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Probable marks : 28

**Scope of the syllabus :-**

- Study of transmission media :  
Cable media-coaxial cable, Twisted pair, fibre optic, their comparison.  
Introduction to wireless media.
- Network topologies - Access methods, Topologies (BUS, RING, STAR), Ethernet, TOKEN RING.
- Protocols - Internet protocols
- Introduction to connectivity devices
- Modem, Hubs, Repeaters, Routers

**Study of transmission media**

**Q. 1** What is transmission media? Give transmission media characteristics.

(Oct. 07; July 18)

Ans. :

- (1) The pathways through which individual systems are connected in a network are called as transmission media.
- (2) Transmission media makes transmission of electronic signals possible from one computer to another. These electronic signals are nothing but binary pulses (I/O).
- (3) Each type of transmission media has special characteristics that make it suitable for a specific type of service.
- (4) The characteristics are :
  1. Cost of media
  2. Installation requirement
  3. Bandwidth
  4. Band usage (base band and broad band)
  5. Attenuation
  6. Immunity from electromagnetic interference.

(March 2019)

**Q. 2** What is Wireless Media ? Write any two advantages of Wireless Media.

(March 2017; July 2018)

Ans. : Wireless communication has extra ordinary convenience. Not all network are connected with cabling. Some network are wireless. The technology is expanding to offer better options for wireless network. There are three basic types of wireless network. 1. Wireless LAN 2. Extended LAN 3. Mobile computing.

**For Advantages of Wireless Media :** Please refer Chapter 5 Q. 3, Pg. No. 5-2.

Q.3 What is a Transmission Medium ? What are the advantages of wireless transmission ?  
(Oct. 2004; July 18)

Ans. : Transmission medium : Refer Q. No. 1.

Advantages of wireless medium :

- (1) High data rates by using large bandwidth.
- (2) Wireless medium can give transmission speed around 24 kbps.
- (3) By this media the communication can reach rural and hilly area.
- (4) Bandwidth for digital data 1 to 10 Mbps.

Q.4 Explain the following characteristics of transmission media.

(March 2002, 2008 Oct. 2005, Oct. 2006, 2010; July 2019)

- (a) Bandwidth      (b) Band usage      (c) Attenuation  
(d) Immunity from electromagnetic interference.

Ans. :

(a) Bandwidth :

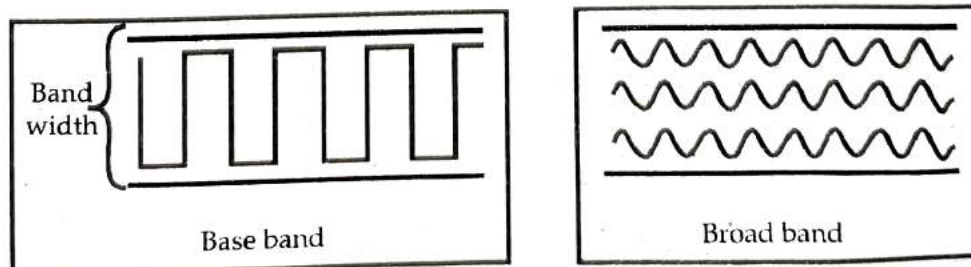
(March 2020)

- (1) Bandwidth is the measure of the capacity of a medium to transmit data.
- (2) Data transmission rates is number of bits transmitted per second.
- (3) Bandwidth of a cable depends on cable length.
- (4) A short cable can have greater bandwidth than a long cable so for all cable designs, maximum lengths for cable runs are specified.
- (5) Beyond these limits the highest frequency signals can deteriorate and error occurs in data signals.

(b) Band usage :

(March 2009)

- (1) The bandwidth is shared so that maximum usage is obtained.
- (2) There are two transmission modes, base band and broad band transmissions.
- (3) Base band devotes the entire capacity of the medium to one communication channel.
- (4) Broad band enables two or more communication channels to share the bandwidth of communication medium.
- (5) Base band is most common mode of operation. Most local area networks (LAN) function in base band mode. In base band, signaling can be analog or digital.
- (6) The base band and broad band transmission modes are shown in following figure :-



(c) Attenuation :

(March 2009, 2020, Oct. 2005)

- (1) Attenuation is a measure of how much a signal weakens as it travels through a medium.

- (2) As signals pass through the medium, part of the signal is absorbed and makes the signal weak.
- (3) Attenuation decides the cable length when signal strength falls below certain limits, then at receiving station noise may appear.
- (4) Repeaters are used to regenerate signals.
- (d) **Immunity from electromagnetic interference (EMI) :** (March 2009, Oct. 2005, 2010)
- (1) Electromagnetic interference consist of outside electromagnetic noise that distorts the signal in a medium.
- (2) EMI is interfering the signals and makes difficult for computers to decode the signal.
- (3) An example of electromagnetic interference is the crosstalk. Crosstalk occurs when the signal from one wire is picked by another wire.
- (4) In computer networks, large number of cables are located close together, therefore crosstalk is a significant problem in networks.

**Q. 5 Explain the following characteristics of transmission media :**

(a) Cost (b) Installation requirements.

**Ans. :**

(a) **Cost of media :**

(Oct -2010)

- (1) One major factor in purchase decision of any networking component is its cost.
- (2) For a new fast technology, cost is also more expensive.
- (3) Decision depends upon application and standard of the resources.
- (4) Therefore, the network designer must settle for something, which is cheaper and robust.

(b) **Installation requirement :**

(March 2020)

- (1) Some transmission media requires skilled labour to install. This increases cost of network and it may cause certain delay.
- (2) Before installation we need to prepare actual physical layout of network.

**Q. 6 Explain in short the six important characteristics of transmission media.**

(March 2004, 20, Oct -2010; July 18)

**Ans. :** Each type of transmission media has special characteristics that make it suitable for a specific type of service. The characteristics are :

- i) Cost of media
- ii) Installation requirement
- iii) Bandwidth
- iv) Band usage
- v) Attenuation
- vi) Immunity from electromagnetic interference.

**i) Cost of media :**

- (a) While designing a network, the cost of media must be considered.
- (b) The cost property is decided by user as per application and standard of resources.

**ii) Installation requirement :**

- (a) Before installation, prepare actual physical layout of network and then estimate cable and cost of installation.
- (b) For almost all media, the cost of installation exceeds than the cost of the cable itself.

**iii) Bandwidth :**

- (a) Bandwidth is the measure of the capacity of a medium to transmit data.
- (b) Bandwidth of a cable depends on cable length.

**iv) Band usage :**

- (a) In baseband transmission mode, baseband devotes the entire capacity of the medium to one communication channel.
- (b) In broadband transmission mode, broadband enables two or more communication channels to share the bandwidth of communication medium.

