

Summer-15

- 1. Give any two applications of microwave communication.
(Each application- 1Mark, Any Two applications)**

Answer: Two applications of Microwave Communication.

- 1) Radar uses microwave radiation to detect range, speed & other characteristics of remote object.
- 2) It is used in satellite for long distance communication.
- 3) Satellite phones.

[Any other relevant application such as cellular networks can also be considered.]

- 2. State two applications of optical fiber cable.(Each application- 1Mark, Any Two applications)**

Answer: Two applications of optical fiber cable:

- 1) Military applications
- 2) Space applications
- 3) Cable television
- 4) Telephone
- 5) Computer networking
- 6) Medical applications

- 3. What is CDMA? (2 Marks)**

Answer:

CDMA:

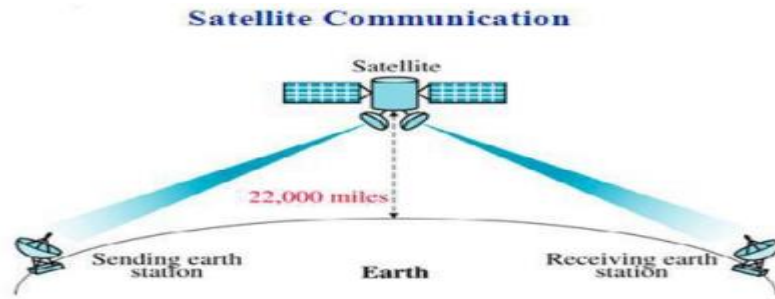
- CDMA is code division multiple access.
- In CDMA more than one user is allowed to share a channel or sub channel with the help of direct – sequence spread spectrum signal.
- In CDMA each user is given a unique code sequence or signature sequence.
- This sequence allows the user to spread the information signal across the assigned frequency band.

- 4. With the help of neat diagram explain satellite communication.
(Diagram- 2 Marks, Explanation -2 Marks)**

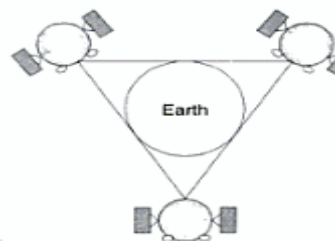
Answer:

SATELLITE COMMUNICATION:

- In satellite communication, signal transferring between the sender and receiver is done with the help of satellite.
- In this process, the signal which is basically a beam of modulated microwaves is sent towards the satellite called UPLINK (6 Ghz).
- Then the satellite amplifies the signal and sent it back to the receiver's antenna present on the earth's surface called as DOWNLINK (4Ghz), as shown in the diagram given



- As the entire signal transferring is happening in space. Thus this type of communication is known as space communication. The satellite does the functions of an antenna and repeater together.
- If the earth along with its ground stations is revolving and the satellite is stationery, the sending and receiving earth stations and the satellite can be out of sync over time.
- Therefore Geosynchronous satellites are used which move at same RPM as that of the earth in the same direction.
- So the relative position of the ground station with respect to the satellite never changes. However 3 satellites are needed to cover earth's surface entirely.

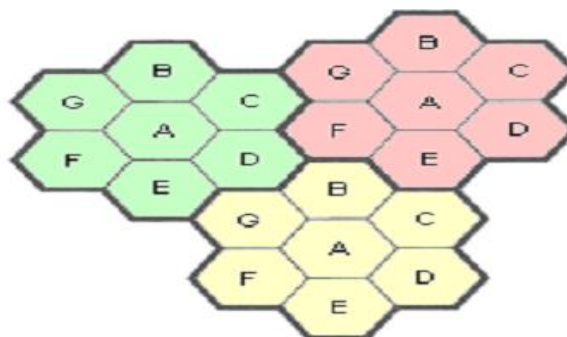


- Frequency band used in satellite communication:

Band	Downlink	Uplink
C	3.7 to 4.2 Ghz	5.925 to 6.425Ghz
Ku	11.7 to 12.2 Ghz	14 to 14.5 Ghz
Ka	17.7 to 21 Ghz	27.5 to 31 Ghz

5. What is the frequency band used for cellular telephony? How a mobile call is transmitted and received? (Explanation of cellular telephony - 2 Marks, Explanation of mobile call transmission & reception - 2 Marks)

Answer:



- Analog transmission is used for cellular telephony.
- Frequency modulation is used for communication between the mobile phone and cell office.
- Two frequency bands are allocated for this purpose.
- One band of them is for the communication that is initiated by mobile phone & the other band for the land phone.
- Each channel requires a full-duplex dialog.
- For preventing interference, adjacent channels are rarely allocated; some of them are also required for control purposes.
- This reduces the number of channels available for each cell.
- The same frequency band can be used for multiple non-adjacent cells as shown in fig.

