

-: MODULATION :-

- Modulation is the process of changing the parameter of the carrier signal, in accordance with the instantaneous value of the Modulating Signal.

-: NEED FOR MODULATION :-

When the information signal are transmitted they carry original frequency but the original frequency of audio music etc is very less (3KHz) due to this low frequency communication is not possible as low frequency signal attenuate on the way and will not reach the Receiver there are three type of problem area while transmitting low frequency.

1. Size of antenna :- The Minimum size of antenna is $\lambda/4$ for transmission of a wave of wavelength for low frequency wave the wavelength is very high requiring a very large size antenna which is not possible.
2. Power transmitted :- The power transmitted by antenna is given by $P = (I/\lambda)^2$ as low frequency wave is very high wavelength so power transmitted is low.

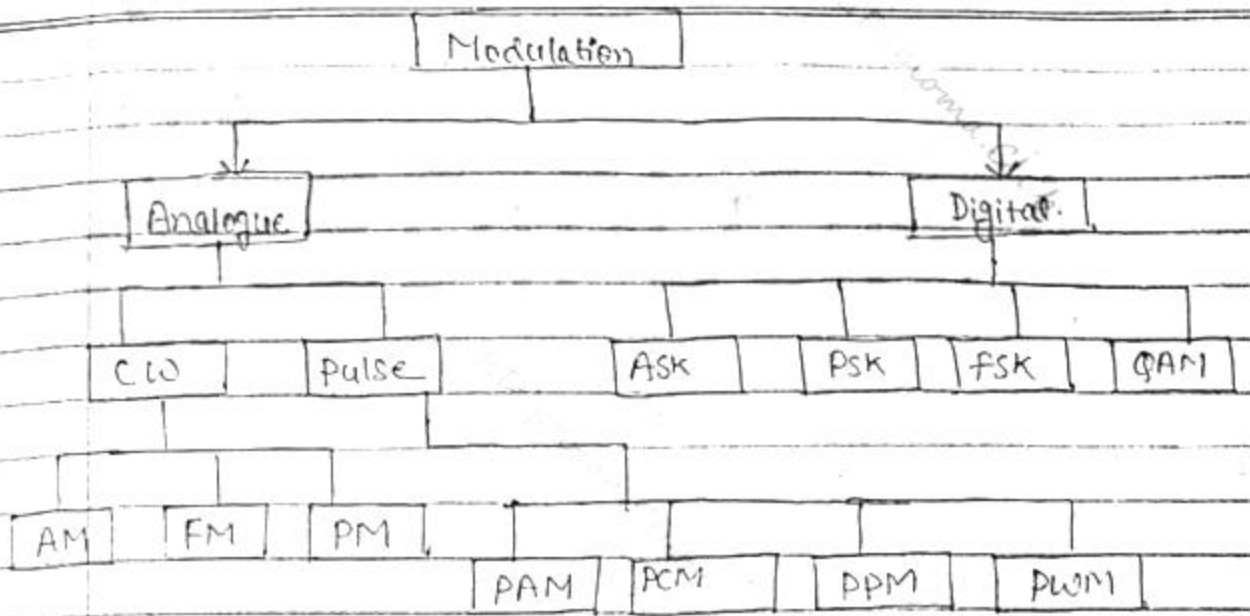
3. overlapping of transmitter :- As the range of frequency is less many transmitter have same frequency range and if two transmitter transmitter similar signal having same range of frequency the receiver will receive the signal and this will distorted the Message. To solve this issue we need Modulation to convert low to high frequency signal.

- Modulation is a process giving strength to the message so that it can travel a long distance that is combining low frequency message signal with high frequency carrier wave.

CLASSIFICATION OF MODULATION :-

it depend on type of Modulation signal it may be analogue or digital signal if the Modulating signal is analogue then it called analogue Modulation.

if the signal is digital that is called digital Modulation.



