

TEMPLECITY INSTITUTE OF TECHNOLOGY & ENGINEERING (TITE)

Writing Space

SUBJECT - Analog And Digital communication

5th Sem Diploma Branch - ECE

1. (a) What is the line connecting positive and negative peaks of the carrier wave form called _____

Ans - Envelope

(b) Find the modulation index if V_{max} is 5.9V and V_{min} is 1.2V.

Ans - 0.662

(c) What is the percentage of modulation if the modulating signal is 7.5V and carrier is 9V?

Ans - 83.33

(d) What is the modulating signal voltage would cause over modulation on a carrier voltage of 10V?

(i) 8V (ii) 1.2V (iii) 10V (iv) 13V

Ans - 13V

2 (a) What do you mean by modulation?
Explain need of modulation?

Ans

The process of changing some characteristics i.e. amplitude, frequency or phase of a carrier wave in accordance with the intensity of the signal is called modulation.

Need of modulation

(i) Increase the signal strength

The strength of the message signal should be increased so that it can travel longer distance. The most vital need of modulation is to enhance the strength of the signal without affecting the parameter of the carrier signal.

(ii) Wireless communication

modulation has removed the necessity for using wires in the communication system.

(iii) Antenna Length

To transmit a wave effectively the length of the antenna should be approximately equal to the wave length of the wave

$$\lambda = \frac{\text{velocity}}{\text{frequency}} = \frac{c}{f} = \frac{3 \times 10^8}{f}$$

If frequency will increase the length of the antenna will reduce

2(b) Q2 Explain different types of signal?

Ans

continuous time signal

If the signal is specified for every value in time then it is known as the continuous time signal

discrete time signal

If the signal is specified only for the discrete time instances then it is called discrete time signal.

Analog signal

A signal whose amplitude can take any value in the continuous range is the analog signal.

Digital signal

A signal whose amplitude can take only finite number of values is the digital signal.

Periodic signal

A signal which repeats itself after finite time 'T' then it is called periodic signal.

Aperiodic signal

A signal which does not repeat after time 'T' then it is called aperiodic signal.

Deterministic signal

A signal whose physical description is known either in mathematical form or graphical ~~form~~ form is known as deterministic signal.

2. C. Derive amplitude modulation?

Ans

The amplitude of the carrier signal varies in accordance with the instantaneous amplitude of the modulating signal is known as amplitude modulation.

The message signal is of low frequency
The carrier is high frequency
Let modulating signal, $m(t)$
carrier signal, $c(t)$

$$\text{modulating signal } m(t) = A_m \cos(2\pi f_m t)$$

$$\text{carrier signal } c(t) = A_c \cos(2\pi f_c t)$$

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A_m - ~~AMP~~ Amplitude of modulating signal

A_c - Amplitude of carrier signal

f_m - Frequency of modulating signal

f_c - Frequency of carrier signal.

The AM wave will be $s(t)$,

$$s(t) = [A_c + A_m \cos 2\pi f_m t] \cos 2\pi f_c t$$

$$s(t) = A_c \left[1 + \left(\frac{A_m}{A_c} \right) \cos 2\pi f_m t \right] \cdot \cos 2\pi f_c t$$

$$s(t) = A_c [1 + m \cos (2\pi f_m t)] \cdot \cos (2\pi f_c t)$$

where m is the modulation index

$$m = \frac{A_m}{A_c}$$

3 (a) Explain communication system ?

Ans

The communication system consists of information, Transmitter, channel, receiver, detector sections.

Information

The message comes from the information source, which originates it. In the sense of selecting one message from a group of messages.

Transmitter

Unless the message comes from the information source is electrical in nature, it will be unsuitable for immediate sending.

In long distance communication, a transmitter is required to process, and possibly encode the incoming information.

Channel - Noise

The acoustic channel (i.e. shouting) is most used for long distance communication, and neither was the visual channel until the advent of the 'laser' channel is often used to refer to the frequency range allocated to a particular service or transmission.

Noise is unwanted energy, usually of random character, present in a transmission system.

Receiver

The most important function of receiver is demodulation sometimes called decoding.

The output of the receiver is fed to a loud speaker, video display unit, computer to get the sending signal.

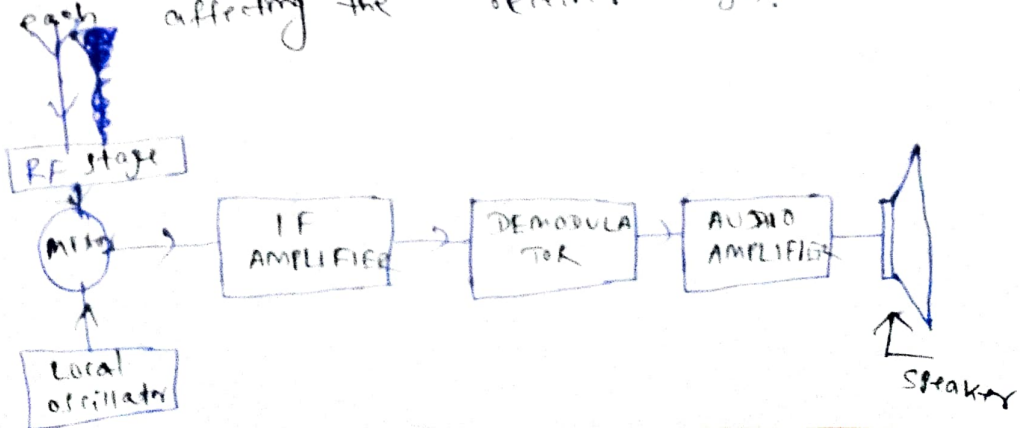
3 (b) Explain Radio Receiver?

Ans

Most receivers do conform broadly to the superheterodyne type, as does the simple broadcast receiver.

Receivers run the whole range of complexity from a very simple crystal receiver, with headphones, to a far more complex radio receiver, with its involved antenna arrangement and visual display system. The important function of the receiver is demodulation.

The output of the receiver may be fed to a loud speaker, video display, television picture tube, pen recorder, or computer. In each instance different arrangement must be made, each affecting the receiver design.



3(c), Describe Relation Between Power and modulation index ?

Ans

Let total power is P_T

$$P_T = P_c + P_{USB} + P_{LSB}$$

$$P_T = \frac{A_c^2}{2R} + \frac{A_{USB}^2}{2R} + \frac{A_{LSB}^2}{2R}$$

$$= \frac{A_c^2}{2R} \left[1 + \frac{m_a^2}{4} + \frac{m_a^2}{4} \right]$$

$$P_T = P_c \left[1 + \frac{m_a^2}{2} \right]$$

$$P_T = P_c \left[1 + \frac{m_a^2}{2} \right]$$

$$\frac{P_T}{P_c} = 1 + \frac{m_a^2}{2}$$

$$m_a^2 = 2 \left(\frac{P_T}{P_c} - 1 \right)$$

$$m_a = \sqrt{2 \left(\frac{P_T}{P_c} - 1 \right)}$$