CHAPTER 2

Transmission and Reception

LEARNING OBJECTIVE

TMOLP

In this chapter, the students can easily…..

- Understand the modulation and demodulation
- Learn the difference between analog modulation and pulse modulation.
- Learn the function of modem
- Study about the different types of modem
- Understand the different types of antenna and its uses

CONTENT

2.1 Introduction

Any message or data want to be sent from one place to another through any media is known as transmission. Earlier the transmission was successful to a short distance, later it was possible to a very long distances, because of modulation. The ultimate aim of transmission is to reach a receiver.

A device which can receive the transmitted signal is known as receiver. The transmitted signals have to demodulate in order to get the actual message or data. So in this chapter we learn about modulation, demodulation and devices that are used to transmit and receive the signal (i.e.,) antenna.

2.2 Principles of Transmission and Reception

Transmission and reception are the most important technique for the communication system. A microphone converts the audio frequencies (20Hz to 20 kHz) into audio electrical signal. The signal is weak so it needs to be strengthened using amplifier.

Audio signals can travel only to a short distance without any signal loss. The Carrier Wave (CW) or Radio Frequency (RF) can travel 3 x 10^8 meter per second. The process of superimposing audio signal over the carrier wave is known as Modulation. The modulated wave is radiated and travels through space, finally it reaches the receiving antenna.

After receiving the signal by the receiving antenna, it enters the receiver. In order to get back the original audio signal, the RF should be removed by using simple detector circuit which is called as detection or Demodulation.
The demodulated signal is amplified and fed to the loudspeaker. It converts audio electrical signal into audio sound signal.

2.3 Modulation

Modulation is the process of changing the characteristic (amplitude, frequency or phase) of the carrier signal, in accordance with the amplitude of the message signal. A device that performs modulation is called modulator.

2.3.1 Need for modulation

1. Separation of signal from different transmitters.

   Audio frequencies are within the range of 20 Hz to 20 kHz. Without modulation, all signals at same frequencies from different transmitters would be mixed up. There by giving impossible situation to tune to any one station particular transmitters. In order to separate the various signals, radio stations must broad cast at different frequencies. This is achieved by process of modulation.

2. Size of antenna

   Antennas should have length at least equal to a half of the wavelength of the signal to be transmitted.

   For an electromagnetic wave of frequency 15 kHz,

   The wavelength $\lambda = c/f = 3x10^8 / 15k$
   $= 300000000/15000 = 20$ km

   It is impossible to built ($\lambda/2=20/2$) 10 km antenna. In modulation, signal which of low frequency are translated to the high frequency of the electromagnetic spectrum using radio waves.

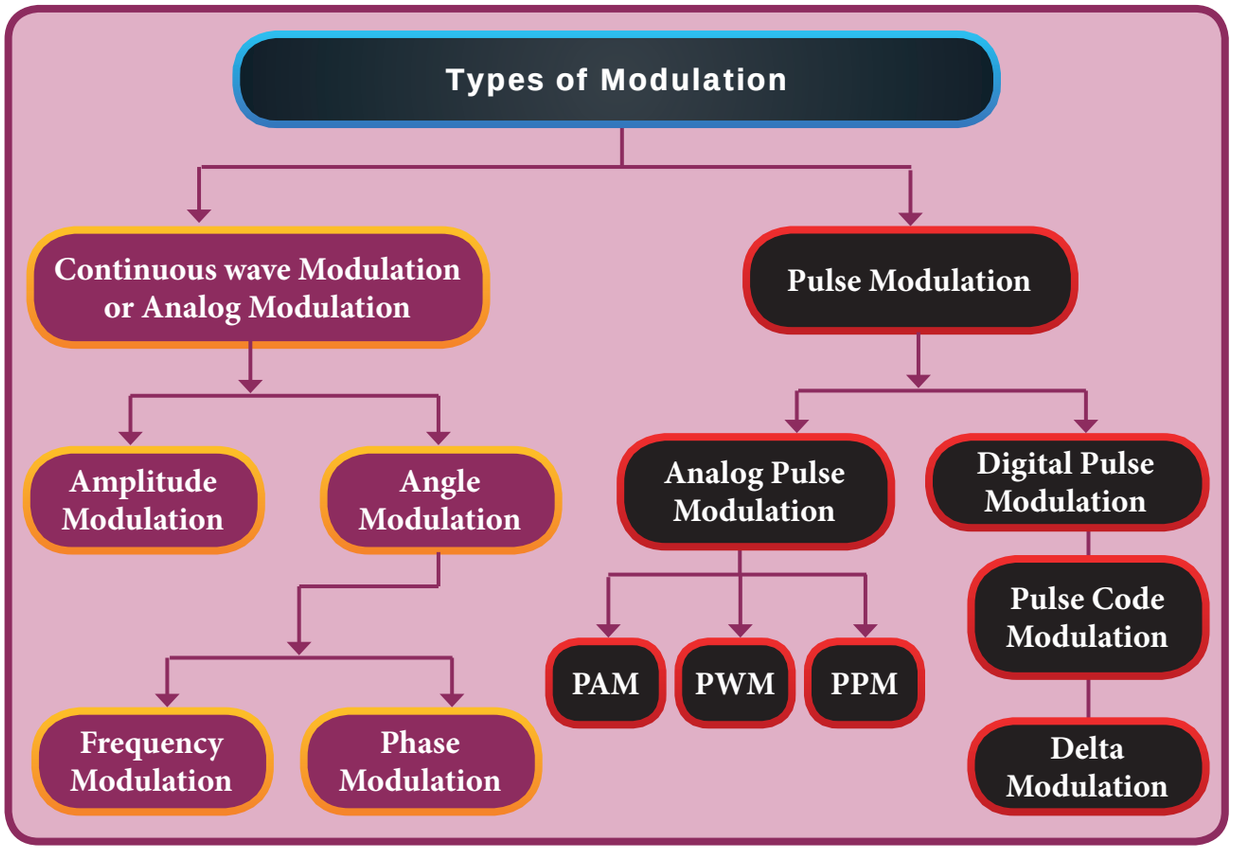
3. It reduce antenna height
4. It reduce bandwidth
5. It transmit information to a long distance without interference.
6. Attenuation of audio signals are high.

2.4 Types of Modulation

The modulation may be classified according to the nature of carrier wave into

1. Continuous wave modulation or Analog modulation
2. Pulse modulation

Classification of modulation is given below in the flow chart.



