MODULATION AND MULTIPLEXING

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MODULATION

The process by which data/information is converted into electrical/digital signals for transferring that signal over a medium is called **modulation**.

- The various forms of modulation are designed to alter the characteristic of carrier waves.

- The most commonly altered characteristics of modulation include

  amplitude

  frequency

  phase

Amplitude modulation

- It is a type of modulation in which only the amplitude of the carrier signal is varied to represent the data being added to the signals whereas the phase and the frequency of the signal are kept unchanged.

Amplitude
modulation
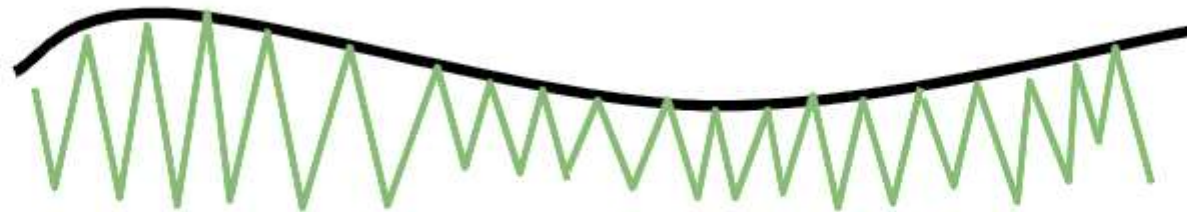
Frequency modulation

- It is a type of modulation in which only the frequency of the carrier signal is varied to represent the frequency of the data whereas the phase and the amplitude of the signals are kept unchanged.
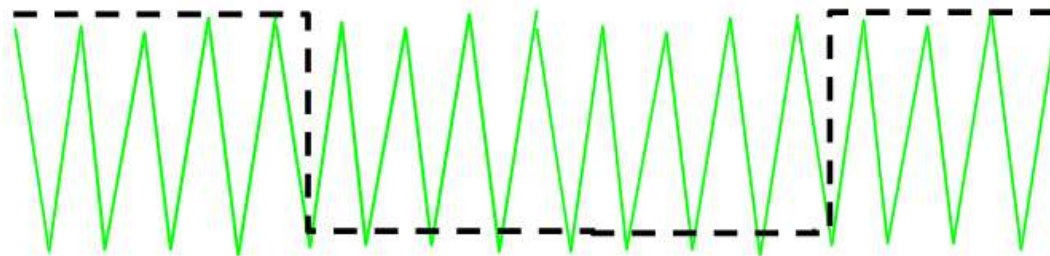
Frequency
modulation

Phase modulation

- It is a type of modulation in which the phase of the carrier signal is varied to represent the data being added to the signal. Different information values are represented by different phases. For example: '1' may be represented by 0° while '0' by 180°.

Phase modulation

This are **Analog Modulation.**

Digital Modulation

- Digital modulation is the process of converting a digital bit stream into an analog carrier wave for transmission via a communication channel.

- Digital modulation is broadly divided into two categories −

    1. Bandpass Modulation as in baseband transmission:

    Here, the bits are converted directly into signals.

    2. Passband Modulation as in passband transmission:

    Here, the amplitude, phase or frequency of the carrier signal is regulated to transmit the bits.

WHAT IS MULTIPLEXING?

Multiplexing

- **Multiplexing** is the sharing of a medium or bandwidth. It is the process in which multiple signals coming from multiple sources are combined and transmitted over a single communication/physical line.
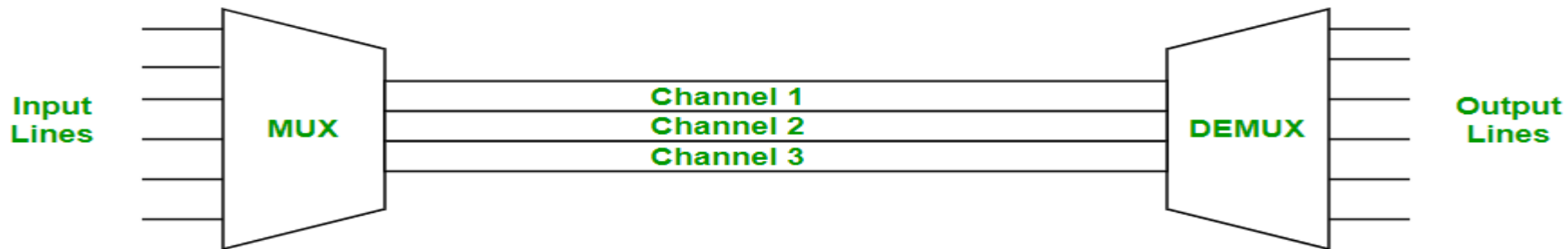
Types of Multiplexing

- There are three types of Multiplexing :

  1. Frequency Division Multiplexing (FDM)

  2. Time-Division Multiplexing (TDM)

  3. Wavelength Division Multiplexing (WDM)
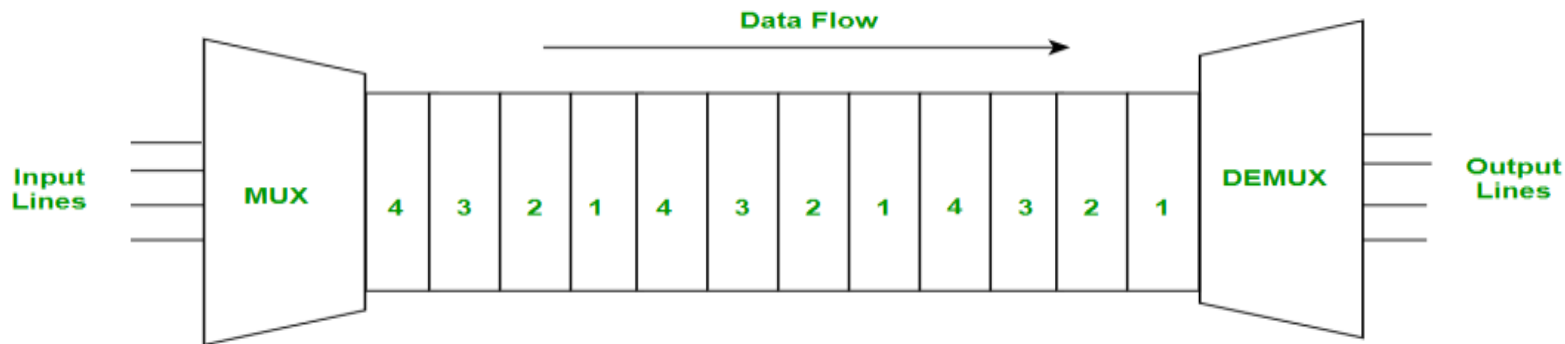
Frequency Division Multiplexing

- Frequency division multiplexing is defined as a type of multiplexing where the bandwidth of a single physical medium is divided into a number of smaller, independent frequency channels.

- Frequency Division Multiplexing is used in radio and television transmission.

Time Division Multiplexing

- Time-division multiplexing is defined as a type of multiplexing wherein FDM, instead of sharing a portion of the bandwidth in the form of channels, in TDM, time is shared. Each connection occupies a portion of time in the link.

- In Time Division Multiplexing, all signals operate with the same frequency (bandwidth) at different times.

Wavelength Division Multiplexing

- Wavelength Division Multiplexing is used on fiber optics to increase the capacity of a single fiber. It is an analog multiplexing technique. Optical signals from the different sources are combined to form a wider band of light with the help of multiplexers. At the receiving end, the demultiplexer separates the signals to transmit them to their respective destinations.

Thank You