TWO MARKS

1. What do you understand by narrowband FM?

When the modulation index is less than 1, the angle modulated systems are called low index. The bandwidth requirement of low index systems is approximately twice of the modulating.

2. Define frequency modulation.

Frequency modulation is defined as the process by which the frequency of the carrier wave is varied in accordance with the instantaneous amplitude of the modulating or message signal.

3. Define modulation index of frequency modulation.

It is defined as the ratio of maximum frequency deviation to the modulating frequency.

$\beta = \delta f / f m$

4. What do you meant by multitone modulation?

Modulation done for the message signal with more than one frequency component is called multitone modulation.

5. Define phase modulation.

Phase modulation is defined as the process of changing the phase of the carrier signal in accordance with the instantaneous amplitude of the message signal.

6. What are the types of Frequency Modulation?

Based on the modulation index FM can be divided into types. They are Narrow band FM and Wide band FM. If the modulation index is greater than one then it is wide band FM and if the modulation index is less than one then it is Narrow band FM

7. What is the basic difference between an AM signal and a narrowband FM signal?

In the case of sinusoidal modulation, the basic difference between an AM signal and a narrowband FM signal is that the algebraic sign of the lower side frequency in the narrow band FM is reversed.

8. What are the two methods of producing an FM wave?

Basically there are two methods of producing an FM wave. They are,

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i) Direct method: In this method the transmitter originates a wave whose frequency varies as function of the modulating source. It is used for the generation of NBFM

ii) Indirect method: In this method the transmitter originates a wave whose phase is a function of the modulation. Normally it is used for the generation of WBFM where WBFM is generated from NBFM

9. Compare WBFM and NBFM.

	WBFM	NBFM
1	Modulation index is greater than 1	Modulation index less than 1
2	Frequency deviation 75 KHz	Frequency deviation 5 KHz
3	Bandwidth 15 times NBFM	Bandwidth 2fm
4	Noise is more suppressed	Less suppressing of noise

10. List the properties of the Bessel function.

The properties of the Bessel function is given by,

i. Jn (β)=(-1)nJ-n(β) for all n, both positive and negative.

ii. ii) For small values of the modulation index β ,we have

J0 (β)=1

J1 (β)=β/2

Jn(β)=0,n>2.

11. Give the average power of an FM signal.

The amplitude of the frequency modulated signal is constant .The power of the FM

signal is same as that of the carrier power.

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P=1/2 Ec^2 .

12. Define phase deviation.

The maximum phase deviation of the total angle from the carrier angle is called phase deviation.

13. Define frequency Deviation.

The maximum departure of the instantaneous frequency from the carrier frequency is called frequency deviation.

14. State the Carson's rule.

An approximate rule for the transmission bandwidth of an FM Signal generated by a single

tone-modulating signal of frequency f m (max) is defined as

∴ BW=2[δ + f m(max)]

15. Define the deviation ratio D for non-sinusoidal modulation.

The deviation ratio D is defined as the ratio of the frequency deviation f, which corresponds to the maximum possible amplitude of the modulation signal m (t), to the highest modulation frequency.

D = Δf/ f m

16. What is the use of crystal controlled oscillator?

The crystal-controlled oscillator always produces a constant carrier frequency there by enhancing frequency stability.

17. What are the disadvantages of FM system?

1. A much wider channel is required by FM.

2. FM transmitting and receiving equipments tend to be more complex and hence it is expensive.

18. How will you generate message from frequency-modulated signals?

First the frequency-modulated signals are converted into corresponding amplitude- modulated signal using frequency dependent circuits. Then the original signal is recovered from this AM signal.

19. What are the types of FM detectors?

The types of FM detectors are

(i) Slope detector and

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(ii) Phase discriminator.

20. What are the types of phase discriminator?

The types of phase discriminator are

Foster seeley discriminator

Ratio detector.

21. What are the disadvantages of balanced slope detector?

1. Amplitude limiting cannot be provided

2. Linearity is not sufficient

3. It is difficult to align because of three different frequency to which various tuned circuits to be tuned.

4. The tuned circuit is not purely band limited.

22. Write the advantages and disadvantages of foster-seely discrimination method?

Advantages:

a) It is much easier to design

b) Only two tuned circuits are necessary and they are tuned to same frequency c) Linearity is better

Disadvantages:

1. It requires Amplitude limiting circuit.

23. What are the applications of phase locked loop?

Phase locked loops are used for various purposes in AM and FM communication.

