

DEPT. OF ELECTRICAL & ELECTRONICS ENGINEERING
SRM INSTITUTE OF SCIENCE AND TECHNOLOGY, Kattankulathur – 603203.

Title of Experiment	: 12. Study of modulation and demodulation techniques.
Name of the candidate	: Kunal Keshan S
Register Number	: RA2011004010051
Date of Experiment	:
Date of submission	:

Sl. No.	Marks Split up	Maximum marks (50)	Marks obtained
1	Pre Lab questions	5	
2	Preparation of observation	15	
3	Execution of experiment	15	
4	Calculation / Evaluation of Result	10	
5	Post Lab questions	5	
Total		50	

Staff Signature

PRE-LAB QUESTIONS

1. What is meant by modulation and demodulation in communication?

Modulation is the process of varying one or more properties of a periodic waveform, the carrier signal, with a modulating signal that typically contains information that is to be transmitted.

Demodulation is defined as extracting the original information-carrying signal from a modulated carrier wave.

2. What is modulation and demodulation?

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3. What is modulation and what is the purpose of it?

Modulation is the process of varying one or more properties of a periodic waveform, the carrier signal, with a modulating signal that typically contains information that is to be transmitted.

To involve data information or speech information, another wave has to be imposed known as input signal above the carrier wave. This process of imposing an input signal on a carrier wave is known as modulation. It modifies the shape of the carrier wave to encode the data information that we intended on carrying. It is similar to hiding the code in the carrier wave.

4. Compare AM and FM

In AM, a radio wave is known as the “carrier” or “carrier wave” is modulated in amplitude by the signal that is to be transmitted. In FM, a radio wave is known as the “carrier” or “carrier wave” is modulated in frequency by the signal that is to be transmitted.

5. What is the difference between a modem and router?

A modem is a device that modulates an analog signal to digital information. It also decodes carrier signals to demodulated the transmitted information.

Routers are computer networking devices that server two functions: 1. Create and maintain a local area network and 2. Manage the data entering and leaving the network as well as data moving inside of the network.

Experiment No. 12 Date :	Study of modulation and demodulation techniques.
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Aim: To study the different modulation and demodulation techniques

Theory:

Modulation and demodulation

Communication is the basic attraction of mankind as it gives the knowledge of what is going on around us. In our daily life, we communicate with many people and use the entertainment media like television, radio, internet and newspaper to get ourselves involved. These entertainment media act as a source of communication. **Electronic communication** comprises TV, radio, internet, etc. When we want to transmit a signal from one location to another, we have to strengthen the signal. After undergoing strengthening process the signal travels to a long distance. This is called as modulation, and this article gives an overview of the modulation and types of modulation techniques.

Communication is nothing but, the process of exchanging (two way communication) or passing (one way communication) information from one person to another. The basic electronic communication system consists of these components: transmitter, receiver and communication channel.

Types of Modulation

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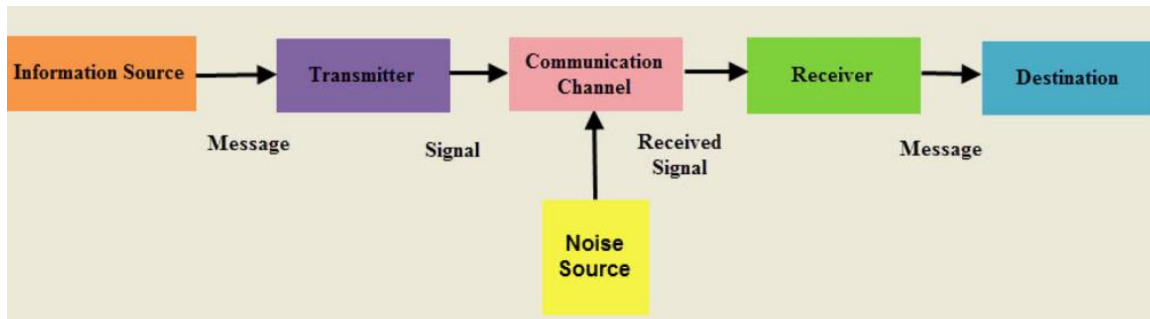


Figure 1. Communication System

A transmitter is a group of electronic circuits designed to convert the information into a signal for transmission over a given communication medium.