Calls using Mobile phones:

- Call is made from the mobile phone by entering 7-, 8-, or 10-digit phone number; the mobile phone itself scans the band & seeks a channel for setting up the call.
- After seeking, it sends this number to the closest cell office, which in turn, sends it to the CTO.
- If the called party is available, CTO lets MTSO (mobile telephone switching office) know.
- At this point, MTSO allocates an empty voice channel to the cell to establish the connection.
- The mobile phone adjust its tuning to the new channel & the dialog begins.

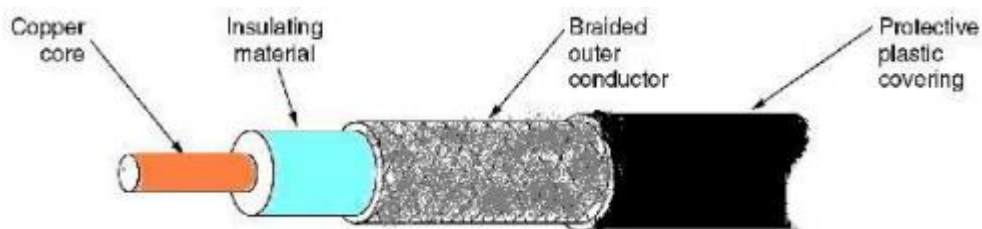
When a land phone places a call to a mobile phone, the telephone central office sends the number to the MTSO.

- The MTSO performs a lookup to see where the mobile phone is currently placed by sending appropriate query signal to all the cells. This process is known paging.
- The cell where the mobile phone is currently located responds to the MTSO. Incoming calls work differently.
- To start with idle phone is continuously listen to paging channel to detect messages at directed at them.
- The MTSO then transmit the incoming call signal to that mobile phone & when the mobile phone is answered, the MTSO assigns a voice channel to the call, thus enabling the conversation.

6. Draw the constructional sketch of co-axial cable. Describe any three characteristics of co-axial cable. (Sketch -2 Marks, Any three characteristics- 2 Marks)

Answer:

Co-axial cable:



Characteristics of coaxial cable are:-

1. Used to transmit both analog & digital signals.
2. It carries signals of higher frequency ranges than twisted pair cable.
3. Lower attenuation than twisted pair cable.
4. Supports higher bandwidth.
5. Requires amplifiers every few kilometers for long distance transmission.
6. Requires repeaters every few kilometers for digital transmission.

7. Explain in brief the functioning of Bluetooth. (Diagram 1 mark, explanation 3 marks)

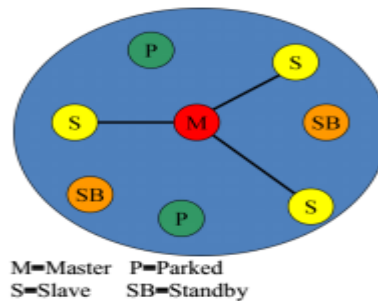
Answer: What is Bluetooth ?

1. A cable-replacement technology that can be used to connect almost any device to any other device.
2. Radio interface enabling electronic devices to communicate wirelessly via short range (10 meters) **ad-hoc** radio connections.
3. A standard small, cheap radio chip to be plugged into computers, printers, mobile phones, etc.
4. Uses the radio range of 2.45 GHz
5. Theoretical maximum bandwidth is 1 Mb/s
6. Several Bluetooth devices can form an ad hoc network called a "piconet".
7. In a piconet one device acts as a master (sets frequency hopping behavior) and the others as slaves Example: A conference room with many laptops wishing to communicate with each other

Bluetooth Architecture

1. Piconet:

- Each piconet has one master and up to 7 simultaneous slaves.
- Master: device that initiates a data exchange.
- Slave: device that responds to the master.
- Master gives slaves its clock and device ID
- Non-piconet devices are in standby



2. Scatternet

- Linking of multiple piconets through the master or slave devices
- Bluetooth devices have point-to-multipoint capability to engage in Scatternet communication.
- Devices can be slave in one piconet and master of another.

8. Describe the following terms with reference to cellular telephony

i. Hard Hand Off

ii. Soft Hand Off (Each term 2M).

Answer:

i. Hard Hand Off-

- In Hard Hand Off a mobile station only communicates with one base station.
- When the (mobile handset) MS moves from 1 cell to another, communication must first be broken with the previous base station before communication can reestablished with the new one. This may create a rough transition.
- Hard hand off was used in earlier systems.

ii. Soft Hand Off –

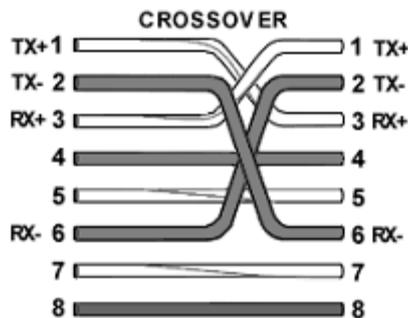
- In this case, a mobile station can communicate with two base stations at the same time this means that, during Hand off a mobile station may continue with the new base station before breaking off from the old one.
- This is used in new systems.
- This provides seamless connectivity while roaming from one cell to another.

