Chapter 7.

Important topics from book

(i) Twisted cable

(ii) UTP and STP (with pictures)

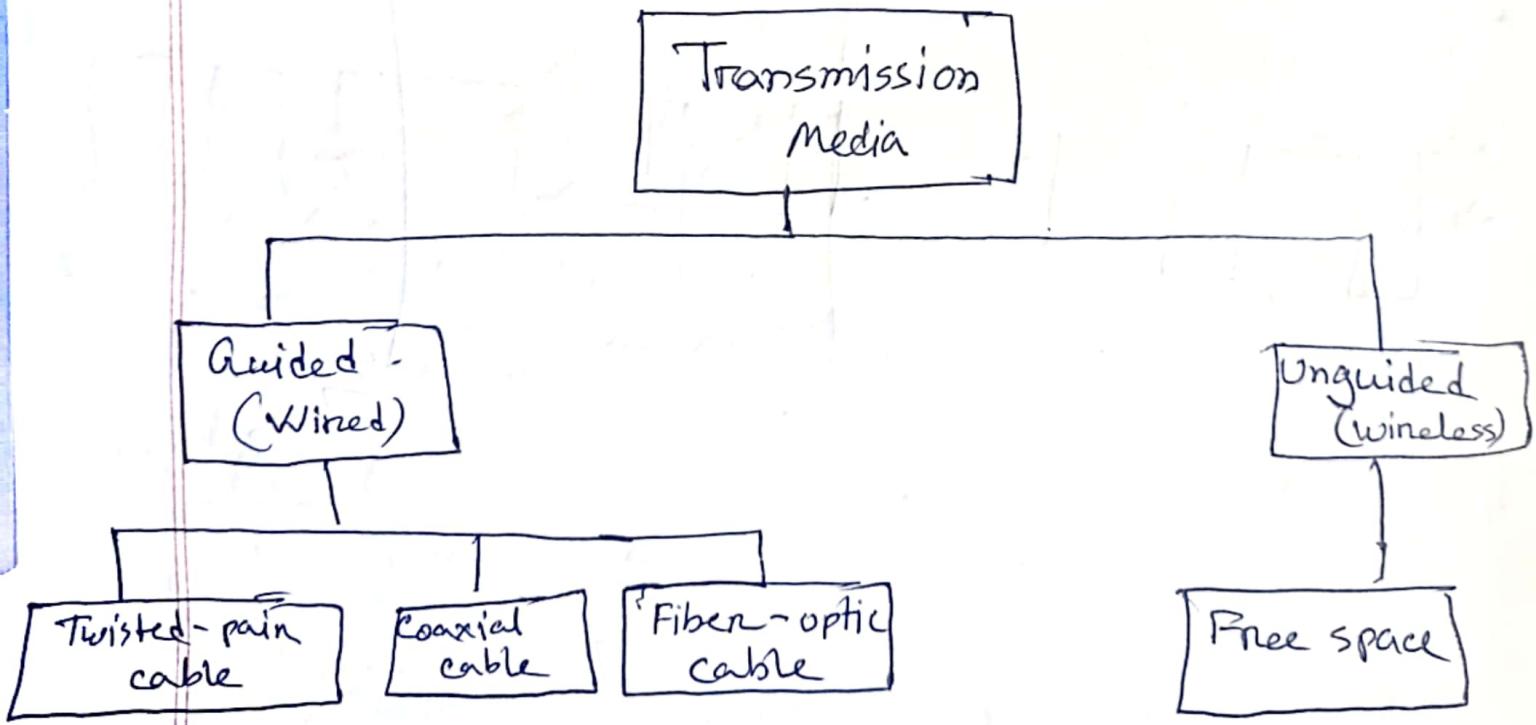
(iii) Connectons

(iv) Applications.