A receiver is a group of electronic circuits designed to convert the signal back to the original information.

The communication channel is the medium which is designed to transmit the electronic signal from one place to another.

Modulation is a way of sending signals of low frequency over long distances without a huge loss of energy by the use of another wave of very high frequency called a carrier wave.

Modulation is nothing but, a carrier signal that varies in accordance with the message signal. Modulation technique is used to change the signal characteristics. Basically, the modulation is of following two types:

- Analog Modulation
- Digital Modulation

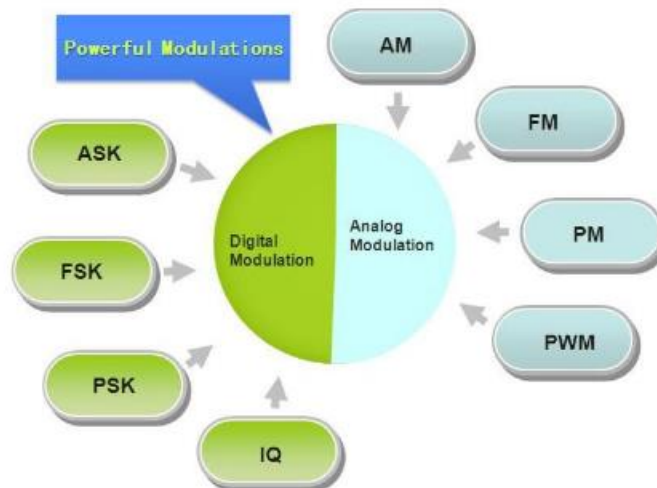


Figure 1. Types of Modulation

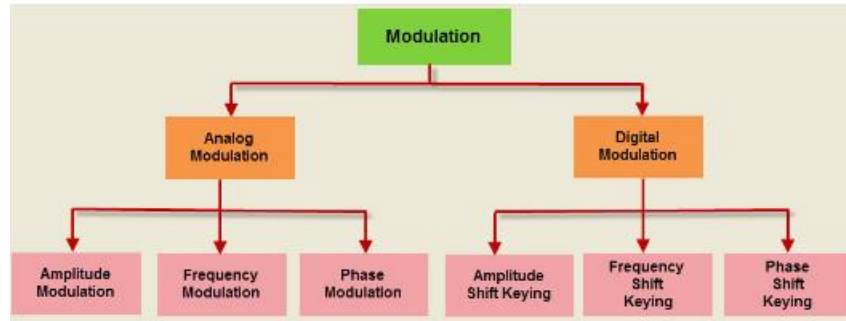


Figure 2. Modulation Techniques

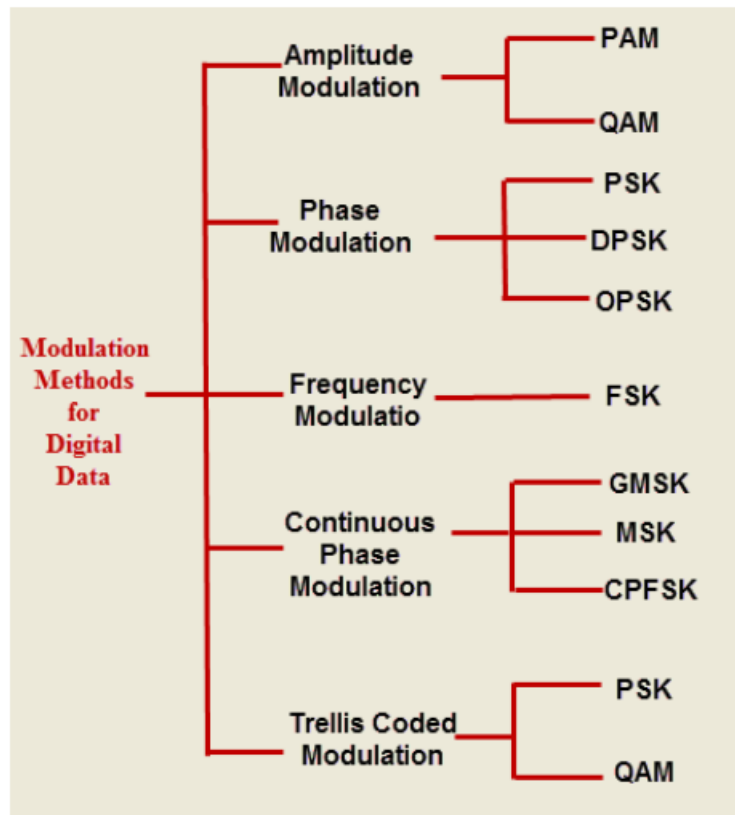


Figure 3. Types of Digital Modulation Techniques

High frequency signals are more directional and because high frequency waves have a small wavelength there is less diffraction. Also smaller aerials are needed because the size of the aerial has to be of the same sort of size as the wavelength of the signal to be transmitted.

Therefore a sound with a frequency of 256 Hz (middle C) received by a microphone, converted to an electrical signal and then transmitted would have a wavelength of $300000000/256 = 1\,170\,000$ m, over 1000 km!

