

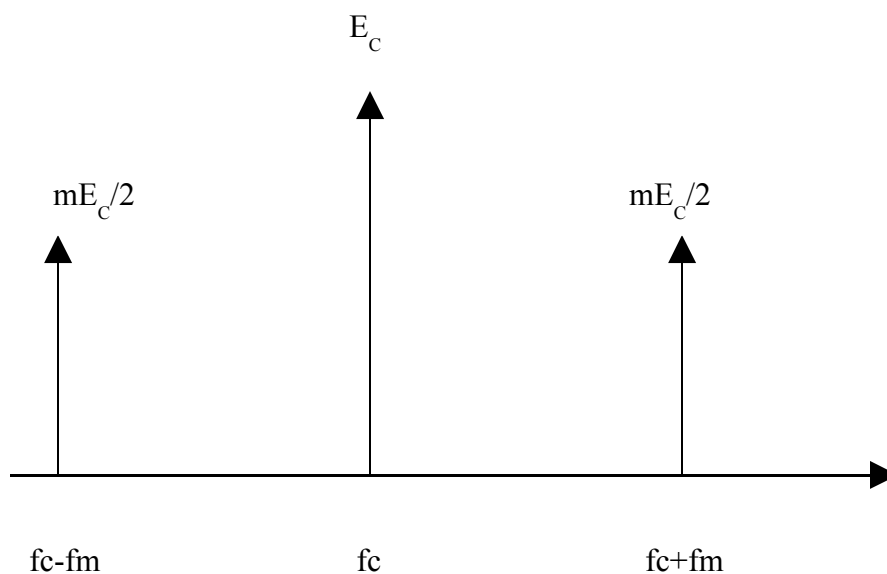
**Sri Sai Ram Engineering College**  
**Department of Information Technology**

**IT2202-PRINCIPLES OF COMMUNICATION**

**UNIT1**

1. Define AM and draw it's spectrum?

Ans: Amplitude of the carrier signal varies according to amplitude variations in modulating signal.



2. Why carrier frequencies are generally selected in HF range than low frequency range?

- i) The antenna size is very large at low frequencies
- ii) High frequencies can be transmitted using tropospheric scatter propagation, which is used to travel long distances

3. Calculate percentage modulation in AM if carrier amplitude is 20v and modulating signal is of 15v?

$$m = E_m/E_c = 15/20 = 0.75$$
$$\%m = 75\%$$

4. Define detection or demodulation

Detection is the process of extracting modulating signal from the modulated carrier. Different types of detectors are used for different types of modulations.

5. Define Amplitude modulation

The amplitude of carrier signal is varied according to variations in amplitude of modulating signal.

6. Define fidelity of the radio receiver

The ability of the receiver to reproduce all the range of modulating frequencies equally is called fidelity of the receiver

7. Define Sensitivity of the radio receiver.

The ability of the receiver to pick up weak signals and amplify them is called sensitivity. It is often defined in terms of the voltage that must be applied to the receiver input terminals to give the standard output power, measured at the output terminals.

8. what is the condition for under, critical and over modulation?

$E_m < E_c$  for under modulation  
 $E_m = E_c$  for critical modulation  
 $E_m > E_c$  for over modulation

9. What is cross over distortion in AM?

Due to over penetration in carrier by message create Cross over distortion.

10. What is frequency modulation?

Frequency of carrier is varied accordance with the instantaneous voltage of the modulating signal where amplitude of carrier is constant.

11. Write the expression for total power in AM wave?

$P_t = P_c(1 + m^2/2)$   
 $P_t = \text{Total power}$   
 $P_c = \text{Carrier Power}$   
 $m = \text{modulation index}$

12. Write the expression for carrier, upper & lower sideband power ?

Carrier power  $= P_c = E^2/2R$   
Upper sideband power = Lower sideband power  $= m^2 P_c/4$   
Where  $P_c = \text{Carrier power}$   
 $m = \text{modulation index}$

13. Write the formula for modulation index using  $V_{max}$  and  $V_{min}$ .  
 $m = (V_{max} - V_{min}) / (V_{max} + V_{min})$

$V_{max}$  = Maximum voltage

$V_{min}$  = Minimum voltage.