(v) Co-axile cable [picture]

(vi) Wireless media

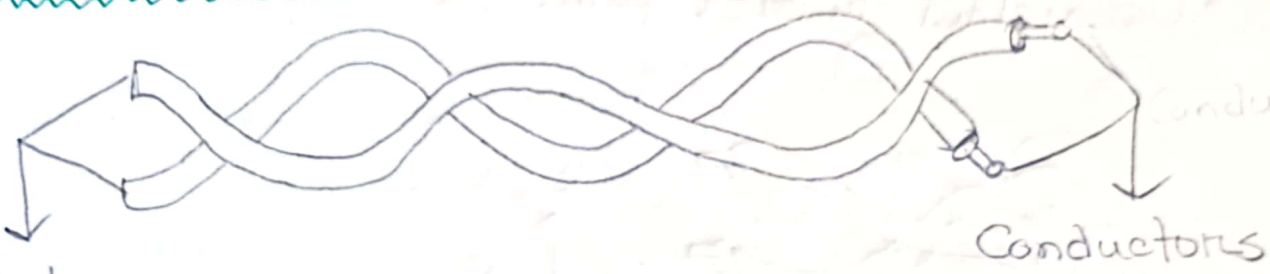
(vii) Propagation mode



Guided Media

That provide a conduit from one device to another..

(i) Twisted - Pair Cable



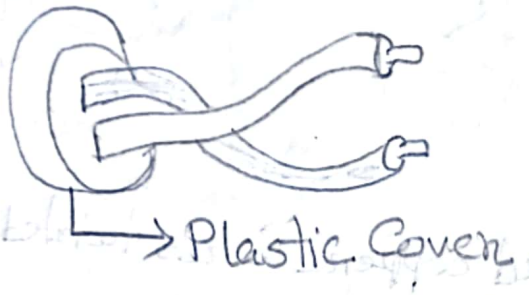
(i) Two separately insulated copper wires twisted together

(ii) Often "bundled" into cables

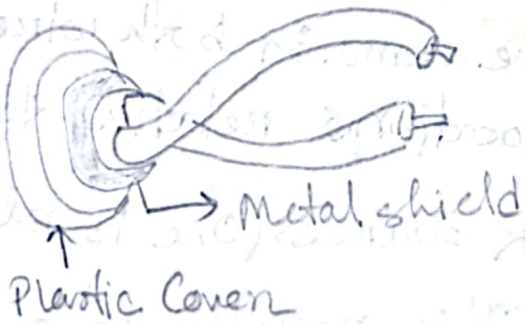
If the two wires are parallel, the effect of these unwanted signals is not the same in both wires because they are at different locations relative to the noise or ~~one~~ crosstalk sources (One is closer and another is farther). This results in a difference at the receiver. By twisting the pairs, a balance is maintained. For example, suppose in one twist, one wire is closer to the noise source and the other is further; in the next twist, the reverse is true. Twisting makes it probable that both wires are equally affected by external influ

(noise or crosstalk). This means that the receiver, which calculates the difference between the two, receives no unwanted signals.

- Unshielded twisted-pair cables (UTP)



- Shielded twisted-pair cables (STP)



Applications

(i) Most common medium

(ii) Telephone network

- Between house and local exchange. (subscriber loop)

(iii) Within buildings
- To private branch exchange (PBX)