9. How cross cable is created? Draw figure and explain. Give its application.

(Creation: 4M; Diagram : 2M; Application : 2M)

Answer:

- Crossover cable is created by connecting the two UTP cables by swapping transmission and reception signals as shown below: Here, One end of the cable is crimped in the same way as straight cable, on the other end the following change has to be done, 1-White and 3 orange- white are to be connected 2 –Green and 6 orange are to be connected as shown in the fig below.



Application: While connecting one computer to another without going through router, switch or hub, the crossover cables are used. These are also used when connecting one computer to a device directly, without any other connecting device. Cross cable is used for connecting similar level devices. For example: two computers or connecting computer with hub since all are level 1 devices.

Winter 14

1. Define Wi-Max. (definition 2 marks)

Answer: Define: Wi- Max is worldwide interoperability for Microwave Access. It is a wireless communication standard which can provide data rates up to 1 Gbps.

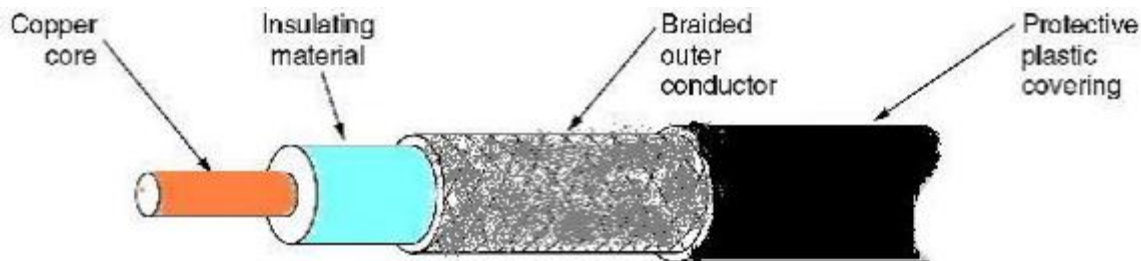
2. Give any two disadvantages of unshielded twisted pair cable. (1 disadvantage- 1mark, any two disadvantages)

Answer: Disadvantages of unshielded twisted pair cable.

1. Highly prone to crosstalk.
2. Unable to provide secured transmission of data.

3. Draw and explain Co-axial cable.

(Diagram 1 mark, explanation 1 mark, any 2 advantages & disadvantages 1 mark each)



- Coaxial cable (also called as coax) has an inner central copper conductor surrounded by an insulating sheath, which in turn is enclosed in the metal mesh.
- This outer conductor (shield) acts not only as a second conductor for completing the circuit but also acts as shield against noise.
- This whole arrangement is enclosed in protective plastic cover as shown in fig. Co-axial cables are divided into various categories depending upon the thickness & size of the shields, insulators and the outer coating & other considerations.
- They are commonly used by cable companies to carry cable transmissions.
- The various coaxial cable standards are RG- 8, RG-9, RG-11, RG-58 and RG-59.

Advantages of coaxial cable are:-

1. It carries signals of higher frequency ranges than twisted pair cable.
2. Lower attenuation than twisted pair cable.
3. Supports higher bandwidth.

Disadvantages of coaxial cable are:-

1. Cost of coaxial cable is more than twisted pair cable.
2. Less flexible.
3. More difficult to install in a building where a number of twists and turns are required.
4. Limited to size of network.

**5. State the factors to be considered for selecting transmission media. (Eight points)
(1/2 marks for any eight factors)**

Answer: Eight factors to be considered:

1. Type of medium.
2. No of conductors/connectors.
3. Flexibility.
4. Durability.
5. Bandwidth.
6. Reliability of connection
7. Required speed
8. Distance
9. Ease of installation and maintenance access
10. Technical expertise required to install and utilize
11. Resistance to internal EMI , cross talk of parallel wires
12. Resistance to external EMI outside the cable.
13. Attenuation characteristics
14. Cost

**6. Explain infrared communication. List any two disadvantages of infrared communication.
(explanation -2 marks, Two disadvantages -2 marks)**

