Unit: Physical layer(Marks 5)

Definition of transmission media:

Transmission media is the “connecting cables” or “connecting media” that connect two or more workstations.

Note: A **workstation** is a special computer designed for technical or scientific applications. Intended primarily to be used by one person at a time, they are commonly connected to a local area network and run multi-user operating systems.

Transmission media are categorized into two groups:

- Guided media: Guided media include cables.
- Unguided media: Unguided media include waves through air, water and vacuum.

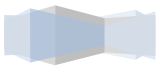
Guided media :

1. Twisted pair cable
2. Coaxial cable
3. Optical fibre

Unguided media :

- Micro wave
- Radio wave
- Satellite communication

Guided media



1.Twisted pair cable: It is the most common form of wiring in data communication application. It is basis for most internal office telephone wiring.Two things are common here:

- The wires come in pairs.
- The pairs of wires are twisted around each other.

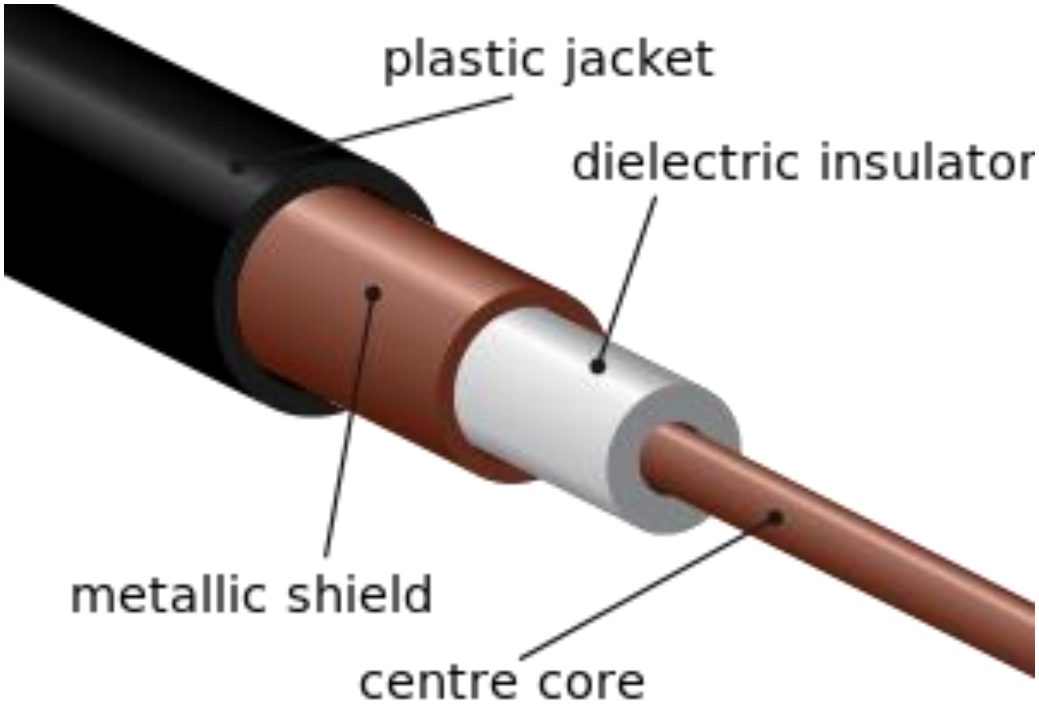
Advantages of twisted pair cable:

- It is simple
- It is easy to install and maintain
- It is physically flexible
- It has a low weight
- It can be easily connected
- It is very inexpensive .

Disadvantages of twisted pair cable:

- High attenuation
- Low bandwidth capabilities

2. **Coaxial pair cable:**
   - Coaxial cable consists of a solid wire core surrounded by one or more foil or wire shields, each separated by some kind plasic insulator.
   - The inner core carries the signal and the shield provides the ground.
   - The coaxial cable has high electrical properties and is suitable for high speed communication.
   - It is widely used for television signals.



Advantages of Coaxial cable:

- Data transmission characteristics are good.
- It can be used as a basis for a shared cable network.
- It can be used for broadband transmission.
- Offer higher bandwidths.

Disadvantages of Coaxial cable:

- It is expensive.
- The coaxial cables are not compatible with twisted pair cables.

3.Optical fibres: A fiber-optic cable, also known as an optical-fiber cable, is an assembly similar to an electrical cable, but containing one or more optical fibers that are used to carry light. The fibre optic consists of three pieces:

i) the core,i.e.,the glass or plastic through which the light travels

ii)the cladding, which is a covering of the core that reflects light back to the core, and

iii)protective coating, which protects the fibre cable from hostile environment.