**v) Attenuation :**

- (a) Attenuation is a measure of how much a signal weakens as it travels through a medium.
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**vi) Immunity from electromagnetic interference (EMI) :****(March 2020)**

- (a) Electromagnetic interference consist of outside electromagnetic noise that distorts the signal in a medium.
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**Q.7 What are the advantages of computer networks ? Distinguish between LAN and WAN ?**

**(March 2003, 06, 11, 19, Oct. 2005, July 17, 18)****Ans. :**

- (1) Computer network is an interconnected collection of autonomous computers or system of computers capable of sharing resources controlling services.
- (2) The main advantages of computer network are :
  - a) Network provides resource sharing.
  - b) It provides exchange of information and software.
  - c) It provides high reliability by using other machine if one machine fails in the network like military banking, air and traffic control.
  - d) Access to any file and data.
  - e) Finally the system is saving money by network only.

**ii) Installation requirement :**

- (a) Before installation, prepare actual physical layout of network and then estimate cable and cost of installation.
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  - d) Access to any file and data.
  - e) Finally the system is saving money by network only.

(3) The differences between WAN and LAN are as follows :

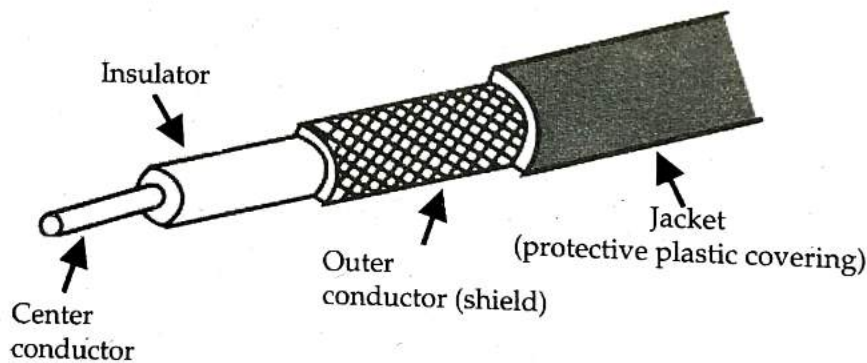
WAN	LAN
1. A WAN (Wide Area Network) is the interconnection of LAN or MAN can be located entirely within a state, country or around the world.	A LAN (Local Area Network) is a group of computers interconnected within a small area such as room, building or a campus.
2. Data transfer rate is comparatively slower such as in Kbits/sec. 10 million bits per second.	Data transfer speed is comparatively high such as thousand bits per second to
3. In WAN, links may be established by using telephone cable or microwave towers or satellite.	Co-axial cables are generally used to connect the computer and other devices.
4. In this network, shortcircuit errors, noise errors, atmospheric errors are higher than any other networks.	Due to short distance, short circuit errors or other noise errors are minimum.
5. For example : pager.	For example : A computer lab in a college.

Q. 8 Describe co-axial cable in detail. OR

Write a short note on Co-axial cable with suitable figure. (Mar. 2003, Oct. 2006, 2010)

Ans. :

- (1) In co-axial cable, there are two conductors sharing a common axis.
- (2) The co-axial cable is shown in following fig.



Co-axial cable

(3) The components of co-axial cable are as follows :

- (a) A center conductor is a solid copper wire or stranded wire.
- (b) An outer conductor form a tube surrounding the inner conductor. This conductor is made up of braided wires, metallic foil or both. The outer conductor is called as shield. This serves as a ground and protects inner conductor from EMI.
- (c) An insulator layer keeps outer conductor spaced evenly from the inner conductor.
- (d) A plastic jacket protects cable from damage.

- (4) There are two types of co-axial cables :
- Thin net (thin, flexible and inexpensive)
  - Thick net (thick, hard and expensive)

#### Advantages :

- The co-axial cable is better shielded than the twisted pair cable. So, it can span longer distance at higher data transmission speed.
- Its shielding provides better resistance to EMI.
- Attenuation is less than twisted pair cable

#### Disadvantages :

- It is relatively more expensive than Twisted Pair but less than fiber optic cable.
- Bandwidth capacity is comparatively less than fiber optic cable.

#### Q.9 Give the important characteristics of co-axial cable.

Ans. :

The important characteristics of co-axial cable are given below.

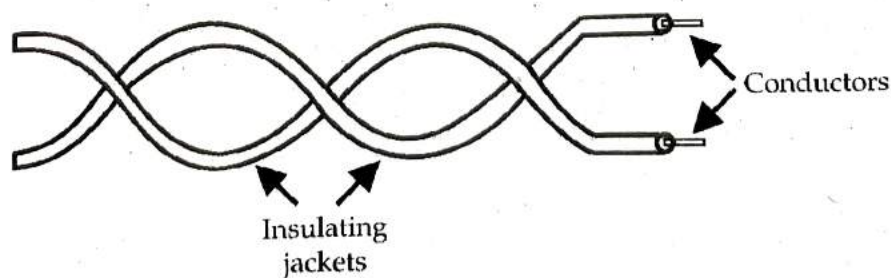
- Cost :** Thinnet cable is low cost cable, it costs less than STP. Thicknet cable more than STP.
- Installation :** Co-axial is easy to install. Installation of thinnet cable is also inexpensive.
- Capacity :** LANs based on co-axial cable gives bandwidth, in between 2.5 Mbps to 10 Mbps. Thicknet co-axial cable gives higher bandwidth.
- Attenuation :** Due to attenuation thinnet co-axial cable can transmit signal reliably upto 185 meters, where as thicknet cable can run upto 500 meters.
- EMI :** As co-axial cable consists of central copper conductor, it is sensitive to EMI, but shielding reduces its sensitivity to EMI. Co-axial cable is less sensitive to EMI than UTP cable.

#### Q.10 Explain Twisted pair cable in detail. OR Write a note on Twisted pair cable.

(March 2009, Oct. 2004)

Ans. :

- Twisted pair cable consist of two wires of conducting material like copper, insulated from each other by plastic.
- The basic Twisted pair cable is shown in fig.



