can be plugged to provide additional access as the network grows in size. Hubs simply broadcast the message to all its connected devices. Hubs can be either *passive* or *active*.

- **Active hubs** electrically amplify the signal as it moves from one connected device to another. Active concentrators are used like *repeaters* to extend the length of a network.
- **Passive hubs** allow the signal to pass from one computer to another without any change.

266. *When would you opt for a router in a network ?*

Ans. Router is one of the smartest network devices. It can filter network traffic and determine the most efficient route for a data packet to travel. It does not broadcast data frames and keeps the traffic moving even in the case of a link failure (through other connected routes). Thus when we want to keep the network traffic moving through most efficient paths we shall go for routers.

267. *Define Error detection and correction.*

Ans.

Error Detection :

Data can be corrupted during transmission. It is called as an error. For reliable communication, the receiver must find out the errors occurred in the data which is called as error detection.

Error Correction :

It is the mechanism to correct the errors and it can be handled in *two* ways :

- (a) When an error is discovered, the receiver can have the sender retransmit the entire data unit.
- (b) A receiver can use an error correcting coder, which automatically corrects certain error.

268. *What is the use of two dimensional parity in error detection?*

Ans. Unlike one-dimensional parity check which can detect single-bit errors, two-dimensional parity check is more efficient. Two-dimensional parity check increases the likelihood of detecting burst errors. It is used to detect errors occurred in more than one bits.

269. *Mention the types of errors that may occur in data transmission.*

Ans. There are two types of errors

- (a) Single-bit error
- (b) Burst-bit error

270. Explain the two types of errors that occur while transmitting data.

Ans. Single bit error: The term single bit error means that only one bit of a given data unit (such as byte character/data unit or packet) is changed from 1 to 0 or from 0 to 1.

Burst error : It means that 2 or more bits in the data unit have changed from 1 to 0 from 0 to 1.

271. What are the functions of bridge?

Ans. Common functions of bridges are :

- (i) Connecting networks
- (ii) Filtering information so that network traffic for one portion of the network does not congest the rest of the network.

272. What are the metrics used in determining the best path for a routing protocol?

Ans. Common metrics used in routing tables for determining the best path for routing are :

- Bandwidth
- Delay
- Load
- Reliability
- Cost
- Hop count
- MTU
- Ticks

273. What are the four main properties of HTTP ?

Ans.

- Global Uniform Resource Identifier
- Request response exchange
- Statelessness.
- Resource meta data

274. What is SMTP used for ?

Ans. SMTP is used when email is delivered from an email client, such as Outlook Express, to an email server or when email is delivered from one email server to another.

275. What are the basic functions of email ?

Ans. Electronic mail on Internet involves these functions: Composition, Transfer, Reporting, Displaying and Disposition of mails.

276. What is simple mail transfer protocol ?

Ans. The TCP/IP protocol that supports electronic mail on the internet is called **Simple Mail Transfer Protocol (SMTP)**. It is a system for sending messages to other computer users based on email addresses.

277. What are the types of messages in HTTP transaction ?

Ans. The types of messages in HTTP transaction are :

- Request messages
- Response messages

278. What is the function of SMTP ?

Ans. The protocol that supports electronic mail on the Internet is called Simple Mail Transfer (SMTP). It is a system for sending messages to other computer users based on email addresses. SMTP provides mail exchange between users on the same or different computers.

279. How does MIME enhance SMTP ?

Ans. MIME is a supplementary protocol that allows non-ASCII data to be sent through SMTP.

MIME transforms non-ASCII data at the sender site to NVT ASCII data and delivers it to the client SMTP to be sent through the Internet. The server SMTP at the receiving side receives the NVT ASCII data and delivers it to MIME to be transforming feed back to the original data.

280. Why is an application such as POP needed for electronic messaging ?

Ans. Workstations interact with the SMTP host, which receives the mail on behalf of every host in the organization, to retrieve messages by using a client-server protocol such as Post Office Protocol, version 3 (POP3). Although POP3 is used to download messages from the server, the SMTP client still needed on the desktop to forward messages from the workstation user to its SMTP mail server.