14. For an AM DSBFC transmitter with an unmodulated carrier power  $P_c = 100W$  that is modulated simultaneously by three modulating signals with coefficients of modulation  $m_1 = 0.2, m_2 = 0.4$  and  $m_3 = 1.5$ , determine
- Total coefficient of modulation
  - Upper and Lower sideband power
  - Total transmitted power

Ans:

a)  $m_t = \sqrt{m_1^2 + m_2^2 + m_3^2} = 0.67$

b)  $P_{sbt} = m_t^2 P_c / 2 = 0.67^2 * 100 / 4 = 22.445w$

c)  $P_t = P_c (1 + m^2/2) = 122.445w$

15. Define Frequency modulation.

Frequency of the carrier is varied accordance with the instantaneous voltage of the message signal. Where amplitude of the carrier is constant.

16. Define Phase modulation

Phase of the carrier is varied accordance with the instantaneous voltage of the message signal. Where amplitude of the carrier is constant.

17. write the formula for modulation index of FM?

$m = K_1 V_m / f_m = \Delta f / f_m$

$m$  = modulation index

$k_1$  = deviation sensitivity Hz per volt

$V_m$  = maximum message signal voltage

$f_m$  = Message signal frequency

$\Delta f$  = Maximum frequency deviation

18. Write the formula for modulation index of PM?

$m = K V_m / \Delta \theta$

$m$  = modulation index

$k$  = deviation sensitivity radians per volt

$V_m$  = maximum message signal voltage

$\Delta \theta$  = Maximum phase deviation

19. What is the advantages of angle modulation over AM modulation?

i) Noise reduction

ii) Improved system fidelity

iii) More efficient power

20. What is the disadvantages of angle modulation over AM modulation

i) Requiring wider bandwidth

ii) Utilizing complex circuits for both Transmitters and receivers

21. what is the maximum frequency deviation allowed by FCC in Standard FM?

FCC allows maximum frequency deviation of 75KHz and carrier frequency of 100MHz

22. A 107.6MHz carrier is frequency modulated by a 7Khz sine wave. The resultant FM signal has a frequency deviation of 50kHz. Determine the modulation index of the FM Wave?

$$\text{Modulation index} = \Delta f / f_m = 50\text{Khz} / 7\text{Khz} = 7.142$$

23. State Carson's rule of FM bandwidth?

$$BW = 2(\Delta f + f_m (\text{max}))$$

$f_m (\text{max})$  = Maximum Message signal frequency

$\Delta f$  = Maximum frequency deviation.

24. What do you understand by narrowband Fm?

When the modulation index is less than one, the angle modulated systems are called low index. Bandwidth is approximately  $2f_m$ . Therefore low index systems are called narrowband FM.

25. What is direct frequency modulation?

Varying the frequency of a constant amplitude carrier directly proportional to the amplitude of the modulating signal at a rate equal to the frequency of the modulating signal.

26. What is direct phase modulation?

Varying the phase of a constant amplitude carrier directly proportional to the amplitude of the modulating signal at a rate equal to the frequency of the modulating signal.

27. Find the minimum BW for angle modulated wave using Bessel Table?

$$B = 2(n * f_m) \text{Hz}$$

N = number of significant sidebands

$f_m$  = Message signal frequency

28. Find the B.W for High index modulation?

$$BW = 2\Delta f$$

$\Delta f$  = Maximum frequency deviation

29. Define Deviation Ratio

$$DR = \Delta f(\text{max}) / f_m(\text{max})$$

$f_m (\text{max})$  = Maximum Message signal frequency

$\Delta f$  = Maximum frequency deviation

30. What is main difference between FM and PM?

FM modulation index is dependent of  $f_m$

PM is independent of  $f_m$ .