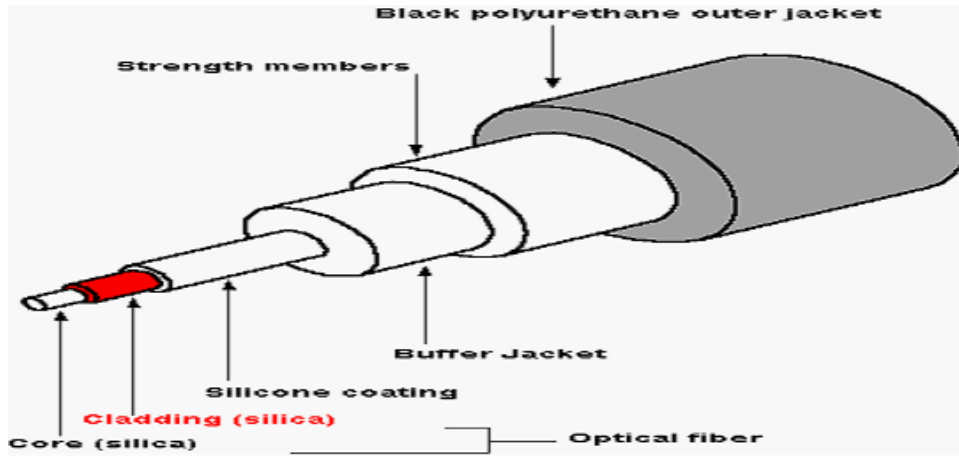
Answer:

- **Infrared communication (IR)** is an example of wireless communication. However, it is limited to very simple applications & suffers from several disadvantages, mainly very small bandwidth & distances that it can support.
- Infrared communication works in the micrometer range, which is 1 to 430 THZ. The term **infrared** comes from the fact that red color has the longest wavelength amongst the colors in visible light.
- However, the wavelength of infrared is longer than that of red color, and hence the frequency of infrared communications is smaller than that of red color. Hence, we have the term below red color or Infrared.
- Infrared communication is used by military for surveillance, for vision in the darkness at night, tracking objects, etc. We use infrared communication whenever we use our remote controls to operate television sets, DVD players, etc. Weather forecasting & astronomy also make use of infrared communication.

Disadvantage:

- i. The major disadvantage is that the sun generates radiation in the infrared band. This can cause a lot of interference with IR communication.
- ii. Infrared signals cannot penetrate walls.
- iii. Large areas require multiple emitter panels, which will increase the cost of the system.

7. Draw and explain fiber optic cable.(2 marks for diagram, 2 marks for explanation)



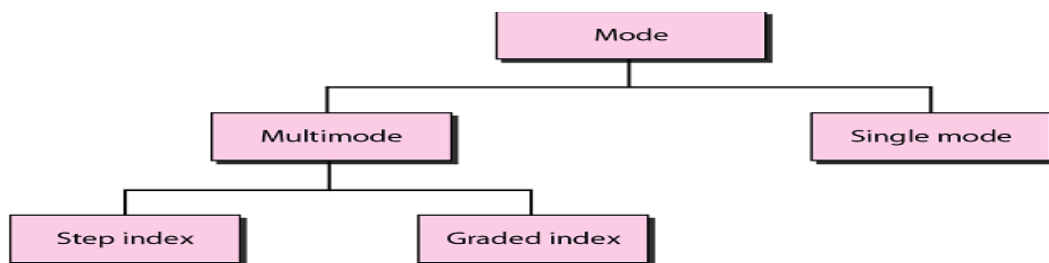
As shown in the figure, at the center is the glass core through which the light propagates. In multimode fibers, the core is typically 50 microns in diameter. In single mode fibers, the core is 8 to 10 microns. The core is surrounded by a glass cladding with a lower index of refraction than the core, to keep all the light in the core. A thin plastic jacket is used to protect the cladding. Fibers are grouped in bundles, protected by an outer sheath.

Fibers can be connected in three different ways. First they can terminate in connectors and be plugged into fiber sockets. Connectors lose about 10 to 20 percent of the light, but they make it easy to reconfigure systems. Second they can be spliced mechanically. Mechanical splices just lay the two carefully – cut ends next to each other in a special sleeve and clamp them in place. Alignment can be improved by passing light through the junction and then making small adjustments to maximize the signal. Third, two pieces of fiber can be fused to form a solid connection. A fusion splice is almost as good as a single drawn fiber.

8. Explain different modes of fiber optic cable.(For each mode 2 marks)

Answer: Current technology supports two modes for propagating light along optical channels.

- 1. Multimode. 2. Single mode.



Multimode can be implemented in two form: 1. Step index. 2. Graded index.