TYPE C

LONG ANSWER QUESTIONS

[3, 4 Marks]

281. Give an example of how 1 two-dimensional parity check detects error in the received data ?

Ans. Two-dimensional parity can detect all 1 and 2 bit errors, and recover from all 1 bit errors. The data bits are arranged in a grid, and parity is computed for each row and column.

For example,

```

1 0 0 1 | 0
1 1 0 0 | 0
0 1 1 0 | 0
0 1 1 1 | 1
-----+-----
0 1 0 0 | 0

```

A single bit error will cause a parity violation in exactly one row and one column. The intersection of that row and column must contain the incorrect bit :

```

1 0 0 1 | 0
1 1 0 0 | 0
0 1 0 0 | 0 ← does not match
0 1 1 1 | 1
-----+-----
0 1 0 0 | 0
      ↑
    does not match

```

A two bit error will cause parity violations in either :

- two rows and two columns
- two rows (if the errors occur in the same column)
- two columns (if the errors occur in the same row)

282. Consider the following data being transmitted where each data unit contains two bytes of data :

```

11001111  10011100
10100100  00111011
01100100  01101010
10100011  00010010
11010001  01001101
    
```

Considering even parity, determine how the data will be transmitted along with two-dimensional parities.

Ans. Considering two-dimensional even parity, the data will be sent as shown below :

```

11001111  10011100  0
10100100  00111011  0
01100100  01101010  1
10100011  00010010  0
11010001  01001101  0
01111101  10010010  1
    
```

283. With a two-dimensional even parity check employed, following data is received. The data contains some errors. Can you pinpoint the erroneous bit ?

```

11001111  10011100  0
10100100  00111011  0
01100100  01100010  1
10100011  00010010  0
11010001  01001101  0
01111101  10010010  1
    
```

Ans. Upon recalculating the parity bits from the received data

```

11001111 10011100 0 0
10100100 00111011 0 0
01100100 01100010 1 1
10100011 00010010 0 0
11010001 01001101 0 0
01111101 10011010 0 0
01111101 10010010 1 1
    
```

The intersecting bit is erroneous bit

ERROR

284. Consider following data units that are to be transmitted along with checksum information.

```

1000 0110 0101 1110
1010 1100 0110 0000
0111 0001 0010 1010
1000 0001 1011 0101
    
```

In what form will the data be transmitted ?

Ans. In order to calculate the checksum, the data units are to be added using 1's complement where the overflow bit is to be added back to the sum.

| | |
|--------------------|-------|
| Block A to Block D | 170 m |
| Block B to Block D | 125 m |
| Block A to Block C | 90 m |

Number of Computers

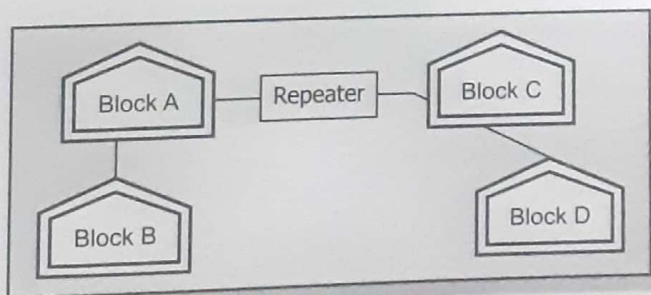
| | |
|---------|-----|
| Block A | 25 |
| Block B | 50 |
| Block C | 125 |
| Block D | 10 |

- (i) What type of network will be formed if all blocks are connected.
- (ii) Suggest the most suitable place (i.e., block) to house the server of this organisation with a suitable reason.
- (iii) Suggest the placement of the following devices with justification
 - (a) Repeater
 - (b) Hub/Switch
- (iv) The organization is planning to link its front office situated in the city in a hilly region where cable connection is not feasible, suggest an economic way to connect it with reasonably high speed.