However a wave of frequency 100 MHz has a wavelength of only 3 m.

We can compare amplitude modulation with a long tube of soft clay on a conveyor belt. The clay moves between the hands of two people, one at each end of the belt.

Modulation – the person at one end moulds the clay by pressing on it as it moves between their hands. By squeezing and relaxing they make a tube of clay with a changing diameter.

At the other end of the belt there is a person with their eyes shut and their hands on either side of the clay at the other end. As the clay moves past their hands are forced in and out by the changing diameter of the clay cylinder. This is called detection

In reality we start with a carrier wave of very high frequency and add to it the audio signal (of relatively low frequency). This addition of the audio signal is called modulation. This can be done either by changing the amplitude of the carrier wave (amplitude modulation) or by changing its frequency (frequency modulation).

The audio signal is produced (Figure 1) and converted to an electrical signal by the

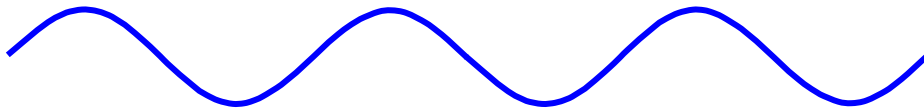


Figure 1

microphone.

The high frequency carrier wave (with a frequency of say 100 MHz) (Figure 2) is produced by the transmitter.

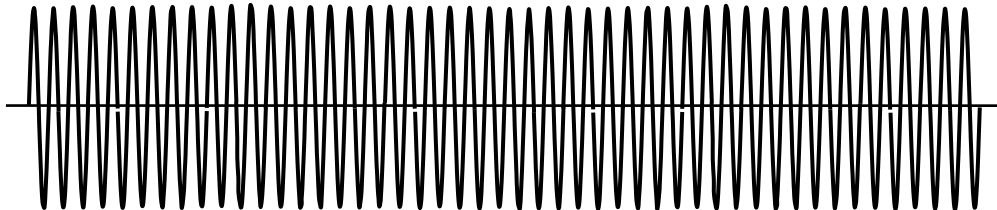


Figure 2

These two signals are added together (modulation) (Figure 3).

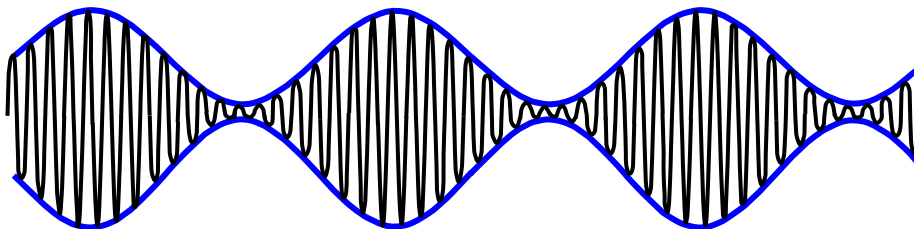
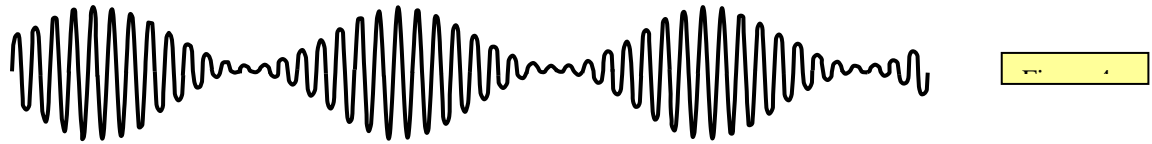