2.5 Analog Modulation

In analog modulation, analog signal (Sinusoidal signal) is used as a carrier signal that modulated the message signal or data signal. Three parameters of sinusoidal waves are amplitude, frequency and phase. So the types of analog modulation are

1. Amplitude Modulation (AM)
2. Frequency Modulation (FM)
3. Phase Modulation (PM)

2.5.1 Amplitude Modulation (AM)

Amplitude modulation is a type of modulation where the amplitude of the carrier signal is varied (changed) in accordance with the amplitude of the message signal while the frequency and phase of carrier signal remain constant.

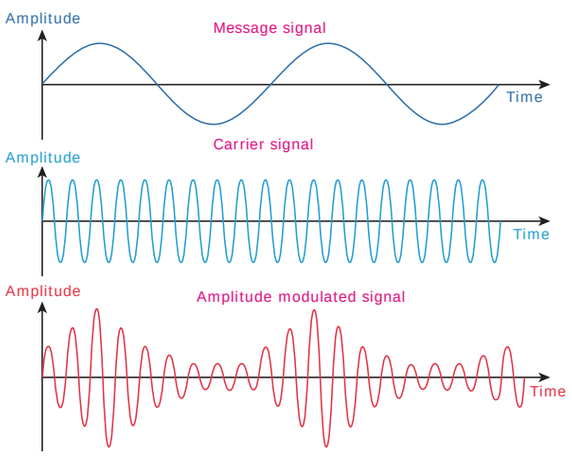


FIGURE 2.1 Amplitude modulation

The first waveform of figure 2.1 shows the modulating signal (or) message signal which contains information. The second waveform of figure 2.1 shows the high frequency carrier signal which contains no information. The third waveform of figure 2.1 shows the resultant amplitude modulated signal.

From the above three figures, it can be observed that the amplitude of the carrier signal is varied in accordance with the amplitude of the message signal while the frequency and phase of carrier signal remain constant.

2.5.1.1 AM advantages

- AM is the simplest types of modulation.
- Hardware design of both transmitter and receiver is very simple and less cost effective.

2.5.1.2 Disadvantages

1. Low efficiency
2. Limited operating range
3. Noise in reception
4. Poor audio quality

2.5.1.3 Applications

- This type of modulation is used in AM radio broad casting.
- It is also used in computer modem.

2.5.2 Frequency Modulation

Frequency modulation is a type of modulation where the frequency of the carrier signal is varied in accordance with the amplitude of the message signal while amplitude and phase of carrier signal remain constant.

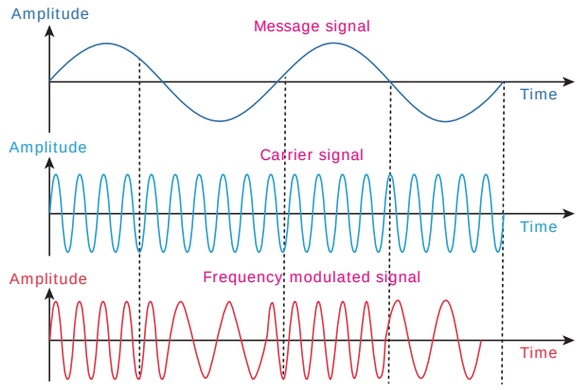


FIGURE 2.2 Frequency modulation

The figure 2.2 shows the frequency modulation. The first waveform of figure 2.2 shows the modulating signal which contains information. The second waveform of figure 2.2 shows the high frequency carrier signal contain no information. The third waveform of figure 2.2 shows the resultant frequency modulated signal. From the above three figures, it can be observed that the frequency of the carrier signal is varied in accordance with the amplitude of message signal. While the amplitude of the carrier signal remain constant.

2.5.2.1 FM advantages

- Much more bandwidth
- Less Radiated Power

2.5.2.2 Disadvantages

Circuit needed for FM modulation and demodulation is slightly complicated than AM.

2.5.2.3 Application

This type of modulation is used in FM Radio broadcasting.

2.5.3 Phase modulation

Phase modulation is a type of modulation where the phase of the carrier signal is varied (changed) in accordance with the phase of the carrier signal, keeping the amplitude and frequency of the carrier signal constant level.

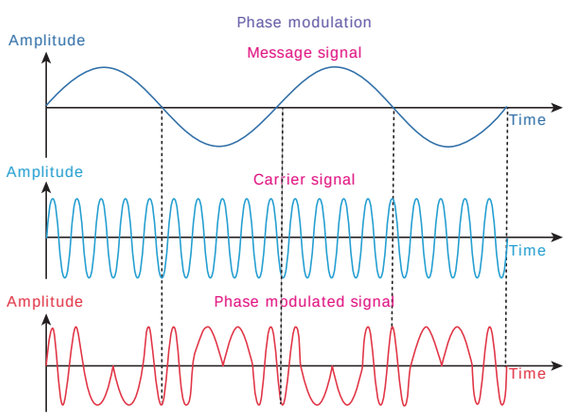


FIGURE 2.3 Phase modulation

The figure 2.3 shows the phase modulation. The first waveform of

figure 2.3(a) shows the modulating signal which contains information. The second waveform figure 2.3(b) shows the high frequency carrier signal which contains no information. The waveform figure 2.3(c) shows the resultant phase modulated signal.

From above the three figures it can be observed that the phase of the carrier signal is varied in accordance with the instant amplitude of the message signal. In this type of modulation, when the phase is changed, it also affects the frequency, so this modulation also comes under frequency modulation.

The frequency and phase modulation comes under angle modulation. When the frequency or phase of the carrier signal is varied in accordance with the amplitude of the modulating or message signal, then it is called angle modulation.

2.5.3.1 Advantages of Phase Modulation

1. Modulation does not catch any channal noise.
2. Low power consumption

2.5.3.2 Disadvantages of Phase Modulation

Circuit used for Phase Modulation and demodulation is complicated than AM and FM.

2.5.3.3 Applications

This type of modulation is used in

- SatelliteCommunication
- TV remote
- Wi-Fi.

Frequency modulation and phase modulation are also called angle modulation.

2.6 Pulse Modulation

In pulse modulation a message signal is converted from analog to digital message and then modulated by using carrier waves. Pulse modulation is a process in which the signal is transmitted in the form of pulses.

2.6.1 Types of Pulse Modulation

This is divided into

1. Analog Pulse Modulation
2. Digital Pulse Modulation

Analog Pulse Modulation is further classified as

- Pulse Amplitude Modulation (PAM)
- Pulse Width Modulation (PWM)
- Pulse Position Modulation (PPM)

Though Digital Pulse Modulation has more number of classifications, here we are going to study only two kinds of it.