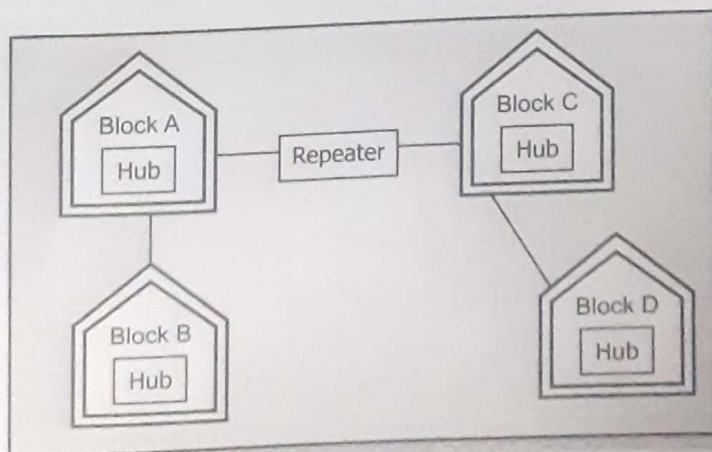
Ans. (i) LAN

(ii) Block C. The most suitable place/block to house the server of this organisation would be Block C, as this block contains the maximum number of computers, thus decreasing the cabling cost for most of the computers as well as increasing the efficiency of the maximum computers in the network.

(iii) (a)

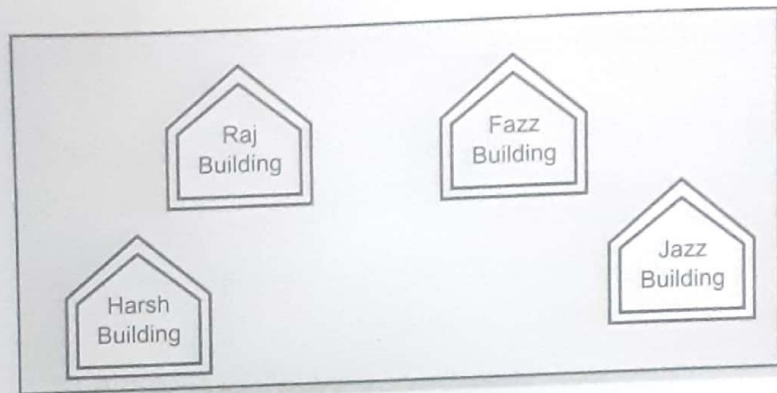


(b) In both the layouts, a hub/switch each would be needed in all the blocks, to interconnect the group of cables from the different computers in each block.



- (iv) The most economic way to connect it with a reasonable high speed would be to use radiowave transmission, as they are easy to install, can travel long distances and penetrate buildings easily, so they are widely used for communication, both indoors and outdoors. Radiowaves also have the advantage of being omnidirectional, which is they can travel in all the directions from the source, so that the transmitter and receiver do not have to be carefully aligned physically.

286. Ravya Industries has set up its new center at Kaka Nagar for its office and web based activities. The company compound has 4 buildings as shown in the diagram below :



[CBSE SP II, 12]

Center to center distances between various building is as follows :

| | |
|---------------------------------|-------|
| Harsh Building to Raj Building | 50 m |
| Raj Building to Fazz Building | 60 m |
| Fazz Building to Jazz Building | 25 m |
| Jazz Building to Harsh Building | 170 m |
| Harsh Building to Fazz Building | 125 m |
| Raj Building to Jazz Building | 90 m |

Number of Computers in each of the buildings is as follows :

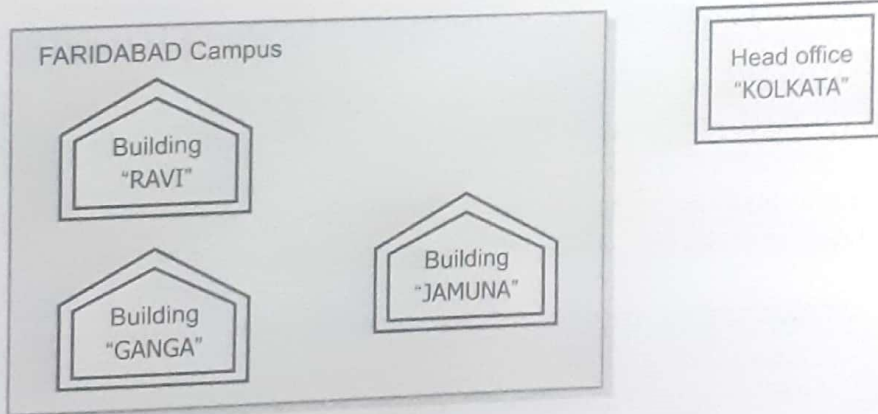
| | |
|----------------|-----|
| Harsh Building | 15 |
| Raj Building | 150 |
| Fazz Building | 15 |
| Jazz Building | 25 |