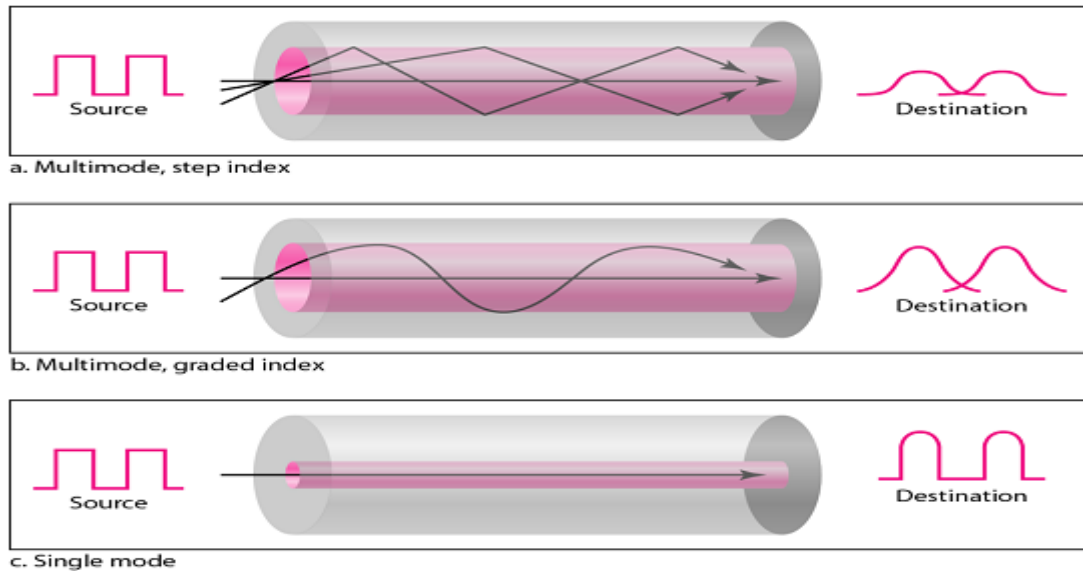
Multimode: Multiple beams from a light source move through the core in different paths. How these beams move within the cable depends on the structure of the core as shown in the fig.

In **multimode step-index fiber**, the density of the core remains constant from the center to the edges.

A beam of light moves through this constant density in a straight line until it reaches the interface of the core and the cladding. At the interface, there is an abrupt change due to a lower density, this

alters the angle of the beam's motion. The term step index refers to the suddenness of this change, which contributes to the distortion of the signal as it passes through the fiber.

A **multimode graded index** fiber decreases this distortion of the signal through the cable. In this, density is highest at the center of the core and decreases gradually to its lowest at the edge. Following fig shows the impact of this variable density on the propagation of light beams.

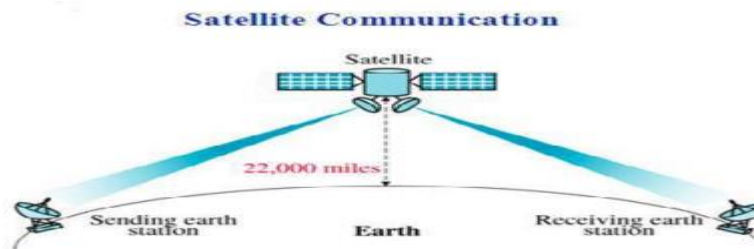


Single mode: The single mode fiber is manufactured with a much smaller diameter than that of multimode fiber and with substantially lower density. The decrease in density results in a critical angle that is close enough to 90° to make the propagation of beams almost horizontal. In this case propagation is almost identical and delays are negligible. All the beams arrive at the destination together and can be recombined with little distortion to the signal.

9. Explain Satellite communication with neat diagram

(Diagram 2 marks, explanation 4 marks, frequency band 1 mark, application 1 mark)

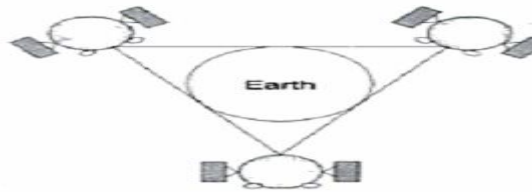
Answer: SATELLITE COMMUNICATION: In satellite communication, signal transferring between the sender and receiver is done with the help of satellite. In this process, the signal which is basically a beam of modulated microwaves is sent towards the satellite called UPLINK (6 GHz). Then the satellite amplifies the signal and sent it back to the receiver's antenna present on the earth's surface called as DOWNLINK (4GHz), as shown in the diagram given



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Frequency band used in satellite communication:

Band	Downlink	Uplink
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Application of satellite:

1. Satellite television
2. digital cinema
3. satellite radio
4. satellite internet access

Summer-14

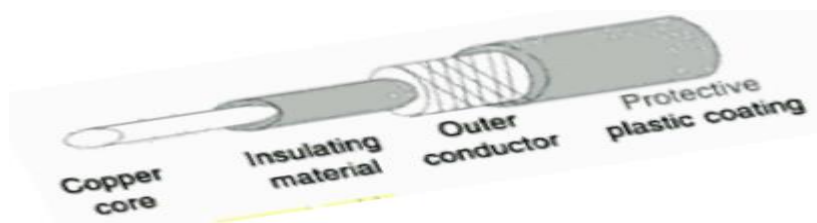
1. List any two advantages of optical fiber cable. *(Any two advantages- 1 Mark each).*

Ans: Advantages of optical fiber cable:

- 1) Higher bandwidth
- 2) Less signal attenuation
- 3) Immunity to electromagnetic interference
- 4) Resistance to corrosive materials

2. Draw the sketch of co-axial cable (cross-sectional view) *(Diagram-1 Mark, Labeling- 1 Mark)*

Ans:



3. Describe various factors to be considered while selecting transmission media.

(Any 4 factors - 1 Mark each).