(i)Automatic frequency correction in FM transmitter uses PLL to keep carrier frequency constant.

(ii)PLL is used direct FM Transmitter uses PLL to keep carrier frequency constant.

i.   PLL is also used in FM demodulators.

24. What do you understand by FM stereo multiplexing?

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FM stereo multiplexing is used for stereo transmission. It is basically frequency division multiplexing. It is used for FM radio broadcasting. The left and right channel signals are used to generate sum and difference signals. The difference signal frequency modulates the carrier. The difference signal, FM difference signal, FM difference signal and carrier are combined together and sent. Such FM multiplexed signal can be coherently received by stereo as well as mono receiver.

25. A 80 MHz carrier is frequency modulated by a sinusoidal signal of 1V amplitude and the frequency sensitivity is 100 Hz/V. Find the approximate bandwidth of the FM waveform if the modulating signal has a frequency of 10 kHz.

Ans: Frequency Sensitivity = 100 Hz/ volt.

Amplitude of modulating signal = 1V

Hence maximum frequency deviation, δ =100 Hz / volt ×1V= 100 kHz

Frequency of modulating signal, fm = 10kHz

$\therefore$ BW = 2 [δ + f m (max)

= 2 [100 +10×103]

BW = 20.2 kHz

26. Obtain the bandwidth of the FM signal.

c (t) =10 × cos [2 ×10 7 ×π t + 8 cos (1000 ×π t)]

Ans: Compare the given FM signal equation with standard FM signal equation,

c (t) = Ec cos (ωc t + m cos ωm t)

Here, m = 8 ,ωm =1000 π , Hence 2π f m =1000 π or f m = 500 Hz

δ = m f m = 8× 500 Hz = 4000 Hz

BW = 2 (δ + f m (max))

= 2 (4000 + 500) = 9000 Hz or 9 kHz

27. State the disadvantages of FM.

i) Bandwidth requirement of FM is much higher.

  ii. FM transmitting and receiving equipment is more complex and costly. iii) Distance of reception is limited only to line of sight.

28. Define modulation?

Modulation is a process by which some characteristics of high frequency carrier signal is varied in accordance with the instantaneous value of the modulating signal.

29. What are the types of analog modulation?

(i) Amplitude modulation.

(ii)Angle Modulation

1. Frequency modulation

2. Phase modulation.

30. Define the term modulation index for AM.

Modulation index is the ratio of amplitude of modulating signal (Em) to amplitude of carrier signal (Ec) i.e. $m = Em/EC$

31. What are the degrees of modulation?

a) Under modulation (m < 1)

b) Critical modulation (m=1)

c) Over modulation(m>1)

32. What is the need for modulation?

Needs for modulation:

a) Ease of transmission

b) Multiplexing

c) Reduced noise

d) Narrow bandwidth

e) Frequency assignment

f) Reduce the equipments limitations.

33. Give the Classification of Modulation.

There are two types of modulation. They are a)Analog modulation and b)Digital modulation

Analog modulation is classified as follows

a) Continuous wave modulation

b) Pulse modulation

Continuous wave modulation is classified as follows

a) Amplitude modulation

b) Double side band suppressed carrier

c) Single side band suppressed carrier

d) Vestigial side band suppressed carrier

Angle modulation

a) Frequency modulation

b) Phase modulation

Pulse modulation is classified as follows

a) Pulse amplitude modulation

b) Pulse position modulation

c) Pulse duration modulation

d) Pulse code modulation

Digital modulation is classified as follows

a) Amplitude shift keying

b)Phase shift keying

c) Frequency shift keying.

34. What is the difference between high level and low level modulation?

In high level modulation, the modulator amplifier operates at high power levels and delivers power directly to the antenna. In low level modulation, the modulator amplifier performs modulation at relatively low power levels. The modulated signal is then amplified to high power level by class B power amplifier. The amplifier feeds power to antenna.