- (i) Suggest the most suitable place (i.e., building) to house the server of this organisation with a suitable reason.
- (ii) Suggest the placement of the following devices with justification :
 - (a) Internet Connecting Device/Modem
 - (b) Switch
- (iii) The organisation is planning to link its sale counter situated in various parts of the same city, which type of network out of LAN, MAN or WAN will be formed ? Justify your answer.

Ans.

- (i) The most suitable place/block to house the server of this organisation would be Raj Building, as this block contains the maximum number of computers, thus decreasing the cabling cost for most of the computers as well as increasing the efficiency of the maximum computers in the network.
- (ii) (a) Raj Building since it contains largest number of computers.
 (b) In the suggested layout, a hub/switch each would be needed in all the buildings, to interconnect the group of cables from the different computers in each block.
- (iii) The type of network that shall be formed to link the sale counters situated in various parts of the same city would be a MAN, because MAN (Metropolitan Area Networks) are the networks that link computer facilities within a city.

287. Granuda Consultants are setting up a secured network for their office campus at Faridabad for their day to day office and web-based activities. They are planning to have connectivity between 3 buildings and the head office situated in Kolkata. Answer the questions (i) to (iv) after going through the building positions in the campus and other details, which are given below : [CBSE D 12]



Distances between various buildings :

| | |
|---------------------------------------|---------|
| Building "RAVI" to Building "JAMUNA" | 120 m |
| Building "RAVI" to Building "GANGA" | 50 m |
| Building "GANGA" to Building "JAMUNA" | 65 m |
| Faridabad Campus to Head Office | 1460 KM |

Number of Computers

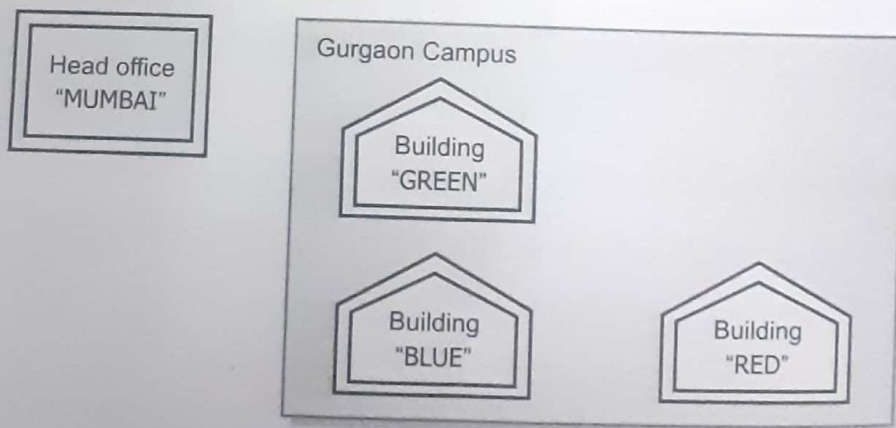
| | |
|-------------------|-----|
| Building "RAVI" | 25 |
| Building "JAMUNA" | 150 |
| Building "GANGA" | 51 |
| Head Office | 10 |

- (i) Suggest the most suitable place (i.e., block) to house the server of this organization. Also give a reason to justify your suggested location.

- (ii) What type of network will be formed if all buildings are connected ?
- (iii) Suggest the placement of the following devices with justification :
 (a) Switch (b) Repeater
- (iv) The organization is planning to provide a high speed link with its head office situated in the KOLKATA using a wired connection. Which of the following cables will be most suitable for this job ?
 (a) Optical Fibre (b) Co-axial Cable (c) Ethernet Cable

Ans.