Twisted pair cable



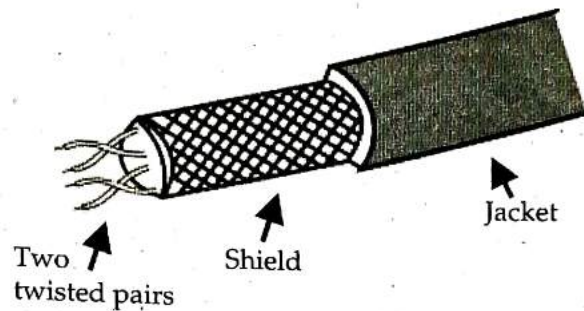
- (3) It consists of two or more strands of copper wire twisted together.
- (4) This twisting reduces the sensitivity of the cable to EMI (electromagnetic interference) and also reduces the tendency of the cable to radiate radio frequency noise.
- (5) This cable is used to connect a PC to either HUB or MAU. Also commonly used in telephone network.
- (6) Twisted pair cables are of two types :
  - (a) Shielded Twisted pair cable (STP)
  - (b) Unshielded Twisted pair cable (UTP)
- (a) Shielded Twisted pair (STP) :**
  - (i) Shielded Twisted pair cable consist of one or more twisted pairs of cables enclosed in a foil wrap and woven copper shielding.
  - (ii) The shield is connected to the ground portion of the electronic device to which cable is connected. Ground portion is electrical reference point.
  - (iii) A properly grounded shield prevents signals from getting into or out of the cable.
- (b) Unshielded Twisted pair (UTP) :**
  - (i) The unshielded Twisted pair does not have a braided shield into its structure. The characteristics of UTP are similar to that of STP.
  - (ii) Telephone systems commonly use UTP cable. In some networks UTP cable is used. UTP cable is available in 5 grades or categories.
- (7) Advantages :**
  - (i) This medium is inexpensive and easy to install.
  - (ii) Since wires are twisted, it reduces EMI and also avoids RF radiation.
  - (iii) Twisted wires also reduce cross talk.
- (8) Disadvantages :**
  - (i) They can be used only for short distance communication.
  - (ii) The typical speed of computer data is 1200 bits/seconds (bps).

**Q. 11 Write a note an shielded twisted pair cable with its characteristics.**

**Ans. :**

- (1) Shielded Twisted pair cable consist of one or more twisted pairs of cables enclosed in a foil wrap and woven copper shielding.

- (2) Following fig. shows IBM type 1 of shielded twisted pair cable :



- (3) The shield is connected to the ground portion of the electronic device to which cable is connected. Ground portion is electrical reference point.
- (4) A properly grounded shield prevents signals from getting into or out of the cable.
- (5) The characteristics of shielded Twisted pair cable are given below :
- (i) **Cost** : The cost of STP cable is more than that of co-axial or UTP cable. Its cost is less than that of thick co-axial or fibre optic cable.
  - (ii) **Installation** : The installations required for STP cable depends upon the type of network. As per the type of network, different connectors are used.
  - (iii) **Capacity** : STP cable has a theoretical capacity of 500 MBPS. Practically it is around 155 MBPS with 100 meter cable run. The most common data rate for STP cable is 16 MBPS.
  - (iv) **Attenuation** : All Twisted pair cables have attenuations. This limits the length of cable. 100 meter limit is most common.
  - (v) **EMI characteristics** : The shield in STP cable results in good EMI characteristics. STP cable has low sensitivity towards electromagnetic interference.

**Q. 12 Write a short note on unshielded twisted pair cable with its characteristics.**

**(Mar. 2002)**

**Ans. :**

- (1) UTP consists of a number of twisted pair with plastic jacket.
- (2) It is commonly used in telephone systems. Now-a-days UTP cable is being used in LAN instead of co-axial cable.
- (3) A UTP cable is shown in following figure :



- (4) The characteristics of Unshielded Twisted pair cable are given below:
- (i) **Cost** : UTP cable is cheaper than any other cable. The cost of category 5 twisted pair cable is high.
  - (ii) **Installation** : UTP cable is easy to install. The equipments required are also low cost. UTP system can be easily reconfigured.

- (7) The fibre optic cable is used in optical transmission system.
- (8) This cable have extremely high bandwidth. It has zero sensitivity to EMI and runs over several kilometers.
- (9) The characteristics of fibre optic cable are given below :
- (i) **Cost** : The cost of fibre optic cable is more than that of co-axial cable and Twisted pair cable.
  - (ii) **Installation** : Fibre optic cable requires skilled installation. Every cable has minimum bend radius. They may get damaged if bent sharply Fibre optic cable can not be stretched.
  - (iii) **Capacity** : Fibre optic cable supports high data rates (upto 2,00,000 MBPS), even with long run cables. Fibre optic cable can transmit 100 MBPS for several kilometer.
  - (iv) **Attenuation** : Attenuation for fibre optic cable is much lower than co-axial cable and twisted pair cable. It can run to larger distance.
  - (v) **EMI** : Fibre optic cable does not use electrical signals to transmit data, therefore they are free from EMI. The data transfer in fibre optic cable have high security, as it can not be detected by electronic wave dropping equipments.

**Q.15 Compare any four attributes of UTP and Optical Fibre Cable.**

**(March 04, 09 Oct. 06, 07, 08, 2011; July 17)**

Ans. :

	UTP	Optical Fibre Cable
(1) Cost	Cost of UTP cable is less than that of optical fibre cable.	Optical fibre cable are expensive.
(2) Installation	Installation of UTP cable is easy.	Optical fibre cable requires skilled
(3) Capacity	Data rate capacity is from 1 to 100 MBPS upto 100 mtrs.	Optical fibre cable can transmit 100 MBPS for several kilometers.
(4) EMI	More sensitive to EMI.	This cable has no sensitivity to EMI.
(5) Attenuation	Attenuation is more than optical fibre cable.	In optical fibre cable attenuation is very less.

**Q.16 Compare the characteristics of fibre optic cable and co-axial cable. Mention at least three points. (March 2002, Oct. 2005)**

Ans. :

- 1) **Cost** : Cost of co-axial cable is less than that of fibre optic cable. Fibre optic cables are expensive.
- 2) **Installation** : Installation of co-axial cable is cheaper and easier than that of fibre optic cable.
- 3) **Capacity** : In general data transmission capacity of co-axial cable is 10 MBPS, while that of fibre optic cable is 100 MBPS.

- 4) **EMI** : Co-axial cable is less sensitive to EMI, while fibre optic cable has no sensitivity to EMI.
- 5) **Attenuation** : It is more in co-axial cable. In optic fibre, attenuation is very less.

**Q. 17** Compare the co-axial cable with Twisted pair cable. Mention atleast three points. (Oct. 2003, 2010, March 2005)

**Ans. :**

	Twisted Pair Cable	Coaxial Cable
(1)	It consists of a pair of wires or one or more pairs of two twisted copper wires insulation.	It is a hallow cable with a solid copper at the center of the cable surrounded by plastic from
(2)	This is inexpensive medium.	Relatively expensive i.e. twice or thrice than twisted pair.
(3)	EMI effect is maximum.	EMI effect is minimum.
(4)	Attenuation is more than coaxial cable.	Attenuation is less than twisted pair cable.
(5)	Bandwidth capacity is from 1 to 100 Mbps upto 100 mtrs.	Bandwidth capacity is from 500 Mbps upto 100 mtrs.
(6)	They can be used only for short distance communication.	It is commonly used in network.