- Pulse Code Modulation (PCM)
- Delta Modulation (DM)

2.6.2 Analog Pulse Modulation

2.6.2.1 Pulse Amplitude Modulation (PAM)

Pulse Amplitude Modulation is a technique in which the amplitude of each pulse is controlled by the instantaneous amplitude of the modulation signal. It is a modulation system in which the signal is sampled at regular intervals and each sample is made proportional to the amplitude of the signal at the instant of sampling. It transmits the data by encoding in the amplitude as a series of pulses. It is similar to amplitude modulation. Figure 2.4 shows pulse amplitude modulation

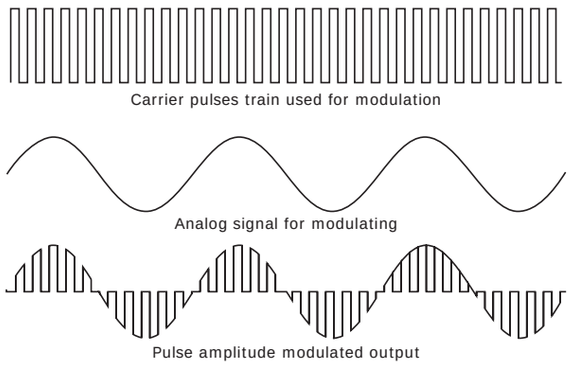


FIGURE 2.4 Pulse amplitude modulation

2.6.2.1 Advantage

Generation and detection is easy.

2.6.2.2 Disadvantages

1. Noise interference is high.
2. Transmission bandwidth is too large.

2.6.2.3 Application of Pulse Amplitude Modulation (PAM)

It is used in many micro controllers for generating the control signals and used in Photobiology.

2.6.3 Pulse Width Modulation (PWM)

Pulse width modulation or pulse duration modulation is a modulation process used in mask communication systems for encoding the amplitude of a signal into a pulse width or duration of another signal, usually a carrier signal, for transmission. Figure 2.5 shows pulse width modulation signal.

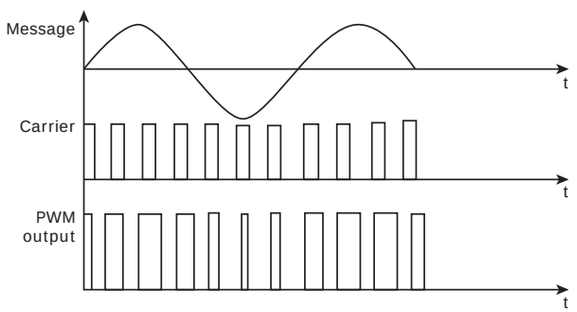


FIGURE 2.5 Pulse Width Modulation

2.6.3.1 Advantage of PWM

Noise interference is less.

2.6.3.2 Disadvantage of PWM

High switching loss occur in this type.

2.6.3.3 Application

It is used to control the direction of a servometer.

2.6.4 Pulse Position Modulation (PPM)

PPM is a modulation in which the amplitude and width are kept constant but the position of each pulse is varied in accordance with the amplitude of the modulating signal. Figure 2.6 shows pulse position modulation signal.

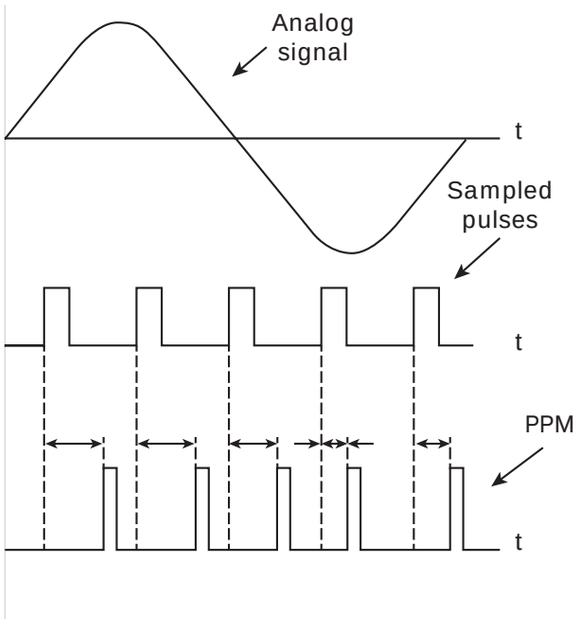


FIGURE 2.6 Pulse Position Modulation

2.6.4.1 Advantage

Noise interference is very low.

2.6.4.2 Disadvantage

The synchronisation between transmitter and receiver is required. It is not possible for every time.

2.6.4.3 Application

It is mostly used in RF communication.

2.6.5 Digital Pulse Modulation (DPM)

The digital modulation is employed for efficient communication. The main advantages of the digital modulation over analog modulation include high noise immunity, bandwidth and permissible power. In digital modulation the modulating signal is converted from analog to digital.

2.6.5.1 Pulse Code modulation (PCM)

The pulse code modulation is the method of converting analog signal into a digital signal (i.e.,) 1s and 0s. As the resultant signal is a coded pulse train, this is called as pulse code modulation.

The following figure 2.7 shows example of PCM output with respect to instantaneous values of a given sine wave.

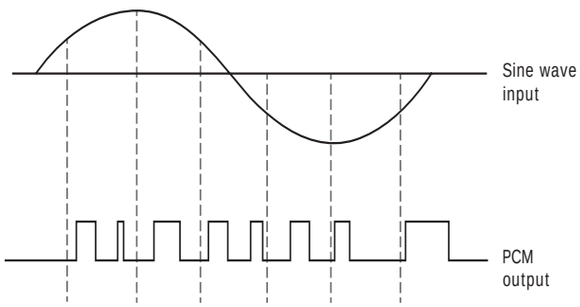


FIGURE 2.7 Pulse Code Modulation

2.6.5.2 Advantage of Pulse Code Modulation

It is more convenient for long distance communication.

2.6.5.3 Disadvantage of Pulse Code Modulation

It requires larger bandwidth.

2.6.5.4 Application

It is used in the satellite communication and space communication.

2.6.6 Delta Modulation (DM)

A Delta Modulation is an analog to digital and digital to analog signal conversion technique used for transmission of voice information where quality is not of primary importance. DM is the simplest form of pulse code modulation. In delta modulation, the transmitted data are reduced to 1bit data stream. Figure 2.8 shows Delta Modulation signal.

2.6.6.1 Advantage

It has lower bandwidth

2.6.6.2 Disadvantage

Overload distortion occur in this type of modulation.