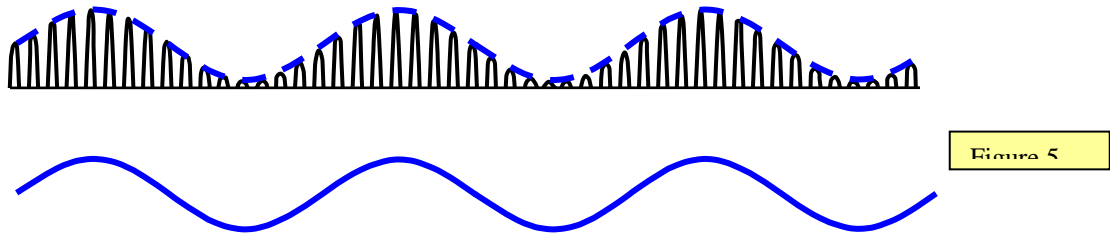
Figure 3

The modulated signal is transmitted (Figure 4).



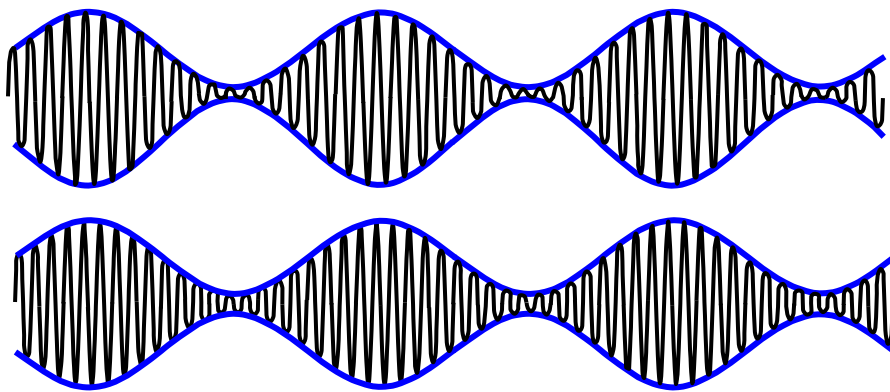
The modulated signal is received by the aerial.

A diode is used to separate the high frequency carrier wave from the low frequency audio signal (demodulation) by removing half the signal. This leaves the outline of the audio signal (Figure 5).



This signal is now amplified and fed to a loudspeaker.

The receiver is tuned to the carrier wave frequency. The following two diagrams (Figures 6 and 7) show two carrier waves of different frequency both modulated by the same frequency audio signal.



Figures 6 and 7

Result :

Study of Modulation and Demodulation is completed.

POST-LAB QUESTIONS

1. What are the different types of modulation?

1. Amplitude Modulation.
2. Frequency Modulation.
3. Phase Modulation

2. Which type of modulation is used in television?

All analog television systems use vestigial sideband modulation, a form of amplitude modulation in which one sideband is partially removed. This reduces the bandwidth of the transmitted signal, enabling narrower channels to be used.

3. What is PPM modulation?

Pulse-Position modulation is a form of signal modulation in which M message bits are encoded by transmitting a signal pulse in one of 2^M possible required time shifts. This is repeated every T seconds, such that the transmitted bit rate is M/T bits per second.

4. What is PWM modulation?

Pulse-Width Modulation, is a method of reducing the average power delivered by an electrical signal, by effectively chopping it up into discrete parts. The average value of voltage fed to the load is controlled by turning the switch between supply and load on and off at a fast rate.

5. What are NTSC and PAL?

NTSC (national television system committee) is responsible for producing the detailed technical specifications for the transmission standard.

PAL (phase alternating line) is a color encoding system for analogue television used in broadcast television systems in most countries broadcasting at 25 fps.