- (i) Building Jamuna. As most computers are situated in this building and as per 80:20 rule of networking, maximum traffic should be local traffic. So server should be in building with maximum computers, i.e., building Jamuna
- (ii) WAN
- (iii) (a) Switches are needed in every building as they help share bandwidth in every building.
 (b) Repeaters may be skipped as per above layout, (because distance is less than 100 m) however if building RAVI and building JAMUNA are directly connected, we can place a repeater there as the distance between these two buildings is more than 100 m.
- (iv) (a) Optical Fiber
288. Workalot Consultants are setting up a secured network for their office campus at Gurgaon for their day-to-day office and web-based activities. They are planning to have connectivity between 3 buildings and the head office situated in Mumbai. Answer the questions (i) to (iv) after going through the building positions in the campus and other details, which are given below : [CBSE OD 12]



Distances between various buildings :

| | |
|-------------------------------------|---------|
| Building "GREEN" to Building "RED" | 110 m |
| Building "GREEN" to Building "BLUE" | 45 m |
| Building "BLUE" to Building "RED" | 65 m |
| Gurgaon Campus to Head Office | 1760 KM |

Number of Computers :

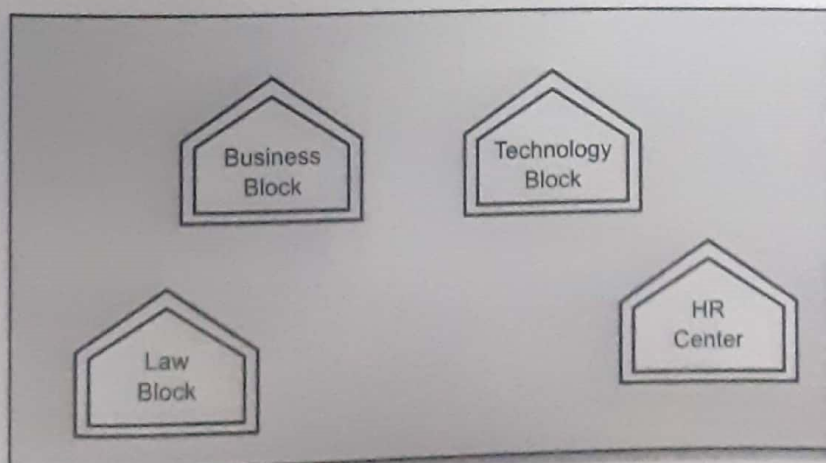
| | |
|------------------|-----|
| Building "GREEN" | 32 |
| Building "RED" | 150 |
| Building "BLUE" | 45 |
| Head Office | 10 |

- (i) Suggest the most suitable place (i.e., building) to house the server of this organization. Also give a reason to justify your suggested location.
- (ii) Suggest a connection medium to connect Ganga office with Headoffice.
- (iii) Suggest the placement of the following devices with justification :
 - (a) Switch
 - (b) Repeater
- (iv) The organization is planning to provide a high speed link with its head office situated in MUMBAI using a wired connection. Which of the following cables will be most suitable for this job ?
 - (a) Optical Fibre
 - (b) Co-axial Cable
 - (c) Ethernet Cable

Ans.

- (i) In building RED as it houses maximum number of computer ; hence most traffic will be local traffic if server is placed here.
- (ii) Any unguided medium e.g., Satellite.
- (iii) (a) Switches are needed in every building as they help share bandwidth in every building.
 - (b) Repeaters may be skipped as per above layout, (because distance is less than 100 m) however if building Green and building Red are directly connected, we can place a repeater there as the distance between these two buildings is more than 100 m.
- (iv) (a) Optical Fibre

289. Quick Learn University is setting up its Academic blocks at Prayag Nagar and planning to set up a network. The university has 3 academic blocks and one Human Resource Center as shown in the diagram below : [CBSE D 11]



Center to center distances between various blocks/center is as follows :

| | |
|------------------------------------|-------|
| Law Block to Business Block | 40 m |
| Law Block to Technology Block | 80 m |
| Law Block to HR Center | 105 m |
| Business Block to Technology Block | 30 m |
| Business Block to HR Center | 35 m |
| Technology Block to HR Center | 15 m |