Advantages of Optical Fibre:

- It is immune to electrical and magnetic interference.
- It is highly suitable for harsh industrial environments.
- Fibre optic cables can be used for broadband transmission where several channels are handled in parallel.
- It is also possible to mix data transmission channels with channels for telescope, graphics, TV and sound.

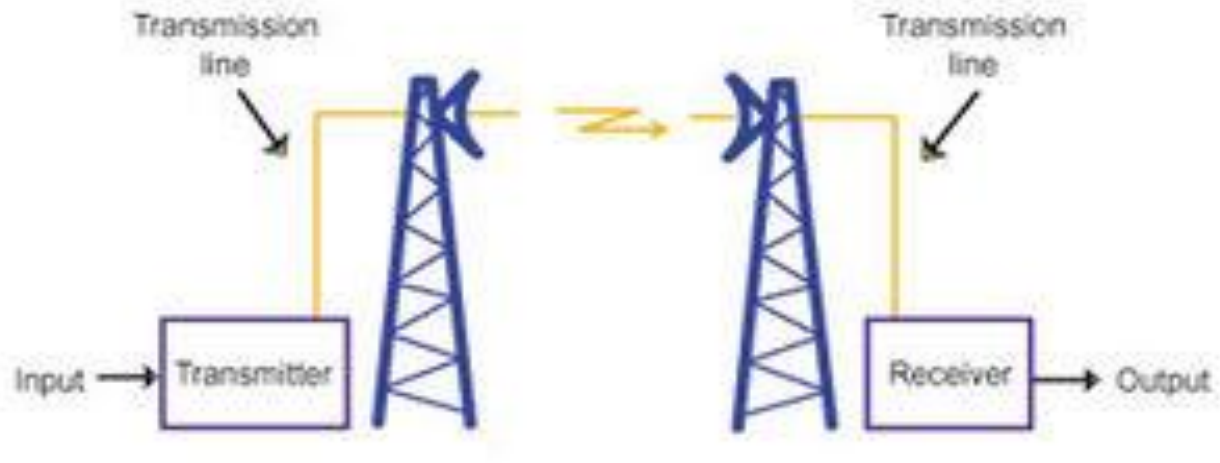
Disadvantages of Optical Fibre:

- Installation problem.
- Connecting either two fibres together on a light source to a fibre is a difficult process.
- Because of noise immunity, optical fibres are virtually impossible to tap.
- Light can reach the receiver out of phase.
- Most expensive.

Unguided media

1.Microwave:

- Microwave signals are used to transmit data without the use of cables.
- Microwave signals are similar to radio and television signals and are used for long distance communication.
- Microwave transmission consists of transmitter, receiver and the atmosphere



Advantages of microwave:

- It is cheaper
- Free from land acquisition right.
- It has the ability to communicate over oceans.

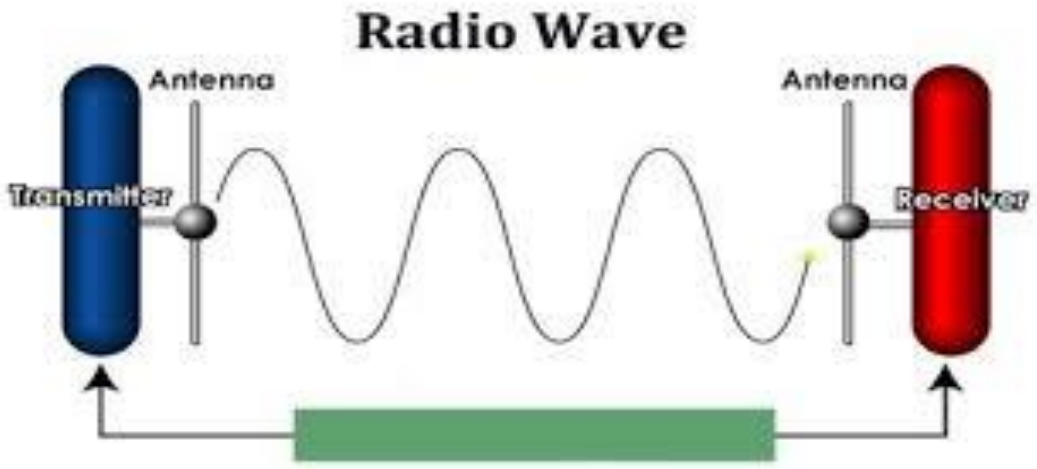
Disadvantages of Microwave:

- Insecure communication.
- Microwave propagation is susceptible to weather effects like rains, thunder storms etc.

- Cost of design, i implementation and maintenance of microwave links is high.

2. **Radio Wave:**

- The transmission making use of radio frequencies is termed as radio-wave transmission.
- All radios, today, use continuous sine waves to transmit information(audio,video,data).
- Any set up has two parts: The transmitter and the receiver.