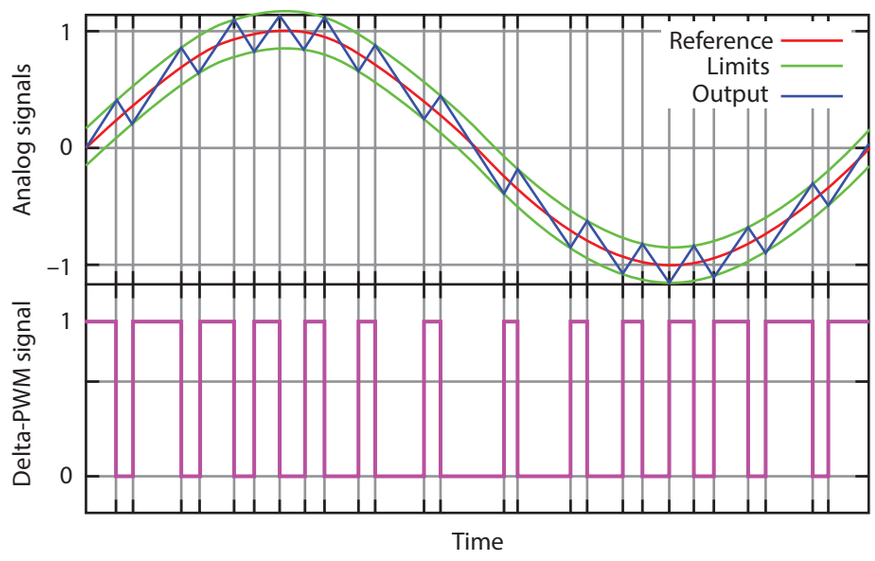


FIGURE 2.8 Delta Modulation

Difference between Continuous Wave Modulation and Pulse Modulation	
Continuous wave modulation or Analog modulation	**Pulse modulation**
The modulated signal is in the form of continuous signals.	The modulated signal is in the form of pulses.
It is not used for sampling technique.	It is used for sampling technique.
It require less bandwidth.	It require large bandwidth.
It has only analog modulation.	Pulse modulation has both analog and digital nature.
High frequency sine wave is used as carrier.	In pulse modulation, the train of pulses is used as a carrier.
Input signal is analog signal only.	The input signal is either analog or digital.
The example of continuous wave modulation is AM (Amplitude Modulation), FM (Frequency Modulation) and PM (Phase Modulation).	The example of pulse modulation is PAM, PPM, PWM, PCM and DM.
It is used in radio and TV broadcasting.	It is used in satellite communication.

2.6.6.3 Application

It is mainly used in voice transmission applications such as telephone and radio communication.

2.7 Demodulation or Detection

Demodulation or detection is a process of recovering the original modulating signal from the modulated carrier wave. (ie) the demodulation is the reverse process of modulation. The devices used for demodulation are called demodulators or detectors.

2.7.1 Necessity of Demodulation

The wireless signals transmitted from a transmitter consist of RF carrier waves and audio frequency signal waves. If the modulated wave is directly fed to the loudspeaker, no sound will be heard from the loudspeaker. This is because of the simple reason that the frequency of the carrier wave is very high and the loudspeaker diaphragm cannot respond to such high frequencies due to large inertia of their vibrating discs etc. Such RF wave does not produces any effect on human ear as their frequencies are much beyond the audible frequency range (20Hz to 20KHz approximately). Hence it becomes essential to separate the audio signal from the modulated carrier wave.

2.8 Modem

Modem stands for Modulator / Demodulator. A modem converts digital signals generated by the computer into analog signals which can be transmitted over a telephone or cable lines and transforms incoming analog signals into their digital equivalents. It is a hardware device that allows a computer or other devices such as a router or a switch to access. Figure 2.9 shows the different types of Modem.

2.8.1 Working of modem

Figure 2.10 shows the working principle of Modem. A Modem is typically used to send digital data over a phone line. The sending modem modulates the data (Digital) into a signal (Analog) that is compatible with the phone line and the receiving modem demodulates the signal back (Analog) into

FIGURE 2.9 Types of Modem

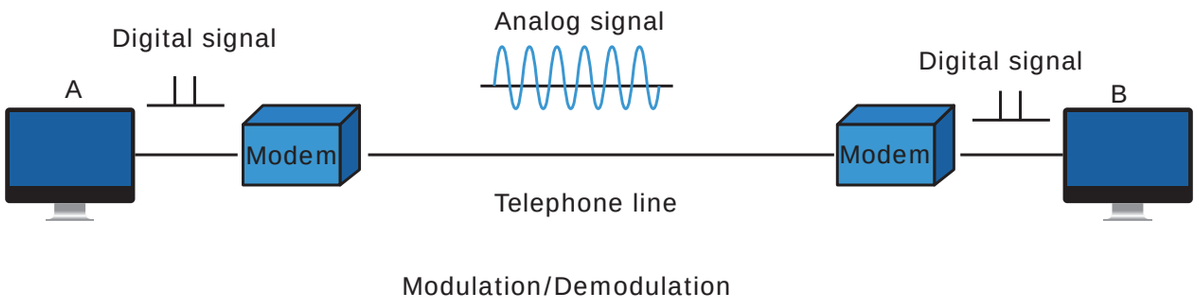


FIGURE 2.10 Modem

digital data. Wireless modem converts digital data into radio signals and back.

2.8.2 Types of Modem

1. On the basis of directional capacity, modems are divded into half- duplex modem and full- duplex modem.
2. On the basis of connection to the line, they are classified into 2-wire modem and 4-wire modem.
3. On the basis of transmission mode they are diveded into asynchronous modem and synchronous modem

2.8.2.1 Half- duplex Modem

Figure 2.11 shows the half- duplex modem. The term half-duplex means that the signal can travel in either direction, but the transmission will take place in only one direction at a time. These modems have only one carrier frequency. This type of arrangement uses more channel bandwidth and the data communication takes place at a very slow rate.

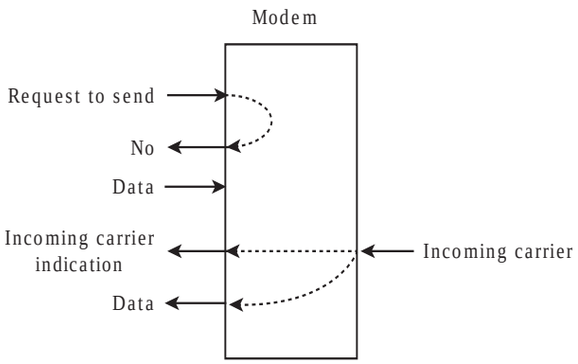


FIG 2.11 Half-duplex modem

2.8.2.2 Full- duplex Modem

Figure 2.12 shows the full – duplex modem. These modems can transmit in both directions simultaneously. They also make use of two carrier frequencies (one for each direction). Each carrier makes use of half of the bandwidth which is available to it. The process of transmission and receiving of data by this modem can take place at full speed.