**Q. 18** Compare the characteristics of Fiber-Optic and Co-axial Cable. Mention at least three points. (March 2008; July 18)

**Ans :**

Fiber-Optic	Co-axial Cable
i) This Cable has no sensitivity to EMI	i) EMI effect is minimum
ii) Optical fibre cable can transmit 100mbps for several kilometers.	ii) Bandwidth capacity is form 500 mbps upto 100 mbps
iii) Optical fibre are expansive.	iii) Co-axial cable are less expensive.

**Q. 19** Compare any four attributes of Coaxial thicknet Cable with UTP cable. (June 2016)

**Ans. :**

Coaxial Thicket cable	UTP Cable
1. More expensive.	1. Less expensive.
2. Difficult to install.	2. Easy to install.
3. Bandwidth upto 500 meters	3. Bandwidth upto 100 meters:
4. Attention less.	4. Attention more.
5. Less sensitive to EMI.	5. More sensitive to EMI.
6. Used in LAN.	6. Used in telephone system

**Q. 20 Explain the following wireless media in detail. OR State and explain different networking media. Explain any two wireless media. (Oct. 2005)**

**Ans. :**

**(I) Radio waves :**

- (1) Radio waves are easy to generate. They can travel long distance and can penetrate buildings easily. Hence, radio waves are widely used for both indoor and outdoor purposes.
- (2) Radiowaves are omnidirectional i.e. the waves travel in all directions, in the free space so that there is no need to place the receiver or transmitter along a direct line of sight.
- (3) Radio wave communication have variety of frequency ranges that are utilised for various communication applications.
- (4) As radiowaves covers large distance, interfare between users is a problem. For this reason government license is necessary to transmit radiowaves.
- (5) Radio communication having major drawback that it may be disturbed by rains, bounce back from obstacles. It offers low bandwidth for data communication.

**(II) Microwaves :**

- (1) Microwaves travels in straight lines and therefore narrowly focused, concentrating all the energy into beam.
- (2) For microwaves transmitting and receiving antennas should be accurately alligned. This directionality allows multiple transmitters linear in a row to communicate with multiple receivers linear in a row without interference.
- (3) Since, microwaves travels in straight lines, for longer distances periodic repeaters are necessary.
- (4) Unlike radiowaves, at lower frequency microwaves can not penetrate buildings.

**(III) Infrared and millimeter waves :**

- (1) Unguided infrared and millimeter waves are widely used for short range communication.
- (2) The remote controls used on television, V.C.Rs. etc. all used infrared communication.
- (3) They are relatively directional, cheap and easy to generate. Major drawback of these waves is that they can not pass through solid objects.
- (4) As infrared waves can not pass through solid objects, it means that an infrared system operating in one room will not interfare with other infrared system operating in adjacent room or any other room. For this reason, no government license is necessary to operate infrared system.

**Q. 21 State four LAN wireless transmission methods. Explain any two of them. (Oct. 2003)**

**Ans. :** Wireless LAN can use one of the transmission method :

- |                           |                |
|---------------------------|----------------|
| (i) Infrared              | (ii) Laser     |
| (iii) Narrow – band radio | (iv) Microwave |

- (i) **Infrared :**
- In infrared transmission infrared rays are used.
  - This is limited within 100 feet.
  - Upto 10 Mbps bandwidth can be supported.
  - Remote control of TV uses infrared transmission.
- (ii) **Laser :**
- In laser transmission LASER rays are used.
  - This receiver and transmitter are in straight of sight.
  - This can be used for LAN and WAN transmission.
- (iii) **Narrow-band radio :**
- In narrow-band radio transmission, a single frequency is used for transmission.
  - The receiver and transmitter need not to put along a direct line of sight.
  - The range of narrow band is greater than infrared.
- (iv) **Microwave :**
- Microwave communication can take two forms : Terrestrial links and satellite links.
  - In terrestrial microwave communication the transmitter and receiver are earth based.
  - Telephone relay towers uses this type of communication.
  - In satellite microwave system, satellite are 22300 miles above the earth
  - Earth stations uses satellite dishes to communicate with satellite.

[Note : Explain any two types]

### Network topologies

**Q. 22** What do you mean by network topology ? Explain in brief the two basic categories of topology.

(March 2004, Oct. 2009, March 2020)

**Ans. :**

- Topology refers to the way in which network of computers is connected.
- A topology defines the arrangement of nodes, cables and connectivity devices that make up the network.
- There are two categories :
  - Physical topology
  - Logical topology
- Physical topology describes actual layout of the network transmission media. It defines the way the network looks.
- Logical topology describes the logical pathway a signal follows as it passes among the network nodes. It defines the data passes among the nodes.

(6) Physical and logical topologies can take several forms.

The most common are :

- (a) Bus topologies                      (b) Ring topologies  
(c) Star topologies                    (d) Mesh topologies

**Q. 23** What is topology ? Explain BUS topology in detail.

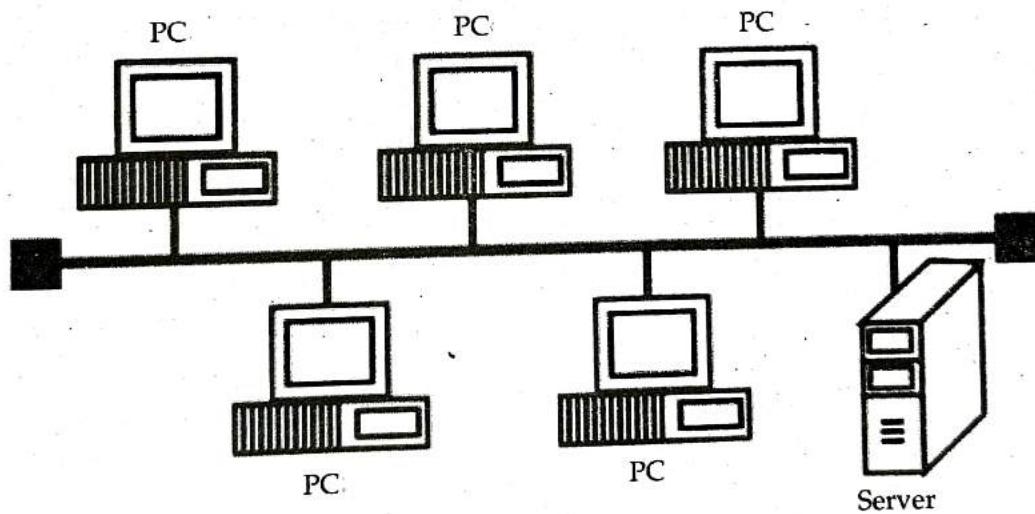
(Oct. 2006, 2007, 2009, 2010, March 2011)

**Ans. :**

- (1) Topology refers to the way in which network of computers is connected.
- (2) Nodes in the network are physically interconnected in some configuration to provide efficient communication. This configuration is called as topology.
- (3) A topology defines the arrangement of nodes, cables and connectivity devices that make up the network.