Ans:

1. **Cost & Ease of installation:** Costing is an important factor, when we select a media. Because absolute cost and ease of installation data are difficult to provide without referring to specific implementations, one can make relative judgments by comparing each medium to the others.
2. **Type of cable:** Coaxial cable, Twisted Pair Cable, Fiber Optic Cable
3. **No of conductors/connectors:** RJ-45, BNC, LC & ST
4. **Noise:** It leads to distortion of a signal. Noise immunity of transmission media is considered at the time of selecting particular network.
5. **Bandwidth:** Higher bandwidth transmission media support higher data rate.
6. **Radiation:** It is leakage of signal from media caused by undesirable characteristics of media.
7. **Durability:** Life span of media
8. **Interference:** interference occurs when undesirable electromagnetic waves affect the signal. Interference can be caused by many factors, including
 - Electromagnetic Interference (EMI)
 - Radio wave interference (RFI)
9. **Attenuation:** Attenuation refers to the tendency of electromagnetic waves to weaken or become distorted during transmission. It is loss of energy as the signals propagates outwards. Attenuation increases with distance, as a wave passes through a medium, some of its energy is absorbed or scattered by the medium's physical properties.

4. Describe two application of

i) twisted pair cable

ii) co-axial cable

(Any 2 applications of each - 1 Mark each)

Ans:

i) Twisted pair cable:

1. Telephone lines.
2. Local area Network
3. DSL Lines

ii) Co-axial cable:

1. Television Systems
2. Connecting VCRs to television
3. Ethernet LANs

5. Compare guided and unguided media used in computer network.
(Any 4 points – 1 Mark each)

GUIDED MEDIA	UNGUIDED MEDIA
Also called as bounded or wired media	Also called as unbounded or wireless media
Point to point connection i.e. signal travelling is directed	Used for radio broadcasting in all directions i.e. signal travelling is undirected
Transport signal in electric current or light/ beam	Transport signal in the form of electromagnetic waves
Unidirection, not broadcast	Broadcast
Installation is costly and time consuming	Installation needs less time and money
Wired media leads to discrete network topologies	Wireless media leads to continuous network topologies
Attenuation depends exponentially on the distance	Attenuation is proportional to square of the distance
Example: Twisted Pair cable, Coaxial cable, Fiber optic cable	Example: Radio, Infrared light, Microwave

6. Explain handoff procedure of cellular mobile phone.
(Handoff Procedure -2 Marks, Types of Handoff – 2 Marks)

Ans: Assume that there is a call going on between two parties over a voice channel. When the mobile unit moves out of coverage area of a particular cell site the reception becomes weak. Then the cell site will request a **hand off**. The system will switch the call to a new cell site without interrupting the call or changing the user. This procedure is called as the hand off procedure or handover procedure.

Following are various types of handoffs.

- 1. Hard hand off:** A hard handoff is a handoff technique used with cellular networks that requires the user's connection to be entirely broken with an existing base station before being switched to another base station.
- 2. Soft hand off:** The hand off is known as soft handoff if the MS starts communication with a new base station without stopping the communication with the older base station.
- 3. Delayed Hand off:** In many situations, instead of one level, a two level handoff procedure is used, in order to provide a high opportunity for a successful handoff. A hand off can be delayed if on available cell take the call.
- 4. Forced handoff:** A forced handoff is defined as the off which would normally occur but prevented from happening or a handoff that should not occur but is forced to happen.
- 5. Queued handoff:** In the queued handoff process, the MTSO arranges the handoff requests in a queue instead of rejecting them, if the new cell sites are busy.

7. Explain following wireless technologies used in computer communication:

i) Wi-Fi ii) Bluetooth (WiFi diagram - 1 Mark, Explanation- 3 Marks, Bluetooth diagram - 2 Marks, Explanation 2 Marks).

Ans:

1. **Wi-Fi:** Wi-Fi stands for wireless fidelity. Wi-Fi provide data rate of 54 Mbps. Wi-Fi based on IEEE 802.11 standard.