- CW - Continuous Wave.
- FM - Frequency Modulation.
- PAM - Pulse amplitude Modulation.
- PWM - Pulse width Modulation.
- ASK - Amplitude Shift Keying.
- PSK - Phase shift Keying.
- FSK - Frequency Shift Keying.
- QAM - Quadrature amplitude Modulation.
- PCM - Pulse code Modulation.
- AM - Amplitude Modulation.
- PM - Phase Modulation.
- PPM - pulse position Modulation.

- If carrier wave is sinusoidal wave form then it is this type of Modulation is called Continuous Modulation.
- If it is pulse wave then it is referred to as pulse Modulation.

- The aim of analog Modulation is to transfer an analog low pass signal over an analog band pass channel to ex a limited rad frequency band or a cable, TV network channel.
- The aim of PM is to transfer a digital bits stream over an analog band pass channel for ex over an PSTN (public switch telephone Network).

Analog: - In AM one of the characteristics (Amplitude frequency Phase) of a high frequency sinusoidal is change in direct proportion to the instantaneous amplitude of a base band signal.

- In digital Modulation low frequency analog signal are converted into a digital format before transmission.

COMPARISON ON ANALOG AND DIGITAL COMMUNICATION

<u>ANALOG</u>	<u>DIGITAL</u>
1. less Bandwidth.	1. large bandwidth.
2. More accurate.	2. less accurate due to quantization error that cannot be avoided or corrected.
3. Low noise immunity.	3. High noise immunity.
4. Low level of security.	4. High level of security as you can use encryption and authentication.
5. No signal coding & processing are used.	5. Support complex condition signal & processing technique such as source coding encryption and equalisation.
6. Low quality of service.	6. High quality of service.
7. you can use FDM only (Frequency Digital Modulation)	7. you can use FDM, TDM, CDM & OFDM Multiplexing technique.

ANALOG

8. In Communication analog Support Voice Service only.

9. More difficult to design than digital.

DIGITAL

8. In Mobile Communication digital Support Voice, SMS, data, image, video call.

9. Easy design using software.

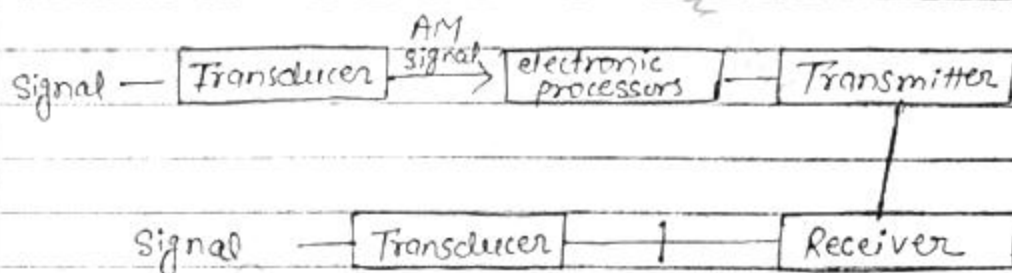
- Very low frequency — 10 to 30 KHz.
- low frequency — 30 to 300 KHz.
- Medium " — 300 — 3000 KHz.
- ~~very~~ high " — 3 — 30 MHz
- very high " — 30 — 300 MHz
- Ultra high " — 300 — 3000 MHz
- Super High frequency — 3000 to 30000 MHz.

∴ Basic idea of Radio Communication :-

→ Radio is the technology of using Radio Waves to Carry information such as Sound and image. Radio is the Radiation of Electromagnetic Signals through atmosphere or free space.

→ Information such as Sound is Carried by systematically changing some property of the Radiated Wave such as their amplitude, frequency, phase or pulse width.

→ When Radio Waves strike an Radiowave Conductor the oscillating field induced an AC current in the conductor the information in the waves can be extracted and transformed back into its original form.



Advantage :-

1. it is able to bounce inosphere so it could around the world.
2. it is also a cheap form of communication.
3. Radio communication can be possible where any satellite and cell phone service are not available.

DISADVANTAGE :-

1. it has low frequency so it cannot transmit alot of data at one time.
2. we cannot transfer video or picture.