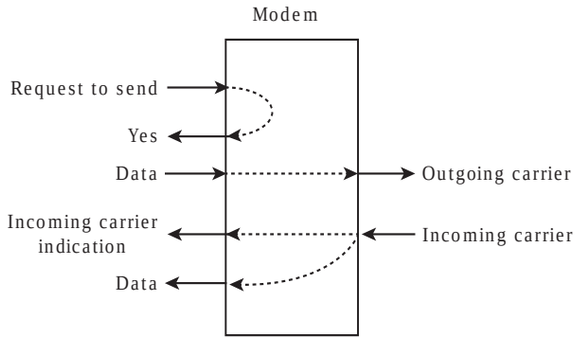


FIGURE 2.12 Full-duplex modem

2.8.2.3 2-Wire Modem

Figure 2.13 shows the 2-wire modem. These modems make use of the same pair of wires for outgoing and incoming carriers. Due to the use of only one pair of wires which is extended into the subscribers location, this type of leased 2-wire connection is less expensive than the 4-wire connection.

2.8.2.4 4-Wire Modem

Figure 2.14 shows the 4-wire modem. In this type of connection, separate wires are used for incoming and outgoing carrier. Data can be transmitted on half and full-duplex mode through these settings. The same carrier frequency can be used for transmissions in both directions as the physical path is separate for each in this case.

2.8.2.5 Synchronous Modem

Figure 2.15 shows the synchronous modem. Synchronous modem can handle a continuous stream of data bits but requires a clock signal. The data bits are always synchronized to the clock signal There are separate bits for the data bits being transmitted and received.

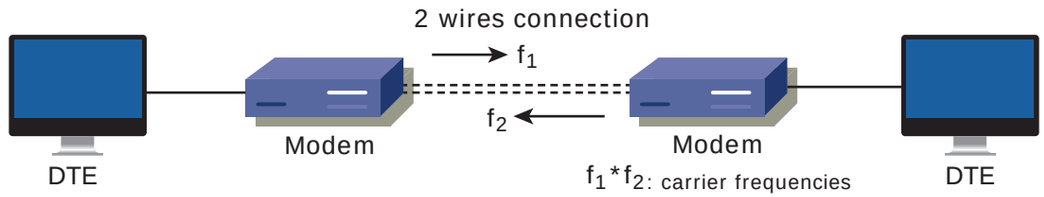


FIGURE 2.13 2-Wire Modem

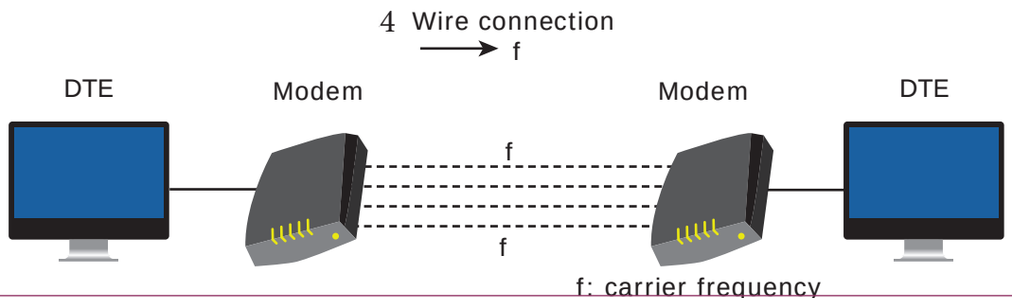


FIGURE 2.14 4-wire Modem

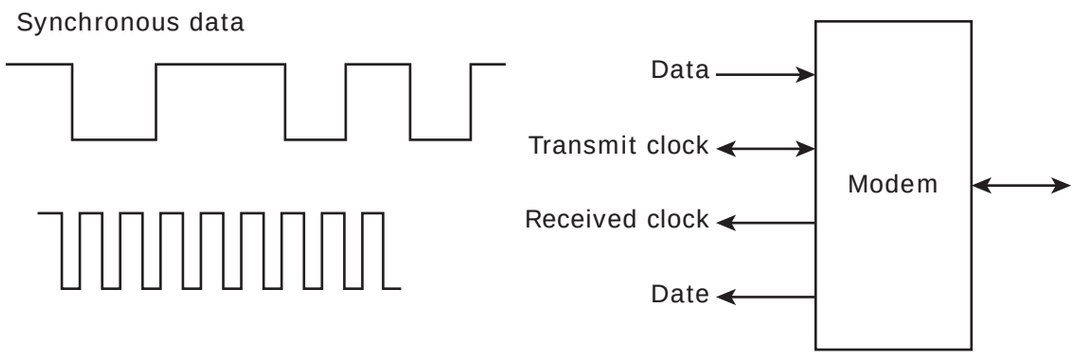


FIGURE 2.15 Synchronous Modem

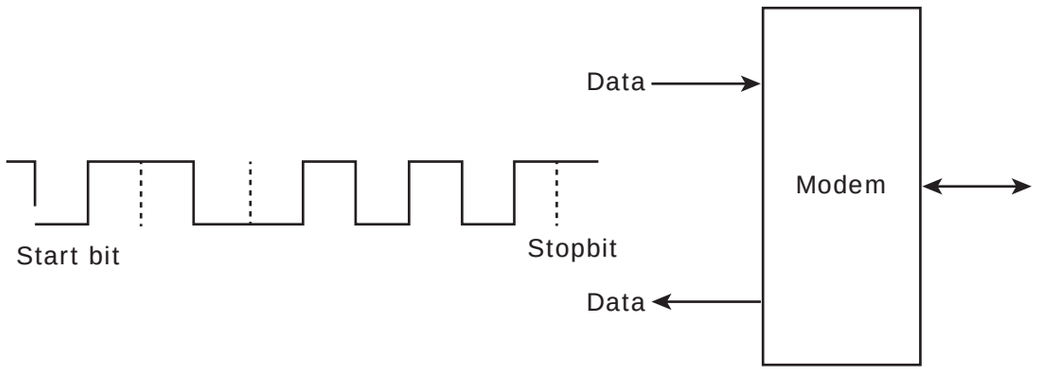


FIGURE 2.16 Asynchronous Modem

2.8.2.6 Asynchronous Modem

Figure 2.16 shows the Asynchronous modem. Asynchronous modem can handle data bytes with start and stop bits. There is no separate timing signal or clock between the modem and the DTE. The internal timing pulses are synchronized to the leading edge of the start pulse.