Number of Computers in each of the Blocks/Center is as follows :

| | |
|------------------|-----|
| Law Block | 15 |
| Technology Block | 40 |
| HR Center | 115 |
| Business Block | 25 |

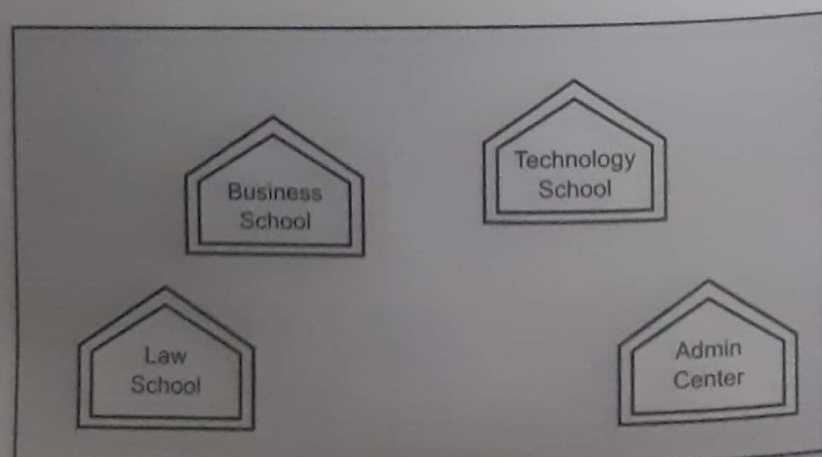
- (i) Suggest the most suitable place (i.e., Block/Center) to install the server of this university with a suitable reason.
- (ii) What type of network will be formed if all these blocks are connected ?
- (iii) Which device you will suggest to be placed/installed in each of these blocks/center to efficiently connect all the computers with in these blocks/center ?
- (iv) The university is planning to connect its admission office in the closest big city, which is more than 250 km from university, which type of network out of LAN, MAN or WAN will be formed ? Justify your answer.

Ans.

- (i) HR Centre because it has the most number of computers.
- (ii) LAN
- (iii) Switch
- (iv) WAN because LAN and MAN cannot cover 250 km.

290. Great Studies University is setting up its Academic schools at Sunder Nagar and planning to set up a network. The university has 3 academic schools and one administration center as shown in the diagram below :

[CBSE OD 11]



Center to center distances between various buildings is as follows :

| | |
|--------------------------------------|-------|
| Law School to Business School | 60 m |
| Law School to Technology School | 90 m |
| Law School to Admin Center | 115 m |
| Business School to Technology School | 40 m |
| Business School to Admin Center | 45 m |
| Technology School to Admin Center | 25 m |

Number of Computers in each of the Schools/Center is as follows :

| | |
|-------------------|-----|
| Law School | 25 |
| Technology School | 50 |
| Admin Center | 125 |
| Business School | 35 |

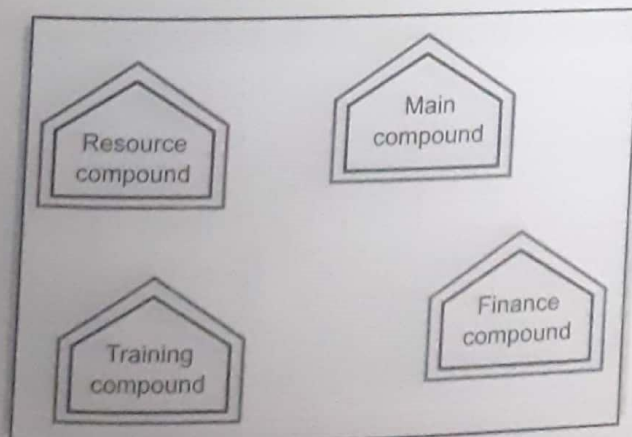
- Suggest the most suitable place (i.e., Schools/Center) to install the server of this university with a suitable reason.
- Suggest the most efficient connecting medium for connecting these Schools/center for wired connectivity.
- Which device you will suggest to be placed/installed in each of these Schools/center to **efficiently** connect all the computers within these Schools/center ?
- The university is planning to connect its admission office in the closest big city, which is more than 350 km from the university. Which type of network out of LAN, MAN or WAN will be formed ? Justify your answer.