**BUS topology :**

- (1) In a BUS physical topology, all the devices are connected to a common shared cable, called as backbone of the network.
- (2) A BUS physical topology is shown in following figure :



- (3) The bus is available for each node to send its data to each and every computer node.
- (4) Most of the buses transmits signals in both directions on backbone cable and hence all workstations are able to receive signals. But some buses are unidirectional and data is transmitted only in one direction of backbone cable. Hence only down stream devices can receive signals.
- (5) The backbone cable carries transmission message along the cable. As message arrives at a workstation, it checks whether the destination address matches to its own or not. If not, it does no more and the message goes to next workstation.

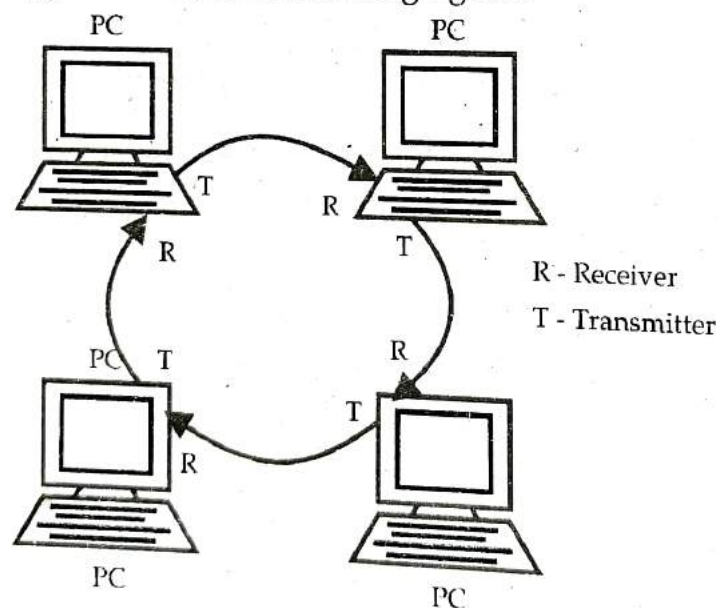
- (6) The bus cable is terminated at each end by placing terminators to prevent signals from reflecting back.
- (7) The commonly used implementation for BUS topology is ethernet at 10 MBPS.
- (8) **Advantages :**
- The bus system is much faster.
  - The bus topology can be extended with sub branches to form another topology.
  - Breakdown of any failure node does not affect other node's communication.
  - Bus topology is widely used in LAN network.

**Q. 24 Explain RING topology. Give its advantages and disadvantages.**

**(March 09, 18, July 2019)**

**Ans. :**

- RING topologies are wired in a circle. Each node is connected to its neighbours on either side, and the data transmits along the ring in one direction only.
- Each device incorporates a receiver and a transmitter and serves as a repeater that passes the signal onto the next device in the ring.
- The RING topology is as shown in following figure :



- RING topologies are suited for networks that uses token passing access methods. The token passes around the ring, and the only node that holds the token can transmit data.
- This topology is always implemented as a logical topology. e.g. In token ring network, the topology is physically a STAR topology. But logical topology is RING topology.
- The commonly used implementation for RING topology is token ring at 4-16 MBPS.



(7) **Advantages :**

- (i) Cable failure affects limited users.
- (ii) Each node has equal access speed to the ring.
- (iii) Equal access for all users.

(8) **Disadvantages :**

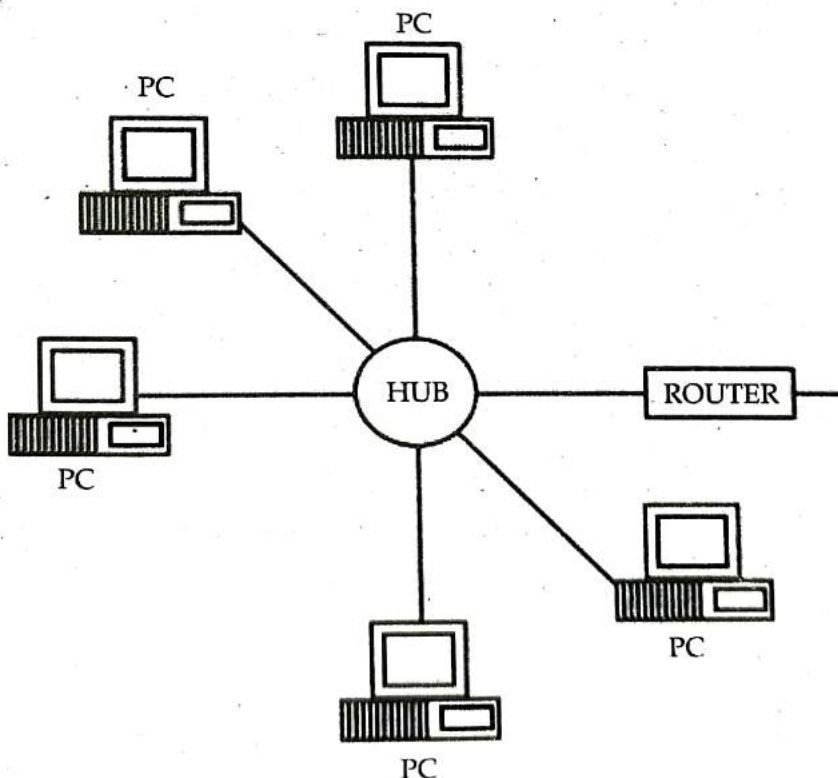
- (i) Costly wiring is required for RING topology.
- (ii) Expensive adapter cards.
- (iii) Difficult connections.

Q. 25 Explain in short, STAR topology.

(March 2006, 11, 18, 19, Oct. 2007, July 2019)

Ans. :

- (1) In a STAR topology all the workstations are connected to central hub.
- (2) The hub receives signal from a workstation and routes it to the proper destination.
- (3) STAR physical topology is often implemented to implement BUS or RING logical topology.
- (4) A STAR topology is shown in following figure :

(5) **Advantages :**

- (i) Adding a new workstation is easier than that in BUS or RING topology.
- (ii) The control is centralised due to use of hub.