Advantages:

- 1) Easy to use.
- 2) Easy and simple to expandability.
- 3) Easy to install and setup.
- 4) No requirement of wires

Disadvantage:

- 1) The range of Wi-Fi is limited
- 2) Security is less in Wi-Fi connections as compared with others.
- 3) Wi-Fi connections are highly suspect able interruption by other devices which are operating in close proximity.

2. **Bluetooth:** Bluetooth is short range wireless technology. Range of bluetooth is 10 meters. Bluetooth Architecture define 2 types of networks. 1) piconet 2) scatternet.

Piconet: It consist of 1 master node and 7 slave nodes. Piconet have 8 active nodes (7+1) in the range of 10 meters. There can be only 1 master station in each piconet. Communication is between master and slave Slave-slave communication is not possible. Piconet can have 255 parked nodes, that cannot take part in communication. There will be 7 slaves in active state and 255 nodes in parked state.

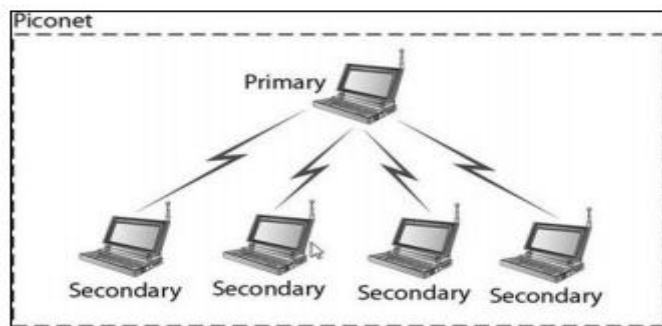


Fig :piconet

Scatternet: It is formed by combining various piconets. Slave in one piconet can act as master in other piconet. Such a node can receive message from the master in the first piconet and deliver the message in second piconet. Station can be member of two piconets. Station cannot be master of two piconet.

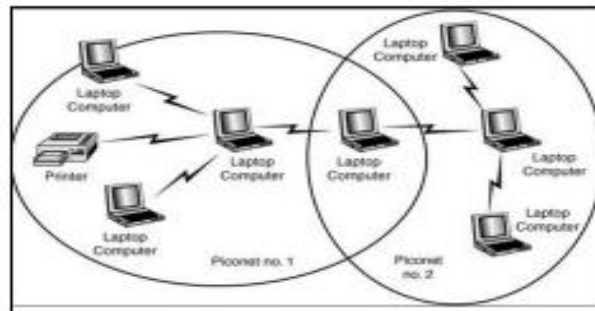


Fig: Scatternet

Winter-15

1. **Define guided media. List the types of guided media.**
(Definition - 1Mark, list types of guided media - 1Mark).

Ans:

Guided Media: Guided media are wired media, Electrical/Optical signals are passed through a solid medium (different types of cables/wires) as the path traversed by the signals is guided by shape and length of the wire, this type of media is called guided media. In Guided media, the signals are confined within the wire and do not propagate outside of the wire/media.

Types of Guided Media:

1. Copper Unshielded Twisted Pair (UTP),
2. Copper Shielded Twisted Pair (STP),
3. Co-axial cables
4. Fiber Optic Cables.

2. **Name the layer which is associated with the transmission media.**
(Naming the Layer - 2 Marks)

Ans: Physical Layer: Transmission media operate at Layer 1 (Physical Layer) of the OSI model, it encompass the physical entity and describe the types of medium on which voice and data can travel.

Physical Layer is associated in two ways with transmission medium.

1. Guided(wired) media E.g. Coaxial Cable, Fiber-optic Cable
 2. Unguided (Wireless) Media E.g. Radio Frequencies, Microwave, Satellite, and Infrared.
3. **If you have two computers to connect to a network located over a long distance over 100 KM, which type of transmission you will used? Justify your answer by describing its features.** (Naming Transmission medium - 2 Marks, Features - 2 Marks)

Ans: You can connect two computers over the Internet (Wide Area Network).

Features of Internet:

1. World Wide Web.
2. E-mail.
3. News
4. Telnet
5. File Transfer Protocol (FTP)
6. Internet Relay Chat (IRC)

E-mail:

Electronic mail (e-mail) is the most popular reason people use the Internet. To create, send, and receive e-mail messages you need an e-mail program and an account on an Internet mail server with a domain name. To use e-mail, a user must have an e-mail address, which you create by adding your user name to the e-mail server's domain name, as in jsmith@aol.com.

News:

One Internet based service called news, includes tens of thousands of newsgroups. Each newsgroup hosts discussions on a specific topic. A newsgroup a some indicated its user's special topic of interest, such as Food cake. To participate in a newsgroup, you need a news-reader program that lets you read articles that have been posted on a news server. You can post articles for others to read and respond to.