35. Define demodulation?

Demodulation or detection is the process by which modulating voltage is recovered from the modulated signal. It is the reverse process of modulation. The devices used for demodulation or detection are called demodulators or detectors. For amplitude modulation, detectors or demodulators are categorized as,

a) Square-law detectors

b) Envelope detectors

36. Define Amplitude Modulation.

In amplitude modulation, the amplitude of a carrier signal is varied according to variations in amplitude of modulating signal. The AM signal can be represented mathematically as,

eAM = (Ec + Em sinωmt) sinωct

and the modulation index is given as,

m = E_m / E_C

37. What is Super Heterodyne Receiver?

The super heterodyne receiver converts all incoming RF frequencies to a fixed lower frequency, called intermediate frequency (IF). This IF is then amplitude and detected to get the original signal.

. What is single tone and multi tone modulation?

If modulation is performed for a message signal with more than one frequency component then the modulation is called multi tone modulation.

If modulation is performed for a message signal with one frequency component then the modulation is called single tone modulation.

38. Compare AM with DSB-SC and SSB-SC.

S.No	AM signal	DSB-SC	SSB-SC

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1	Bandwidth = 2fm	Bandwidth = 2fm	Bandwidth = fm
2		Contains USB,LSB	USB,LSB
3		Power required is less than that of AM.	Power required is less than AM &DSB-SC

39. What are the advantages of VSB-AM?

1. It has bandwidth greater than SSB but less than DSB system.

2. Power transmission greater than DSB but less than SSB system.

3. No low frequency component lost. Hence it avoids phase distortion.

40. How will you generating DSBSC-AM?

There are two ways of generating DSBSC-AM such as

a).Balanced modulator

b).Ring modulators

41. What are advantages of ring modulator?

a).Its output is stable.

b). It requires no external power source to activate the diodes.

c).Virtually no maintenance.

d). Long life.

42. Define SSB-SC.

(i) SSB-SC stands for Single Side Band Suppressed Carrier

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(ii) When only one sideband is transmitted, the modulation is referred to as Single side band modulation. It is also called as SSB or SSB-SC.

43. Define DSB-SC.

After modulation, the process of transmitting the sidebands (USB, LSB) alone and suppressing the carrier is called as Double Side Band-Suppressed Carrier.

44. What are the disadvantages of DSB-FC?

(i) Power wastage takes place in DSB-FC

(ii) DSB-FC is bandwidth inefficient system.

45. Define Coherent Detection.

During Demodulation carrier is exactly coherent or synchronized in both the frequency and phase, with the original carrier wave used to generate the DSB-SC wave. This method of detection is called as coherent detection or synchronous detection.

46. What is Vestigial Side Band Modulation?

Vestigial Sideband Modulation is defined as a modulation in which one of the sideband is partially suppressed and the vestige of the other sideband is transmitted to compensate for that suppression.

46. What are the advantages of signal sideband transmission?

a) Power consumption

b) Bandwidth conservation c) Noise reduction

47. What are the disadvantages of single side band transmission?

a) Complex receivers: Single side band systems require more complex and expensive receivers than conventiaonal AM transmission.

b) Tuning difficulties: Single side band receivers require more complex and precise tunig than conventional AM receivers.

48. Compare linear and non-linear modulators?

S.No	Linear Modulators	Non Linear Modulators
1	Heavy filtering is not	Heavy filtering is

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	required.	required.
2	These modulators are used in high level modulation.	These modulators are used in low level modulation.
3	The carrier voltage is very much greater than modulating signal voltage.	The modulating signal voltage is very much greater than the carrier signal voltage.

49. What is BW for AM wave?

The difference between these two extreme frequencies is equal to the bandwidth of the AM wave.Therefore, Bandwidth, $B = (\omega_c + \omega_m) - (\omega_c - \omega_m)$ $B = 2\omega_m$

50. What is the BW of DSB-SC signal?

Bandwidth, $B = (\omega_c + \omega_m) - (\omega_c - \omega_m)$ $B = 2\omega$ .It is obvious that the bandwidth of DSB-SC modulation is same as that of general AM waves.

51. What are the demodulation methods for DSB-SC signals?

The DSB-SC signal may be demodulated by following two methods:

(i) Synchronous detection method.

(ii) Using envelope detector after carrier reinsertion.

52. Write the applications of Hilbert transform?

(i) For generation of SSB signals,

(ii) For designing of minimum phase type filters,

ii.   For representation of band pass signals.

53. What are the methods for generating SSB-SC signal?

SSB-SC signals may be generated by two methods as under:

(i)Frequency discrimination method or filter method.

(ii)Phase discrimination method or phase-shift method.

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