Ans.

- Admin Center because it contains maximum number of computers (using 80-20 rule).
- Fibre optic cable
- Switch
- WAN because LAN and MAN cannot span more than 100 km.

291. "Learn Together" is an educational NGO. It is setting up its new campus at Jabalpur for its web based activities. The campus has 4 compounds as shown in the diagram below :

[CBSE D 10]



Center to center distances between various Compounds as per architectural drawings (in Metre) is as follows :

| | |
|--|-------|
| Main Compound to Resource Compound | 110 m |
| Main Compound to Training Compound | 115 m |
| Main Compound to Finance Compound | 35 m |
| Resource Compound to Training Compound | 25 m |
| Resource Compound to Finance Compound | 135 m |
| Training Compound to Finance Compound | 100 m |

Expected Number of Computers in each Compound is as follows :

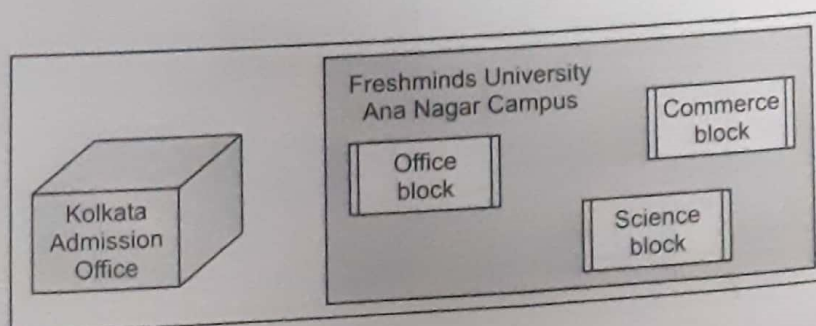
| | |
|-------------------|-----|
| Main Compound | 5 |
| Resource Compound | 15 |
| Training Compound | 150 |
| Accounts Compound | 20 |

- (i) Suggest the most suitable place (i.e., compound) to house the server for this NGO. Also provide a suitable reason for your suggestion.
- (ii) Suggest the placement of the following devices with justification :
- (a) Repeater (b) Hub/Switch
- (iii) The NGO is planning to connect its International office situated in Mumbai, which out of the following wired communication link, you will suggest for a very high speed connectivity ?
- (a) Telephone Analog Line (b) Optical Fiber (c) Ethernet Cable

Ans.

- (i) Training compound as it hosts most computers.
- (ii) (a) **Repeater**. As per one layout (shown in (i)), the repeater can be avoided as all distances between the compounds are ≤ 100 m.
- (b) **Hub/Switch**. Training compound as it is hosting the server.
- (iii) (b) Optical Fibre.

292. Freshminds University of India is starting its first campus in Ana Nagar of South India with its center admission office in Kolkata. The university has 3 major blocks comprising of Office Block, Science Block and Commerce Block in the 5 km area Campus.



[CBSE D 09]

As a network expert, you need to suggest the network plan as per (i) to (iv) to the authorities keeping in mind the distance and other given parameters.

Expected Wire distances between various locations :

| | |
|--|---------|
| Office Block to Science Block | 90 m |
| Office Block to Commerce Block | 80 m |
| Science Block to Commerce Block | 15 m |
| Kolkata Admission office to Ana Nagar Campus | 2450 km |

Expected number of Computers to be installed at various locations in the University are as follows :

| | |
|--------------------------|-----|
| Office Block | 10 |
| Science Block | 140 |
| Commerce Block | 30 |
| Kolkata Admission office | 8 |