Telnet:

Telnet is a specialized service that lets you use one computer to access the contents of another computer a telnet host. A telnet program creates a "Window" into the host so you can access files, issue commands, and exchange data. Telnet is widely used by libraries to allow visitors to look up information, find articles and so on.

File transfer protocol:

File Transfer protocol (FTP) is the internet tool used to copy files from one computer to another. Using a special FTP program or a web browser, you can log into an ETP host Computer over the internet and copy files on to your computer. FTP is handy for finding and copying software files, articles and other types of data. Universities and software companies use FTP servers to provide visitors with access to data.

Internet Relay chat (IRC):

Internet Relay chat (IRC) is a service that allows users to communicate in real time by typing text in a special window. Like news, there are hundreds of IRC "channel" each devoted to a subject or user group. You can use a special IRC program to participate in chat room discussions but many chat rooms are set up in web sites, enabling visitors to chat directly in their browser window.

4. Describe any four physical characteristics of fiber optic cable.

(Any Four physical characteristics - 1 Mark each).

Ans:

1. Core - Thin glass center of the fiber where the light travels.

2. Cladding - Outer optical material surrounding the core that reflects the light back into the core.

3. Buffer coating - Plastic coating that protects the fiber from damage and moisture. Hundreds or thousands of these optical fibers are arranged in bundles in optical cables. The bundles are protected by the cable's outer covering, called a jacket.

4. Strengthening fibers: These components help protect the core against crushing forces and exercise tension during installation.

5. Cable jacket: This is the outer layer of any cable. Most fiber optic cables have an orange jacket, although some types can have black or yellow jackets

Optical fibers come in two types:

Single-mode fibers - Used to transmit one signal per fiber (used in telephones and cable TV)

Multi-mode fibers - Used to transmit many signals per fiber (used in computer networks, local area networks).

Some optical fibers can be made from plastic. These fibers have a large core (0.04 inches or 1 mm diameter) and transmit visible red light from LEDs.

5. State the criteria for selecting transmission media.

(1/2 Marks for any eight factors)

Ans: Already Given.

6. Compare cable and wireless transmission. (Any four points - 4Marks.)

Ans: Already Given

7. Explain satellite communication with the help of neat diagram.

(Diagram - 2 Marks & Explanation - 2 Marks)

Answer: Already Given

8. Explain twisted pair cable with neat sketch.

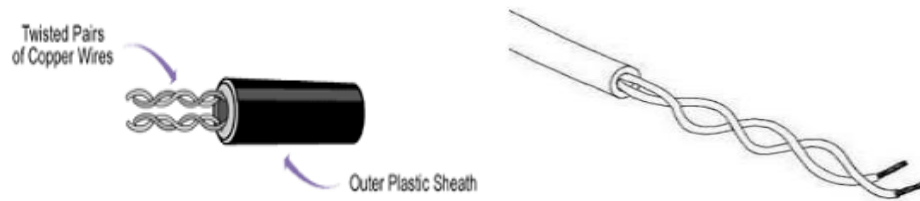
(Diagram - 2Marks Explanation - 2Marks)

Ans: A type of cable that consists of two independently insulated wires twisted around one another. The use of two wires twisted together helps to reduce crosstalk and electromagnetic induction. While twisted-pair cable is used by older telephone networks and is the least expensive type of local-area network (LAN) cable, most networks contain some twisted-pair cabling at some point along the network.

Types:

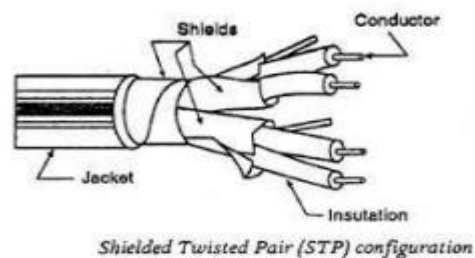
i) Unshielded Twisted Pair Cable (UTP): Unshielded twisted pair is the most common kind of copper telephone wiring. Twisted pair is the ordinary copper wire that connects home and many business computers to the telephone company. To reduce crosstalk or electromagnetic induction

between pairs of wires, two insulated copper wires are twisted around each other. Each signal on twisted pair requires both wires.



ii) Shielded Twisted Pair Cable (STP)

STP is a type of copper telephone wiring in which each of the two copper wires that are twisted together are coated with an insulating coating that functions as a ground for the wires. The extra covering in shielded twisted pair wiring protects the transmission line from electromagnetic interference leaking into or out of the cable. STP cabling often is used in Ethernet networks, especially fast data rate Ethernets.



Advantages of Twisted pair cable

1. It can be used to carry both analog and digital data.
2. It is relatively easy to implement and terminate.
3. It is the least expensive media of transmission for short distances.
4. If portion of a twisted pair cable is damaged it does not affect the entire network.