(iv) For local area networks (LAN)
- 10 Mbps, 100 Mbps, 1 Gbps

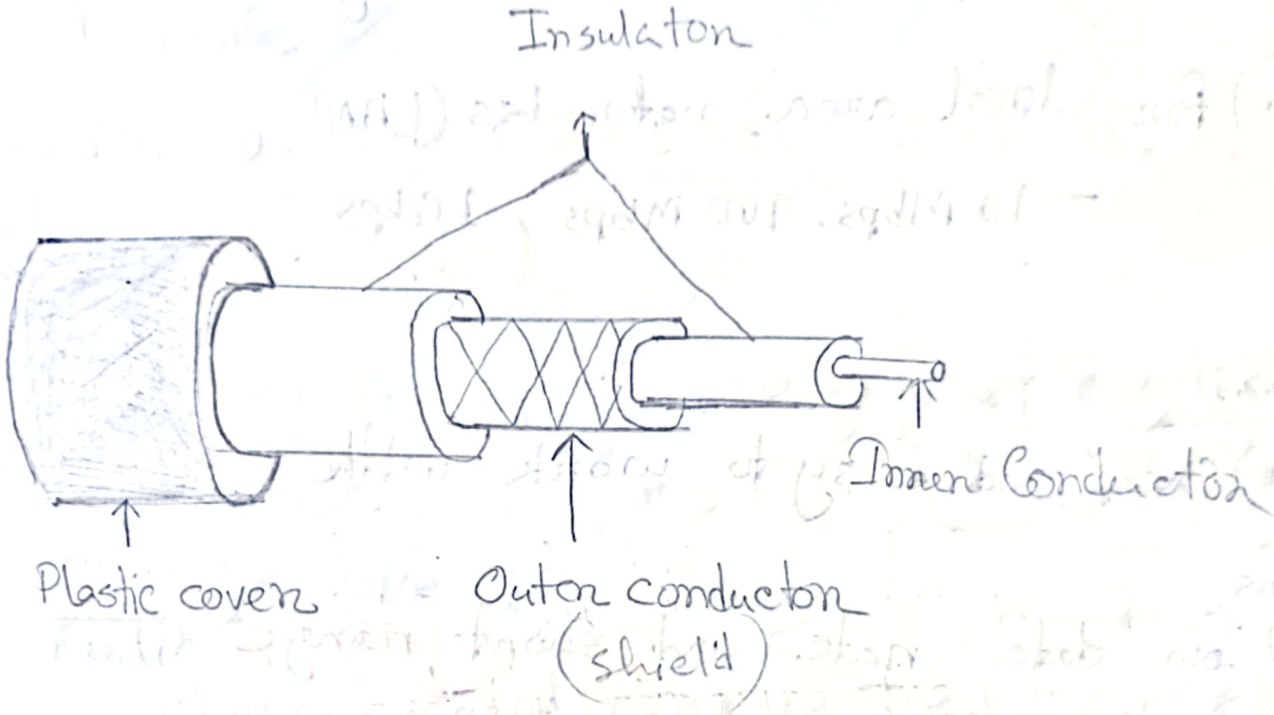
Pros
(i) Cheap and easy to work with

Cons
(i) Low data rate and short range

#Straight-through cable usage
(i) Switch to router
(ii) Switch to PC or Server
(iii) Hub to PC or Server

#Crossover cable usage
(i) Switch to switch
(ii) Switch to hub
(iii) Hub to hub
(iv) Router to router
(v) PC to PC
(vi) Router to PC

(ii) Coaxial Cable



Applicatin

(i) Cable TV (ii) Thin Ethernet (iii) Thick Ethernet

(iii) fiber - Optic cable

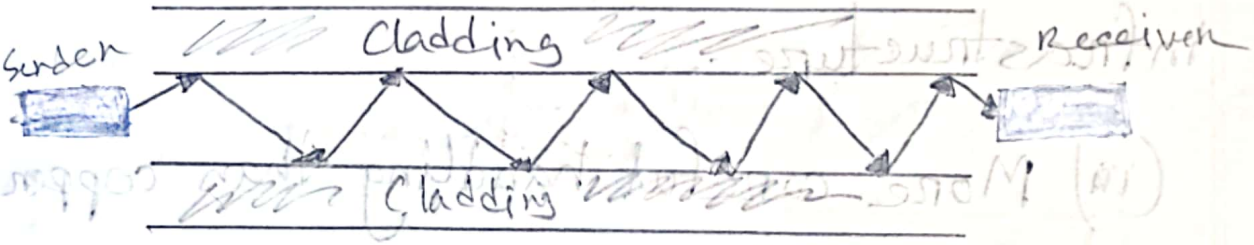
Physical description

(i) Made of glass / plastic and transmit signal in form of light.

(ii) Optical signal is carried by photon pulses through thin (8-10 microns) glass strands (optical fibers)

(iii) Light waves are produced either by light emitting diodes (LEDs) or injection laser diode (ILD)

(iv) At transmitting and receiving end, singnal is converted from and reconverted to electrical form by optical modems such as an avalanche photo diode



Benefits

(i) Greater capacity
- Data rates of hundreds of Gbps

(ii) Smaller size & weight

(iii) Lower attenuation

(iv) Electromagnetic isolation

(v) Greater repeater spacing
- 10s of km at least

(vi) Immunity to corrosive materials

(vii) More immune to tapping

Challenges

(i) More expensive (usually) than copper media over the same distance (but for a higher capacity)

(ii) Different skills and equipment required to terminate and splice the cable ~~infrastruct~~ infrastructure.