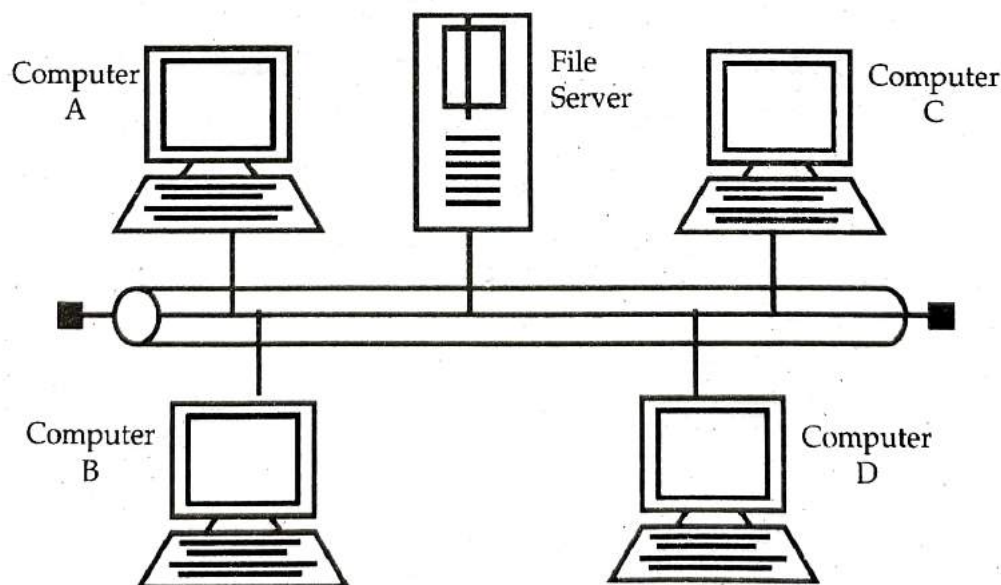
- v) Reconfiguration is easy, as computer is needed to connect directly to the server. But to make each connection, long cable is needed.
- vi) In star topology all process is done only through the central computer. So if central computer fails, whole network is damaged.
- vii) Any failure of anyone connection doesn't affect the total network.
- viii) **Advantages:**
  - i) Adding a new workstation is easier than that in BUS or RING topology.
  - ii) The control is centralised. due to use of hub.

**Q. 31 Discuss in detail Ethernet, with ethernet terminology. OR Write a note on Ethernet.**

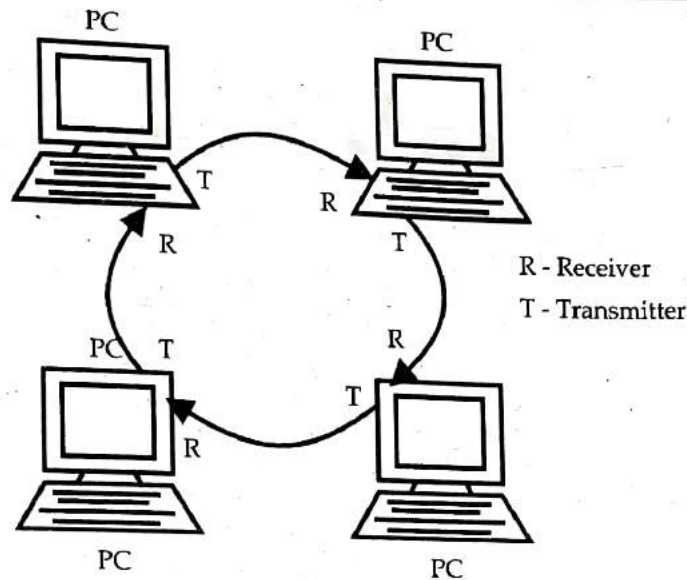
**(March 2003, 2005, Oct. 2008; March 2017; June 2016; July 2017)**

**Ans. :**

- (1) Ethernet is a local area network technology, with networks traditionally operating within single building.
- (2) Atmost, Ethernet devices can have a few hundred meters of cable between them. Modern technology allows Ethernet to span upto 10 kms.
- (3) Ethernet devices are connected to a common shared medium that provides the path along which the electronic signals will travel. Historically, this medium was co-axial cable. But, now-a-days twisted pair cable or fibre optic cable are also used.
- (4) Ethernet network transmit data in small units called **frames**.
- (5) Each frame must contain source address as well as destination address, which identifies recipient and sender of message. The address will uniquely identify node. No two Ethernet devices can have same address.
- (6) Ethernet network is as shown in following figure.



In above figure when computer A sends message to computer C, computers B and D will also get the message and check whether the destinations address matches to its own address or not, if not, it will discard the frame.



ii) **Token passing :**

- 1) Token passing utilizes a frame called a token, which circulates around the network.
- 2) A computer that needs to transmit must wait until it receives the token.
- 3) When computer receives token, it is permitted to transmit.
- 4) When computer completes transmitting, it passes the token frame to the next station or token ring network.

**Q.34 Discuss access methods of networking. OR Discuss any two access methods of networking ?**

(March 2003, 2020, Oct. 2009)

**OR Explain the following access methods brief.**

(Oct. 2002, 04, 08, March 2006, 18)

**(i) Contention (ii) Token passing**

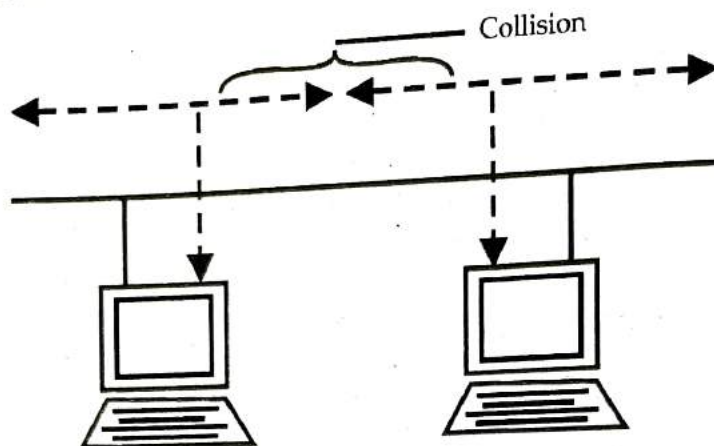
**Explain in brief Token passing and Polling' access. methods**

(Mar. 10; July 17, 18)

**Ans. :**

- (1) An access method is a set of rules governing how the network nodes share the transmission medium.
- (2) There are three most important types of media access methods :  
(A) Contention (B) Polling (c) Token passing
- (3) **Contention :**
  - a) In contention, any computer in the network can transmit at any time (first come first served).
  - b) This system breaks down when two computers attempt to transmit at the same time. This is a case of collision.
  - c) To avoid collision, carrier sensing mechanism is used. Here each computer listens to the network before attempting to transmit. If network is busy, it waits until network quiets down.
  - d) In carrier detection, computers continue to listen to the network as they transmit. If computer detects another signal that interferes with the signal it is sending, it stops transmitting. Both computers then wait random amount of time and attempt to transmit.

- e) Contention methods are most popular media access control method on LANs.



(4) **Polling :**

- In polling based systems, there is a device (called controller or master device) to poll other devices on the network to see whether they are ready to either transmit or receive data.
- This access method is not widely used on network because the polling itself can cause a fair amount of network traffic.