2.8.2.7 Applications of Modem

Modems were originally used for connecting users to the internet or for sending faxes, but a majority of modems in use today are used by businesses in a variety of different applications. Some of these applications include data transfers, remote management, broadband backup, point of scale, machine to machine among many others.

2.9 Antenna

An antenna is a transducer that converts Radio Frequency (RF) signal into electrical signal or electrical signal into radio Frequency signal. Antennas are used for both the purpose of transmitting and receiving. Antennas play an important role in the communication system. They are designed for different applications, with different materials, structures for better communication.

Antennas are essential components of all radio equipment, and are used in Radio broadcasting, Television broadcasting, Two way radio, Communication receiver, Radar, Satellite communications and other devices.

2.9.1 History of Antenna

The first antenna was built in 1888 by German physicist Heinrich Hertz. He developed wireless communication system in which he forced an electrical spark to occur in the gap of dipole antenna. He used a loop antenna as a receiver and observed a similar disturbance. By 1901, Marconi was sending information across the Atlantic. For a transmit antenna he used several wires attached to the ground across the antenna ocean the receiver antenna was a 200 m wire help up by a kite.

2.9.2 Properties of Antenna

- Antenna Gain
- Aperture
- Directivity and bandwidth
- Polarization
- Effective length
- Polar diagram

2.9.2.1 Antena Gain

Antenna gain describes how much power is transmitted in the direction of peak radiation to that of an isotropic source.

Gain (G) = power radiated by an antenna/ power radiated by reference antenna

2.9.2.2 Aperture

It is also known as the effective aperture of the antenna that actively participate in transmission and reception of electromagnetic waves. The power received by the antenna gets associated with collective area. This collective area is known as effective aperture.

2.9.2.3 Directivity and bandwidth

It is defined as the measure of concentrated power radiation in a particular direction. Bandwidth can be defined as the range of frequencies over which an antenna can properly radiates energy and receives energy.

2.9.2.4 Polarization

An electromagnetic wave launched from an antenna may be polarized vertically and horizontally. If the wave gets polarized in the vertical direction, it requires vertical antenna, If the wave gets polorarized in horizontal way, it needs a horizontal antenna to launch it. Sometimes circular polarization is used, it is a combination of both horizontal and vertical ways.

2.9.2.5 Effective length

It can be defined for both transmitting and receiving antennas. It is the ratio of area under non-uniform current distribution area under uniform current distribution.

2.9.2.6 Polar diagram

In case of a transmitting antenna, this is a plot that discusses about the strength of the power field radiated by the antenna in various angular directions. Figure 2.17 shows the polar pattern of polar antenna.

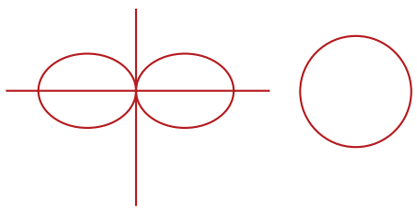


FIGURE 2.17 Polar antenna

2.10 Types of Antenna

Some important types of antenna are given below:

1. Dipole antenna

A dipole antenna is the simplest type of radio antenna. Consisting of a conductive wire rod that is half the length of the maximum wavelength the antenna is to generate. This wire rod is split in the middle, and the two sections are separated by an insulator. Each rod is connected to a coaxial cable at the end closest to the middle of the antenna as shown in Figure 2.18. Radio frequency voltages are applied to dipole antennas at the centre, between the two conductors. Dipole means "two poles".

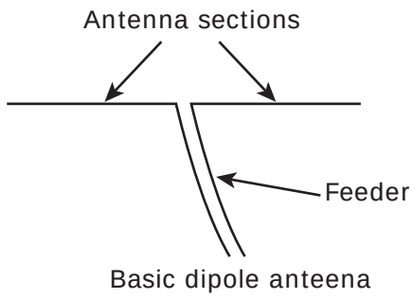


FIGURE 2.18 Dipole antenna

The different types of dipole antennas are such as half wave dipole antenna, multiple half wave dipole antenna, folded dipole antenna, short dipole antenna, non resonant dipole and so on.

2. Loop antenna

A loop antenna is a radio antenna consisting of a loop or coil of wire, tubing or other electrical conductor usually fed by a balanced source or feeding a balanced load. An example is the ferrite (loopstick) antenna used in most AM broadcast radios. Loop antennas are simple and easy to construct. They are available in different shapes like circular, elliptical, rectangular etc., as shown in figure 2.19. The fundamental characteristics of the loop antenna are independent of its shape.

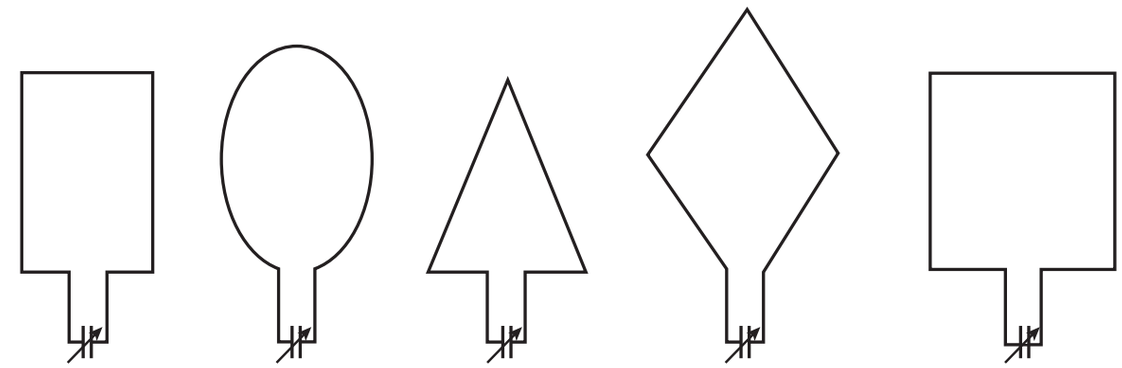


FIGURE 2.19 Loop antenna

3. Folded dipole antenna

A folded dipole is a dipole antenna with the ends folded back around and connected to each other, forming a loop as shown in figure 2.20.

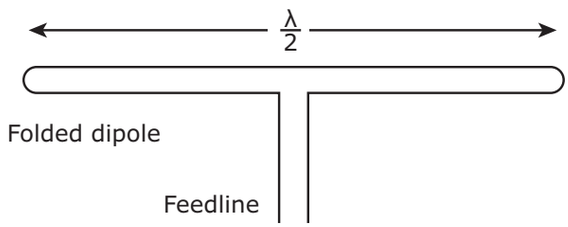


FIGURE 2.20 Folded Dipole

Typically the width of the folded dipole antenna is much smaller than the length 'l'. One of the main reasons for using a folded dipole antenna is the increase in feed impedance that it provides.