(iii) More careful handling than copper media.

Applications

(i) Long-haul trunks. 20,000 - 60,000

a. About 1500 km in length & ~~2000~~ voice channels.

b. Undersea optical fiber

(ii) Metropoliton trunks

a. About 12 km in length & 100,000 voice channels.

b. Underground conduits joining telephone exchanges.

(iii) Rural exchange trunks

a. About 40-160 km in length & less than 5000 voice channels

(iv) Subscriber loops

a. Handling voice, data, image and video

(v) LANs

a. Capacity of 100 Mbps to 1 Gbps

Transmission characteristics

(i) Act as wave guide for 10^{14} to 10^{15} Hz

a. Portions of infared and visible spectrum

(ii) Light Emitting Diode (LED)

a. Cheaper

b. Wider operating temp range

c. Last longer.

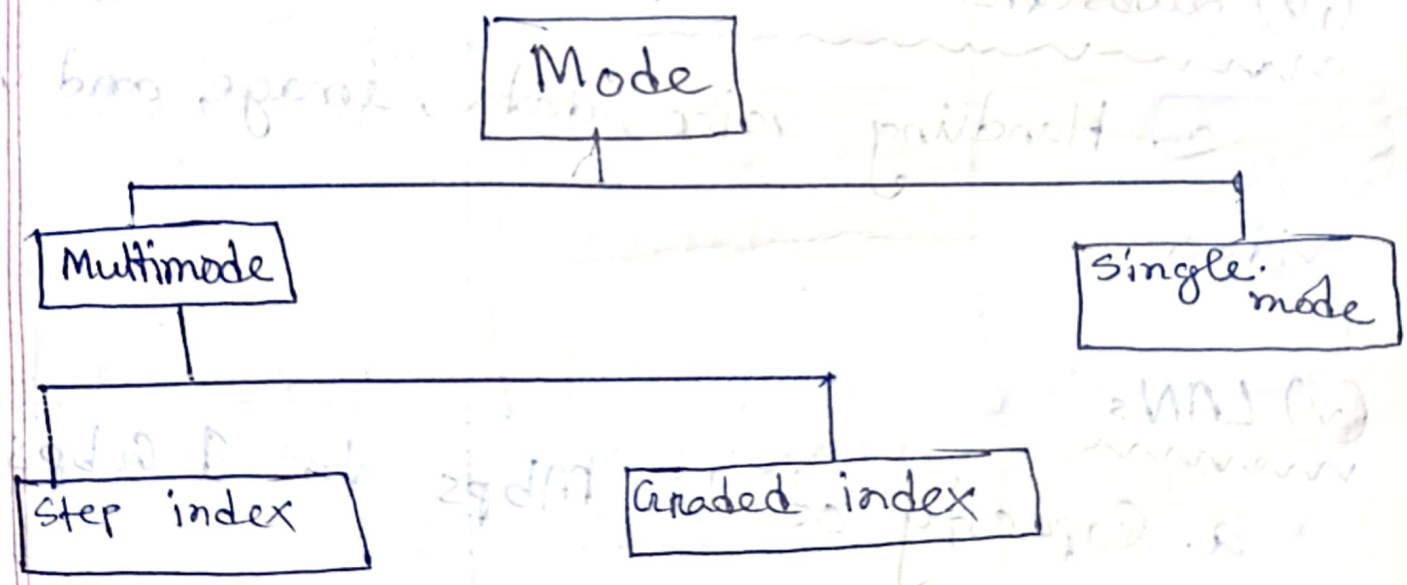
(iii) Injection Laser Diode (ILD)

a. More efficient

b. Greater data rate

(iv) Wavelength Division Multiplexing.