Transmission Method used in communication :-

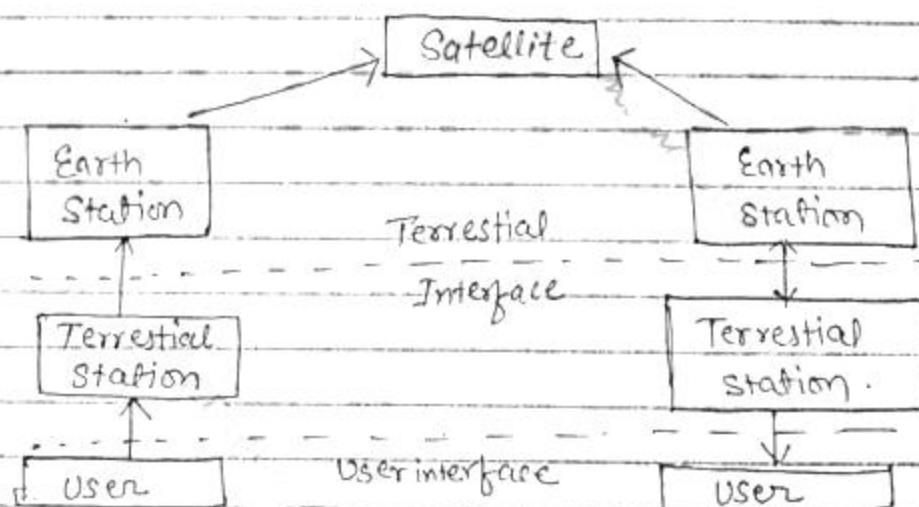
→ Microwave Communication :-

it is a line of site wireless communication technology that uses high frequency by radio waves to provide High Speed Wireless Connection that can send and receive voice, video and data information. Microwave ~~link~~ links are widely used for point-to-point communication because their small wavelength allows antennas to direct them in narrow beams which can be pointed directly at the receiving antenna. This allows thereby microwave equipment to use the same frequencies without interfering with each other as low frequency radio waves do.

→ SATELLITE COMMUNICATION :-

it is a radio relay station in orbit above earth. It receives, amplifies and redirects analog and digital signals carried on a specific radio frequency.

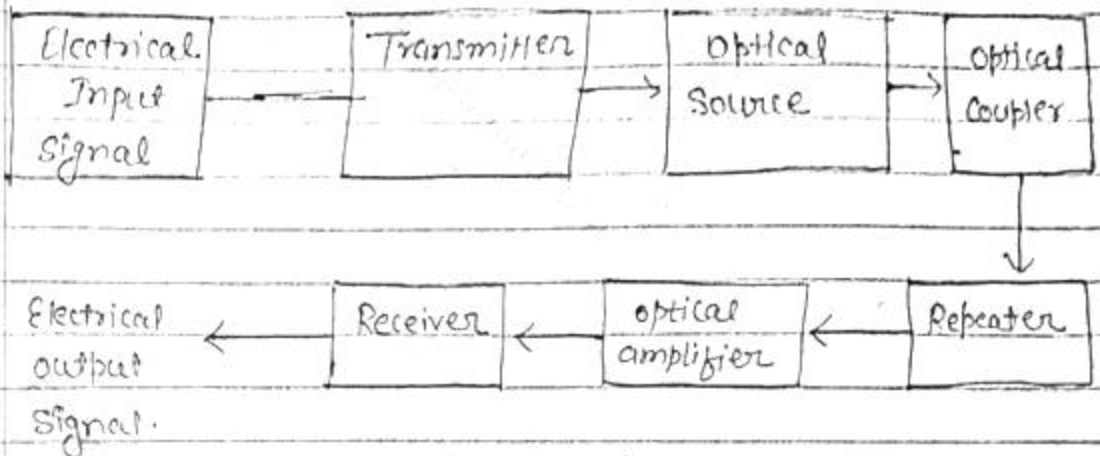
Element of Satellite Communication :-



- The user generate a baseband signal that proceeds through a terrestrial network and transmitted to a satellite at the earth station.
- The satellite consist of a large no of repeater in the space that perform the reception of modulated radio frequency carrier in its uplink frequency spectrum from all the earth station in the present network amplifies these carriers and transmits them back to the earth station in the downlink frequency station.
- In order to avoid the interference downlink frequency spectrum should be different from uplink frequency spectrum.
- The signal at the receiving earth station is processed to get back baseband signal it is send to the user through the terrestrial network.