(5) **Token passing :**

- Token passing utilizes a frame called a token, which circulates around the network.
- A computer that needs to transmit must wait until it receives the token.
- When computer receives token, it is permitted to transmit.
- When computer completes transmitting, it passes the token frame to the next station or token ring network.

**Q. 35 Explain the following terms with respect to cabling :**

- |               |                |
|---------------|----------------|
| (A) 10 BASE 2 | (B) 10 BASE 5  |
| (C) 10 BASE T | (D) 10 BASE FL |

**Ans. :**

**(A) 10 BASE 2 :**

- This uses thinnet of co-axial cables.
- Each network connects directly to the network cable with a T-connector.
- The minimum cable distance between clients must be 1.5 feet.
- The T connector must be connected directly to the network adapter.
- The entire network cabling scheme cannot exceed 925 meters (3035 feet).

**(B) 10 BASE 5 :** This uses thicker net co - axial cable.

- 10 BASE 5 uses an external transceiver to attach to the network adapter card.
- The minimum cable distance between transceivers is 2.5 metres.
- The maximum network segment length is 500 meter (1640 feet)
- The entire network cabling scheme cannot exceed 2500 meters. (8200 feet)

**(C) 10 BASE T :**

- (i) This uses UTP cable.
- (ii) The maximum number of computers on a LAN is 1024.
- (iii) The cabling should be UTP category 3, 4 and 5. STP cable can also be used.
- (iv) The cable segment length (hub to transceiver) is 100 meters (328 feet)

**(D) 10 BASE FL :**

- (i) 10 BASE FL is a specification for ethernet over fiber optic cables.
- (ii) This supports a maximum cabling distance of about 2000 meters and eliminate any electrical complications.

**Protocols**

**Q. 36** What is meant by protocol ? Explain the concept of TCP/IP protocol.

**(March 2004, 08, 11, Oct. 2003, 04; June 2016; March 2018, July 2019)**

**Ans. :**

(1) A protocol is defined as an agreement between communication particle for how communication should be proceed.

**OR** protocols are rules by which computers communicates i.e. protocol is set of rules and formats for sending and receiving data.

(2) Internet protocols are called TCP/IP (Transmission Control Protocol/Internet Protocol) protocols. This protocol do not belong any one company and technology is available to everybody.

(3) TCP/IP protocol use three types of addresses for network addressing :

- (a) Hardware or physical address is used by the data link and physical layers.
- (b) Internet protocol address provides logical node identification. This address is unique address assigned by administrator expressed in four parts dotted notation.  
e.g. 123.144.131.21
- (c) Logical node names are easier to remember than an IP address.

**Introduction to connectivity devices**

**Q. 37** Explain modem in detail.

**(March 2006, 2010, Oct 2010; March 2017)**

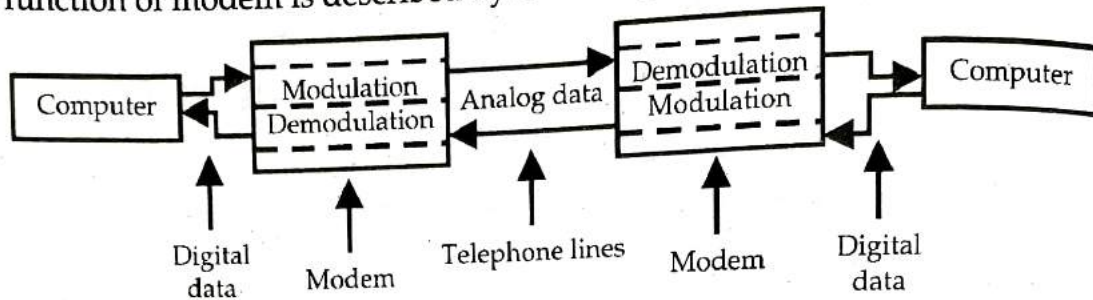
**Ans. :**

(1) Computers store digital data, while telephone lines can only transfer analog data. If a computer is to be connected to internet through telephone, then it must convert digital data to analog data before transmitting the computer signals.

(2) Converting one signal form to another form is called modulation and reconverting it to original form is called as demodulation.

(3) Modem is modulator/demodulator. Modem is used to connect computer to internet. Modems convert digital data to analog data and vice-a-versa.

- (4) They have two advantages :
- (i) Modem allows higher speed of transmission on any given analog line.
  - (ii) Modem reduce effect of noise and distortion.
- (5) The function of modem is described by following figure.



- (6) Modems are classified into two categories according to transmission method :
1. Asynchronous modems
  2. Synchronous modems

**Q. 38 What are the two types of modems. Explain them.**

(Mar.2010)

**Ans. :** Modems are classified into two categories depending upon transmission methods:

- 1) Asynchronous modems
  - 2) Synchronous modems
- 1) Asynchronous modems :**
- (a) In asynchronous modems, transmission clock is not used for synchronisation. Instead it uses, bit synchronisation.
  - (b) Here each frame begins with a start bit that enables the receiving device to adjust to the timing of transmitted signal.
  - (c) Messages are kept short.
  - (d) It is used to transmit character data.
  - (e) Asynchronous transmission is simple, inexpensive technology. It is used for PC to PC communication.
- 2) Synchronous modems :**
- (a) Synchronous modes uses clocks on transmitting and receiving devices.
  - (b) It uses a 'sync' signal, which is a bit pattern and can be easily recognised by the receiver.
  - (c) A wide variety of data types can be transmitted.
  - (d) A long series of bits can also be transmitted.

**Q. 39 Explain Hubs and repeaters in details.**

(March 02, 05, 09, 10, 18, Oct. 06; July 19)

OR

**What is Hub ? Explain active and passive hab.**

**Ans. :**

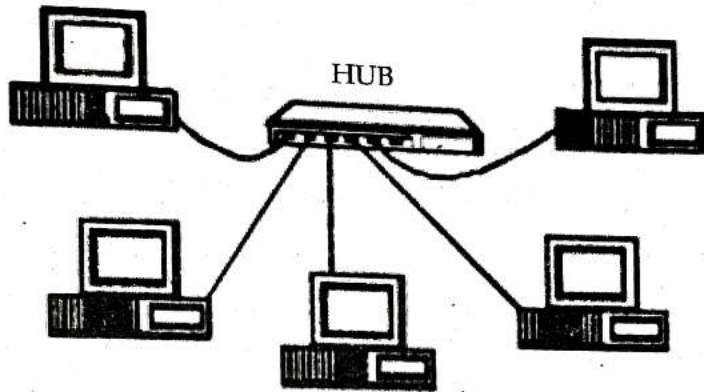
(March 2004, 2010, 2020)

**I) Hubs :**

- (1) In some network topologies, mostly ARCNET based star topologies, a device hub is used.

- (2) Hub is a connecting device in which cables can be connected without soldering wires to centralise network traffic through a single connecting point.
- (3) It manages the cabling in the network and sends signal to the other components of the network.