Propagation Modes

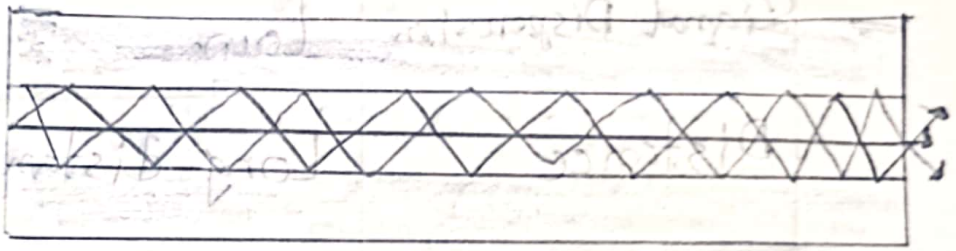


#Optical fiber Transmission Modes

~~(i) Mul~~

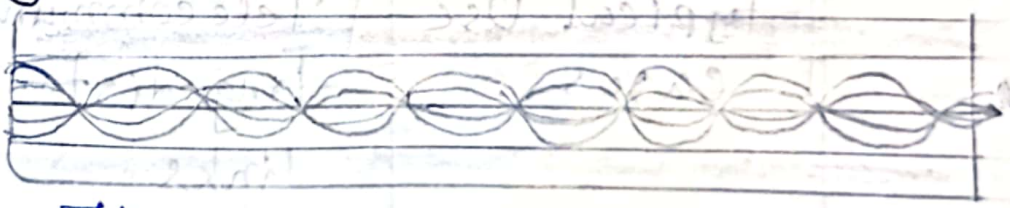
(i) Multimode step-index fiber

The reflective walls of the fiber move the light pulses to the receiver.



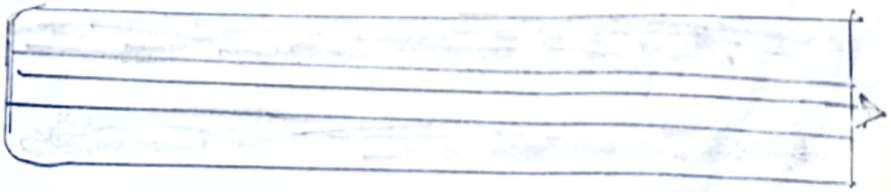
(ii) Multimode graded-index fiber

Acts to refract the light toward the center of the fiber by variations in the density



(iii) Single mode fiber

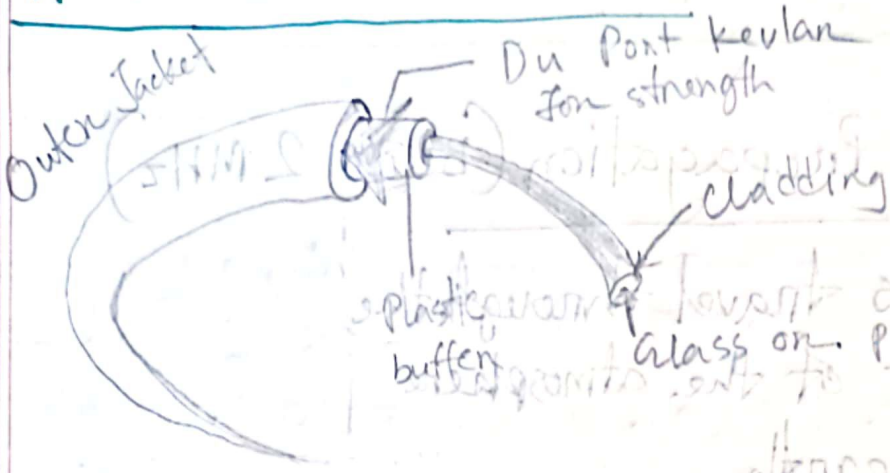
The light is guided down the center of an extremely narrow core.



#Single Mode Vs Multi Mode Transmission

Aspect	Single-mode	Multi-mode
Core Diameter	~~Small~~ Small	long (50 µm or above)
Modal Dispersion	Negligible	Significant
Signal Dispersion	Low	High
Distance	Long distance	Short to medium distance
Application	Long distance communication	Short-distance connections
Typical Use cases	Telecommunication, long-distance links	Data centers, campus networks

#Fiber Construction



Fiber-optic cable connectors : (i) SC connector
(ii) ST connector
(iii) MT-RJ connector

#Unguided Media

Unguided media transport electromagnetic waves without using a physical conductor. This type of communication is called wireless connection.

(i) Radio waves (ii) Microwaves

(iii) Infanred.

This chapter is full theory tical so read the book