4. Yagi Uda antenna

A Yagi Antenna is the most commonly used type of antenna for TV reception. It is the most popular and easy to use type of antenna with better performance which is famous for its high gain and directivity.

The frequency range in which yagis antennas operate in around 30 GHz which belong to the VHF and UHF bands.

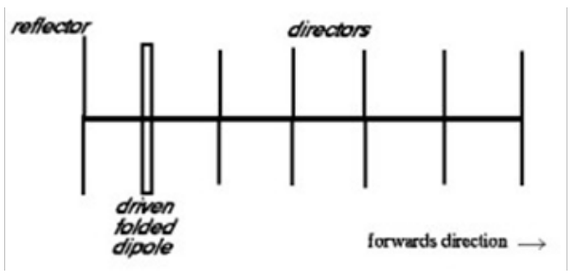


FIGURE 2.21 Yagi Uda antenna

Figure 2.21 shows a Yagi antenna. It consists of three elements normally director, folded dipole and reflector. The number of director may be added to increase the directivity of the antenna.

Advantages of Yagi antenna

- High gain
- High Directivity

Disadvantages of Yagi Antenna

- Prone of noise
- Prone to atmospheric effects.

Applications

- Mostly used for Television reception. It is very widely used as a high gain HF, VHF, and UHF bands.

5. Monopole antenna

A monopole antenna is a class of radio antenna consisting of a straight rod shaped conductor, often mounted perpendicularly over some type of

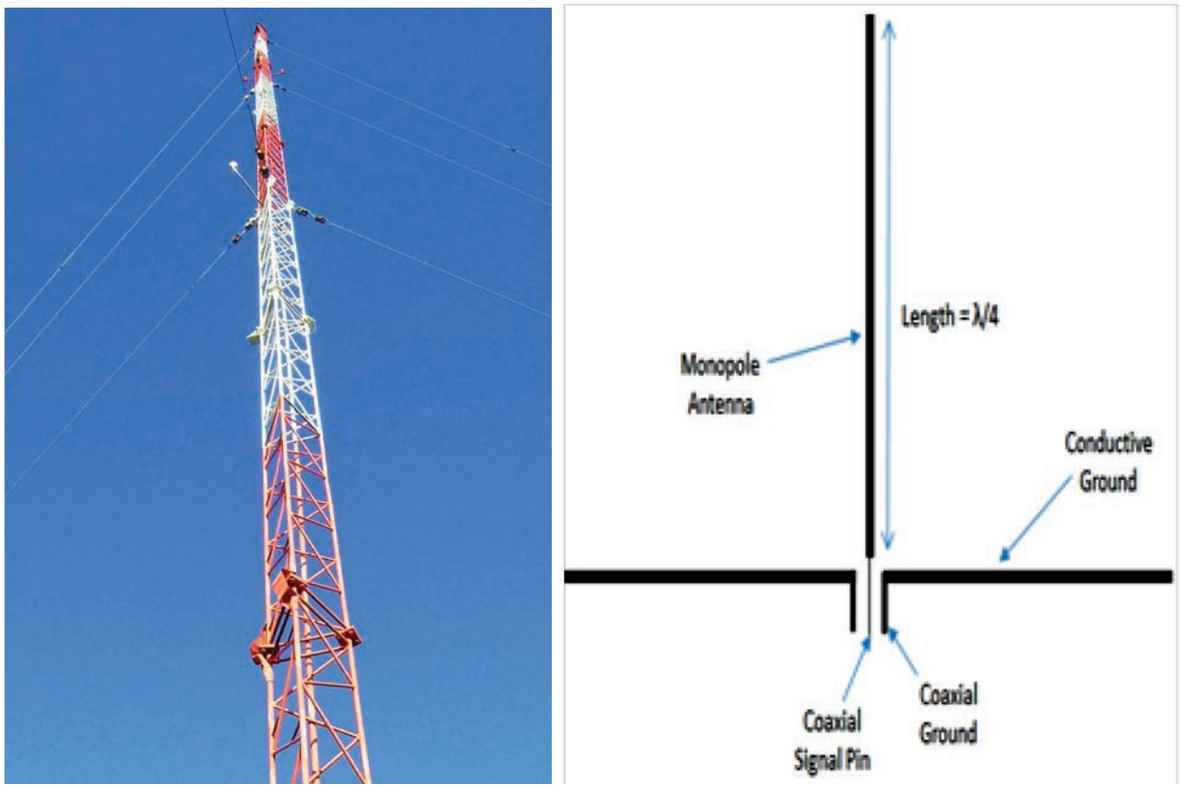


FIGURE 2.22 Monopole antenna

conductive surface, called a grounded plane. Therefore, the length of the antenna is determined by the wavelength of the radio waves it is used with. The monopole antenna was invented in 1895 by Erugliems Marconi, so it is sometimes called the Marconi antenna. Common types of monopole antenna are the whip, rubber, ducky, helical, random wire, inverted L and T antenna, inverted F and mast radiator. It is also known as ground plane antenna. Figure 2.22 shows the monopole antenna.

6. Microstrip antenna

Microstrip antennas are also known as patch antennas or printed antennas.

These are mostly used at micro wave frequencies. It is a narrow

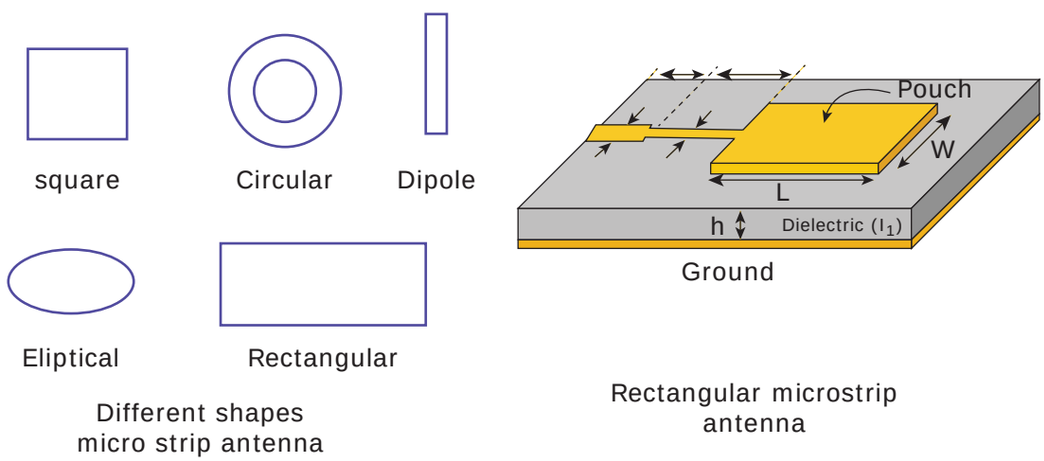


FIGURE 2.23 Microstrip antenna

band wide beam antenna. It is an antenna fabricated using micro strip techniques on a printed circuit board. It is a kind of internal antenna. They are mostly used in microwave frequencies. It consists of a radiating patch on one side of a dielectric substrate which has a ground plane on the other side. Micro strip antennas patches are in variety of shapes such as rectangular, square, triangular and circular, etc., as shown in Figure 2.23

It is used in mobile satellite communication system, Direct broad cast television (DBS), wireless LANs, GPS system, missiles and telemetry, UHF patch antennas for space.