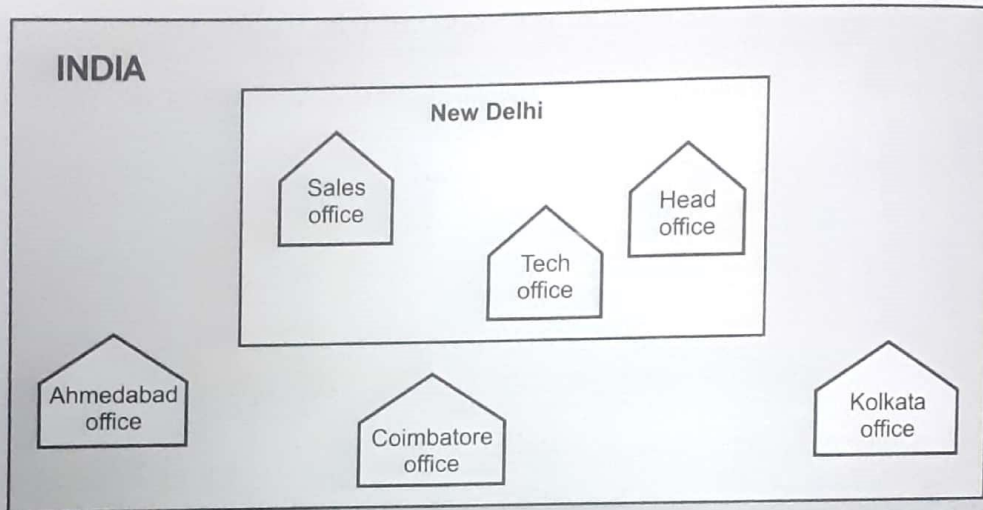
- (i) What type of server should be installed in university ?
- Dedicated
 - Non-dedicated
- (ii) Suggest the most suitable place (i.e., block) to house the server of this university with a suitable reason.
- (iii) Suggest an efficient device from the following to be installed in each of the blocks to connect all the computers :
- MODEM
 - SWITCH
 - GATEWAY
- (iv) Suggest the most suitable (very high speed) service to provide data connectivity between Admission Office located in Kolkata and the campus located in Ana Nagar from the following options :
- Telephone line
 - Fixed-Line Dial-up connection
 - Co-axial Cable Network
 - GSM
 - Leased line
 - Satellite Connection

Ans.

- (i) Dedicated server
- (ii) Science Block as it contains maximum number of computers.
- (iii) SWITCH
- (iv) Satellite Connection Or Leased line

293. "Hindustan Connecting World Association" is planning to start their offices in four major cities in India to provide regional IT infrastructure support in the field of Education & Culture. The company has planned to setup their head office in New Delhi in three locations and have named their New Delhi offices as "Sales Office", "Head Office" and "Tech Office". The company's regional offices are located in "Coimbatore", "Kolkata" and "Ahmedabad". [CBSE OD 07]

A rough layout of the same is as follows :



Approximate distance between these offices as per network survey team is as follows :

| Place From | Place To | Distance |
|-------------|-------------------|----------|
| Head Office | Sales Office | 10 KM |
| Head Office | Tech Office | 70 Meter |
| Head Office | Kolkata Office | 1291 KM |
| Head Office | Ahmedabad Office | 790 KM |
| Head Office | Coimbatore Office | 1952 KM |

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

| | |
|-------------------|-----|
| Head Office | 100 |
| Sales Office | 20 |
| Tech Office | 50 |
| Kolkata Office | 50 |
| Ahmedabad Office | 50 |
| Coimbatore Office | 50 |

- (i) Suggest network type (out of LAN, MAN, WAN) for connecting each of the following set of their offices :
- Head Office and Tech Office
 - Head Office and Coimbatore Office
- (ii) Which device you will suggest to be produced by the company for connecting all the computers with in each of their offices out of the following devices ?
- Switch/Hub
 - Modem
 - Telephone
- (iii) Which of the following communication media, you will suggest to be procured by the company for connecting their local offices in New Delhi for very effective and fast communication ?
- Telephone Cable
 - Optical Fibre
 - Ethernet Cable
- (iv) Suggest an effective method/technology for connecting the company's regional offices at "Kolkata", "Coimbatore" and "Ahmedabad".

Ans.

- (i) Head office and Tech. office — LAN
Head office and Coimbatore office — WAN
- (ii) Switch/Hub
- (iii) Optical fibre
- (iv) For local offices :
For connecting regional offices — SATELLITE is an efficient technology.