Advantages of radio wave:

- Radio wave transmission offers mobility.
- It is cheaper
- Free from land acquisition right.

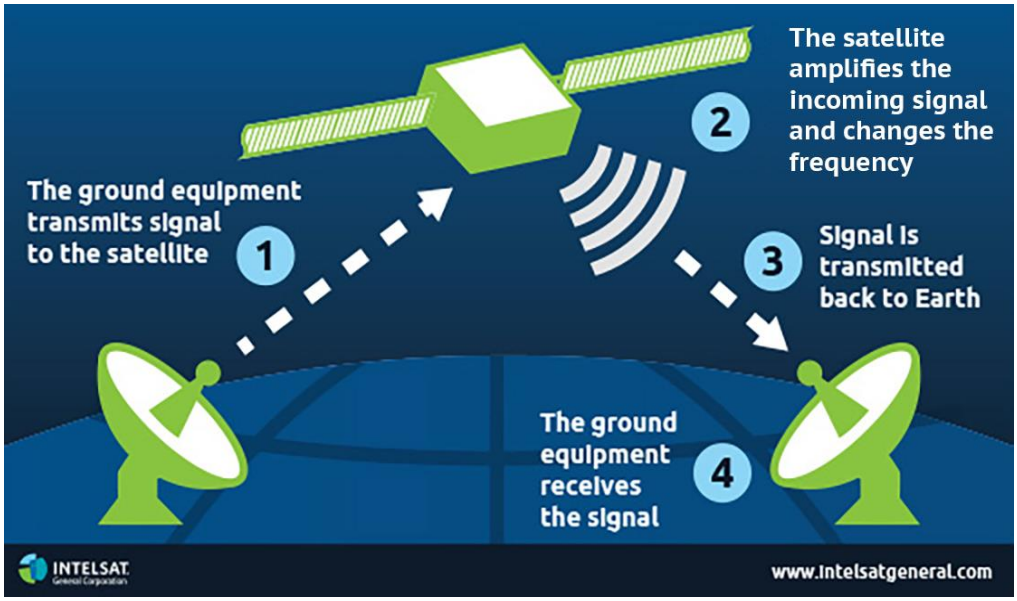
Disadvantages of radio wave:

- Insecure communication.
- Microwave propagation is susceptible to weather effects like rains, thunder storms etc.

3.Satellite Communication:

- A communications satellite is an artificial satellite that relays and amplifies radio telecommunications signals via a transponder;

- It creates a communication channel between a source transmitter and a receiver at different locations on Earth.
- Communications satellites are used for television, telephone, radio, internet, and military applications.



Advantages of satellite communication:

- The area coverage through satellite communication is quite large.
- The satellite proves to be best alternative where the laying and maintenance of intercontinental cable is difficult and expensive.
- The heavy use of intercontinental traffic makes the satellite communication attractive.
- Satellite can cover large areas of the earth.

Disadvantages of satellite communication:

- Technological limitations prevent the deployment of large, high gain antennas on the satellite platform.
- Over crowding of available bandwidths due to low antenna gains.
- High investment cost and insecure cost associated with significant probability of failure.

Other two popular unguide media:

i. **Infrared**: This type of transmission is used in TV remotes, Automotive garage doors, wireless speakers etc.

The infrared light transmits data through the air and can propagate throughout a room, but will not penetrate walls.

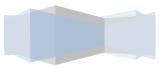
ii. **Laser**: It is point-to-point transmission, typically between buildings. It requires the use of a laser transmitter and a photo-sensitive receiver at each end.

Difference between guided media and unguided media:

BASIS FOR COMPARISON	GUIDED MEDIA	UNGUIDED MEDIA
Basic	The signal requires a physical path for transmission.	The signal is broadcasted through air or sometimes water.
Alternative name	It is called wired communication or bounded transmission media.	It is called wireless communication or unbounded transmission media.
Direction	It provides direction to signal for travelling.	It does not provide any direction.
Types	Twisted pair cable, coaxial cable and fibre optic cable.	Radio wave, microwave and infrared.

Modulation and demodulation:

Modulation is the process of varying one or more properties of a periodic waveform, called the *carrier signal*, with a modulating signal that typically contains information to be transmitted. A **modulator** is a device that performs modulation. A **demodulator** is a device that performs demodulation, the inverse of modulation. A modem can perform both operations.



Questions from this chapter:

1. Briefly explain different transmission media used in computer network? 5

2. Write the merits and demerits of any two guided transmission medium. 5

3. Differentiate between guided media and unguided media. 5

4. Define guided media. 2

5. Briefly explain merits and demerits of satellite communication. 5

6. Define modulation and demodulation. 2