7. Dish antenna or Parabolic antenna

Dish antenna is an antenna that uses a parabolic reflector, a curved surface with the cross sectional shape of a parabola to direct the radio waves. The main advantage of a parabolic antenna is that it has high directivity. It was intervened by German Physicist Heinrich Hertz. A dish antenna is known simply as a dish, is a common in microwave systems. This type of antenna can be used for satellite communication and broadcast reception, radio astronomy and radar. They are also used in radio telescope. Figure 2.24 shows a Dish antenna

FIGURE 2.24 Dish antenna

8. Discone antenna

A discone antenna is a version of biconical antenna in which one of the cones is replaced by a disc. It is usually mounted vertically, with the disc at the top and cone beneath as shown in figure 2.25. It has three major components: the disc, the cone and the insulator.

FIGURE 2.25 Discone antenna

The discone wideband coverage makes it attractive in commercial military amateur radio and radio scanner applications.

9. Horn antenna or microwave horn

It is an antenna that consists of a flaring metal waveguide (a metal pipe used to carry radio waves), shaped like a horn to direct radio waves in a beam. Horns are widely uses as antennas at UHF and microwave frequencies above 300MHz. Figure 2.26 shows different horn antenna.

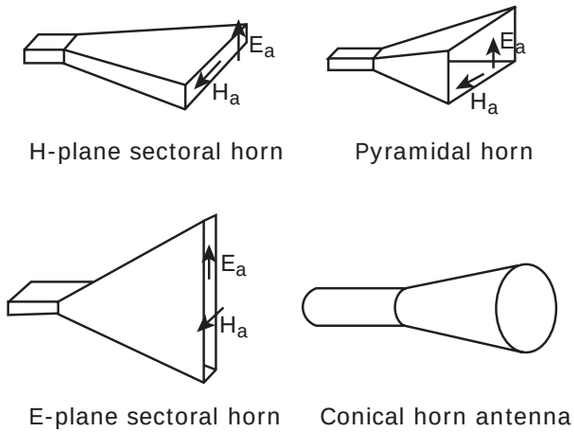


FIGURE 2.26 Horn antenna

An advantage of horn antennas is that since they have no resonant elements, they can operate over a wide range of frequencies, a wide bandwidth.

LEARNING OUTCOME

After learning this unit, the student can able to deliver,

- The process of modulation
- The types of analog and pulse modulation
- The necessity of demodulation
- The working principles of Modem
- The uses of different antenna

GLOSSARY

Terms	Explanation
Amplitude	The magnitude of a voltage or current waveform indicating, the strength of a signal.
Data	All information, facts, numbers, letters, symbols etc., which can be produced by the computer.
Bandwidth	The available space between two given points on the electromagnetic spectrum.
Gain	An increase in the power amplitude of the signal
Modem	A combined device for modulation and demodulation
Half duplex	Allowing the transmission of signals in both direction but not simultaneously.
Full duplex	Can communicate with one another in both direction.
Modulator	It is a device that performs modulation.
Demodulator	It is a device that performs demodulation.
Antenna	A metallic device for sending or receiving radio waves.

QUESTIONS

Part – A (1 Mark)

I Choose the correct answer

1. The device which converts audio signal into electrical signal is called_____.

(a) Microphone

(b) Modem

(c) Antenna

(d) Loud speaker

2. The device which converts electrical signal into audio signal is called _____.

(a) Microphone

(b) Modem

(c) Antenna

(d) Loud speaker

3. Audio frequency are within the range of _____.

(a) 20 Hz to 20 kHz

(b) 30 Hz to 30 MHz

(c) 100 Hz to 30 kHz

(d) 88 MHz to 108 MHz

4. In Amplitude Modulation, _____ of carrier signal is varied in accordance with the amplitude of the message signal.

(a) Phase

(b) Frequency

(c) Amplitude

(d) None of the above

5. The type of modulation is used in satellite is _____.

(a) Amplitude Modulation

(b) Frequency Modulation

(c) Phase Modulation

(d) Angle Modulation

6. Which modulation is the odd one?

(a) PAM

(b) PWM

(c) PPM

(d) FM

RY8OG

7. A transducer which converts RF signal into electrical signal or electrical signal into RF signal is called _____.

(a) Antenna

(b) Loud speaker

(c) Microphone

(d) Modem

8. The type of antenna used in VHF and UHF bands is _____.

(a) Dipole antenna

(b) Folded dipole antenna

(c) Yagi Uda antenna

(d) Loop antenna

9. Antenna used in mobile is _____.

(a) Dipole antenna

(b) Folded dipole antenna

(c) Yagi Uda antenna

(d) Microstrip antenna

10. _____ is used in Radar.

(a) Microstrip antenna

(b) Dish antenna

(c) Loop antenna

(d) Horn antenna

Part – B (3 Marks)

II Answer in one or two sentences

1. What is modulation?
2. Define: Amplitude modulation.
3. What is meant by Phase Modulation?
4. What are the advantage and disadvantages of frequency modulation?
5. What is demodulation?
6. Define: Pulse Modulation
7. What are the different types of analog modulation?
8. What is Modem?
9. What is an Antenna?
10. What are the different types of Pulse Modulation?

Part – C (5 Marks)

III Answer in a paragraph

1. What is the need for modulation?
2. Explain about the necessity for detection?
3. Differentiate Analog and Pulse Modulation?
4. Explain Yagi Uda antenna.

Part – D (10 Marks)

IV Answer in One Page (Essay type Question)

1. Explain about Amplitude and Frequency Modulation?
2. Explain
   i. Pulse Amplitude Modulation
   ii. Pulse Width Modulation
3. Briefly explain any two types of Modem.

Answers

1. (a)	2. (d)	3. (a)	4. (c)	5. (c)
6. (d)	7. (a)	8. (c)	9. (d)	10. (b)