- OPTICAL FIBRE -

An optical fibre is a flexible, transparent fibre made by glass (silica) or plastic to a diameter slightly thicker than that of a human hair. It works on the principle of Total Internal Reflection.



- The optical communication consists of three main elements: Transmitter, an electrical signal applied to the optical transmitter.

→ Transmission channel: - It consists of a cable that provides mechanical and environmental protection to the optical fibres contained inside. Each optical fibre acts as an individual channel.

- Receiver: - It consists of photodetector, amplifier and signal restore.

:- Mobile Communication System :-

A wireless form of communication in which voice and data information is emitted transmitted and receive through microwaves.

Mobile :- A cellular phone is a portable telephone that doesn't use a wired connection it connect to a wireless carrier network using radio waves.

- Mobile phone system consist of mobile station base station and MSC (Mobile switching centre).

:- How A CALL is MADE :-

When a mobile phone is turned on its scan forward control channel and select the one with highest strength when a call is placed to other mobile user MSC dispatches request to all the base station in cellular system the base station relief the acknowledgement sent by the mobile and inform MSC of Handshak.

MSC struck the base station to move the call to an unused voice channel within the cell at this point the base station signal the mobile to change frequency to an unused forward and reverse voice channel pair at which point another data message (called alert)

is transmitted over the forward voice channel to instruct the mobile phone to ring their by instructing the user to answer the phone.

Transmission line :-

Transmission line is a specialised cable or other structure design to conduct alternating current or Radio frequency i.e. currents with a frequency high enough that the wave nature must be taken into account. Transmission lines are used for purpose such as connecting the transmitter & Receiver with their antenna. (then they are called feed line) Distributing cable, television signal, trunk line routing call between telephone switching centre, Computer network connection and high speed computer database.

Types of Transmission line on the basis of Mode:-

1. Balance Transmission line :-

A Balance Transmission line consisting of two conductor of the same type each of which have equal impedance along their lengths and equal impedance to ground and two other circuit.

2. Unbalanced Transmission line :-

An Unbalanced line is a transmission line whose conductor have unequal impedance with respect to ground as a part to a balance line.

→ Type of Transmission line on the basis of Hardware :-

- 1) Open wire.
- 2) Twin wire
- 3) Co-axial wire
- 4) Optical fibre
- 5) twisted pair
- 6) Strip line.

1. Open wire :-

- An open wire transmission line is made up of two parallel wire/wire Non conductive spacers are used b/w the wires to separate and support them
- ⇒ the distance b/w the conducting wire is anywhere b/w 2 to 6 inches.

Advantage :-

1. The open wire transmission line pair is used to transmit acoustic waves for telephone application.
2. Simplicity in construction.

Disadvantage :-

1. High energy loss.
2. It is capable of picking up random signal resulting in interference (cross talk).

11) Twin Wire:-

parallel twin wire is often called flat twin wire and made up of two conductors separated by a dielectric plastic such as polyethylene.

- The distance between the conducting wire is 0.3 inches.

Advantage

1. it has low loss
2. Economically low.
3. it is flexible for easy of handling.

Disadvantage

1. it is most vulnerable to interference.
2. it most give away from metal object which can cause power loss.

Co-axial Cable or line:-

• The Co-axial cable consist of ²Center (inner) conductor in a dielectric that is included by a metallic shield which is a flexible braided conductor of copper.

- it are usually thin glass wire which are used to transmit optical signals. Their diameter is nearly