Figure shows a network inter-connected with hub.



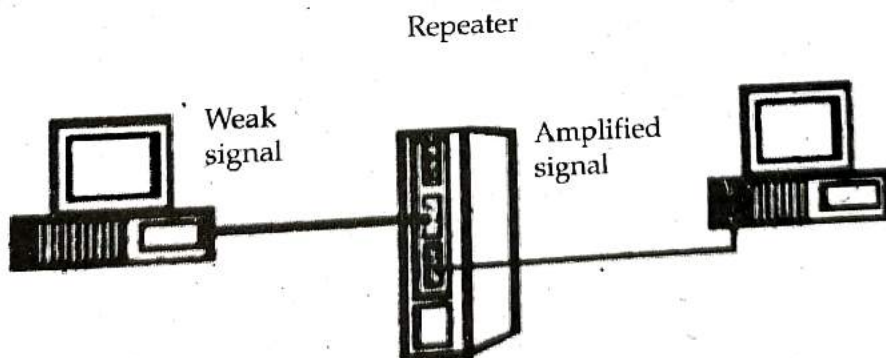
- (4) Hubs are of three types :
  - (i) Active hub      (ii) Passive hub      (iii) Switching hub
- (5) The active hub interconnect the network and also amplifies the signal received apart from splitting and retransmitting it to the destination. This hub contains electronic circuits.
- (6) Passive hub only splits and transmits signal received and it can not amplify it. This do not contain any electronic component.
- (7) Switching hub are quickly routes the signals between ports of hubs. It can be used in place of router.

**(Oct 2010, March 2018, 19)**

**II) Repeater :**

- (1) A repeater is a hardware unit mostly used in Ethernet to extend.
- (2) A repeater reshapes and amplifies the signal from one Ethernet segment to another.

Figure shows network with repeaters :



- (3) A backbone cable runs vertical up in the building and a repeater is used to attach an Ethernet segment running in each floor of the office to the backbone cable.
- (4) No two Ethernet workstations can have more than two repeaters between them, if they have to communicate reliably.
- (5) The main disadvantage of repeaters is that they repeat noise in the system.
- (6) Separate power supply is needed for repeaters.

**Q. 40 Write a short note on routers. OR**  
**Explain function of Router in Network and list different types of Routers.**

(March 2006, 18, 19)

(Oct. 2009)

**Ans. :**

- (1) Routers are internetwork connectivity devices. They are used to connect two topologically similar or dissimilar LANs. i.e. the LANs can be different e.g. they can be ethernet and token ring. Each LAN is logically separate and is assigned an address.
- (2) Routers can use network address to assist efficient delivery of message. Delivering packets according to logical network address is called as routing. Routers performs routing.
- (3) Routers are intelligent. They can use algorithms to determine most efficient path for sending a packet to any given network.
- (4) Routers can also be used to divide large, busy LANs into smaller segments.
- (5) Routers are also employed to connect LAN to wide area network (WAN).
- (6) Routers are of two types :  
 1. Static routers    2. Dynamic routers  
 Static routers do not determine paths, but you need to specify them. Dynamic routers have capacity to determine paths (routes).

**Q. 41 Write the functions of each of the following devices in short :**

(March 2008, 2011 Oct. 2003, 2004, 2005, 2007, 2008)

- (i) Modem      (ii) Hub      (iii) Repeater      (iv) Routers

**Ans. : (i) Modem :**

- (a) Modem means modulator / demodulator.
- (b) It is used to connect computer to internet.
- (c) Modem convert digital data to analog data and vice-a-versa.

**(ii) Hub :**

- (a) Hub is a connecting device in which cables can be connected to centralize network traffic through a single connecting point.
- (b) It manages the cabling in the network and sends signal to the other components of the network.

**(iii) Repeater :**

- (a) A repeater reshapes and amplifies the signal from one network to another.

**(iv) Routers :**

- (a) Routers are internetwork connectivity devices used to connect two topologically similar or dissimilar LANs.
- (b) Routers use algorithm to determine most efficient path for sending a packet to any given network.

**Q. 42 Explain the following terms**

- (a) Modem      (b) Hub      (c) Repeater

**Ans. :** Please refer Q. 36.

(March 2003)

**Q. 43 Give atleast two advantages and one disadvantage of wireless media over cable media.**

**Ans. : Advantages of wireless media :**

- (1) Communication can reach rural and hilly area.
- (2) High data rate transmission by using large bandwidth.

(March 2014)



**Disadvantages of wireless media :**

- (1) Skilled labour require to install. This increases cost of network.
- (2) EMI and outside noise disturb the signal.

**Q. 44 Explain TCP/IP protocol in detail.**

**(March 2019)**

**Ans. :**

A protocol is defined as an agreement between communication particle for how communication should be proceed.

**OR** protocols are rules by which computers communicates i.e. protocol is set of rules and formats for sending and receiving data.

**General TCP/IP Transport Protocols**

In transport protocols there are two main forms of address : a node address and a logical network address.

A node address is the address of the entity of device on the network. Logical network address is the segment on the network to which node is attached.

TCP/IP uses numbering scheme. This number is IP address. All devices on network need a unique IP address. An IP address is a set of four numbers, they can range in value between 0 to 255. Each number is separated by period.

For example : 34.120.66.79 or 107.219.2.34

There are three classes of address – class A, class B and class C. In class A, the number between 1 and 127 appears before first dot. The first number represent the network address. The last three numbers represent the node or host number. In 34.120.66.79, the host number is 120.66.79 on network 34. In class B, the first number can range in value from 128 to 191. The first two numbers forms network address and last two forms host ID.

In class C, the first number can range in from 192 to 223. The first three numbers make up the network address and last number forms host ID.

**Internet Protocol (IP)**

IP is connectionless protocol. It is packet – switching protocol that performs addressing and route selection. IP routes packets through internet works. It also performs disassembly and reassembly. IP also performs error checking.

**Q. 45 Select the correct alternative and rewrite the following.**

1. — cable type is ideal for connecting between two buildings.  
 (i) UTP                      (ii) STP                      (iii) Co-axial                      (iv) Fibre optic

**Ans. :** (iv) Fibre optic

2. In — topology connections are made from centre point of server or Hub.  
 (i) Bus                      (ii) STAR                      (iii) RING                      (iv) All of these

**Ans. :** (ii) STAR

3. The process of modulation and demodulation is done by device namely —.  
 (i) Hub                      (ii) Repeater                      (iii) Router                      (iv) Modem

**Ans. :** (iv) Modem

4. If the network is to be extended beyond predefined cable limit — is used.

**(March 2002)**

**Ans. :** (i) Modem                      (ii) Repeater                      (iii) Hub                      (iv) Router

(ii) Repeater