**QUESTION BANK**

**Short answer questions:**

1. Define modulation. Why is modulation required?
2. Define modulation index?
3. Describe the DSB-SC wave modulation with spectrum?
4. Describe the detection of AM wave using a)square law detector b)envelope detector
5. Compare Square law detector with envelope detector?
6. Explain the detection of DSB-SC wave using synchronous detector
7. Why frequency translation is required?
8. Explain the generation of DSB-SC wave using a) balanced modulator b)ring modulator
9. What is envelope distortion?
10. List the various types of modulations?
11. What are the Advantages of SSB systems?
12. Compare different AM systems?
13. List Application of different AM systems?
14. What is Hilbert Transform?
15. Draw the spectrum of SSB modulated signal?
16. Draw the spectrum of VSB modulated signal?
17. What are the methods for SSB generation?
18. List Application of SSB?
19. Write the expression for SSB and VSB Waves.
20. What is Angle modulation? What are different types of Angle modulation?
21. Define PM & FM? What is frequency deviation & phase deviation?
22. Compare AM and FM?
23. What are Advantages & Applications of FM?
24. Explain the Phasor diagram of FM signals?
25. Plot FM wave taking modulating wave m(t) as a. Sine wave b. Square wave
26. Define is deviation ratio?
27. What is wideband FM & Narrowband FM?
28. State Carson’s Rule?
29. Derive the equations for FM & PM waves?
30. Explain how noise affects performance of analog modulation systems?
31. Define figure of merit?
32. Discuss threshold effect.
33. Explain threshold extension.
34. Explain pre-emphasis &de-emphasis.
35. Define Average noise figure.
36. Define Average Noise Temperature.
37. List out various noise sources.
38. Define White noise and Shot noise.
39. Write SNR expressions for FM and AM.
40. Define Sensitivity and Selectivity.
41. List the Classification of receivers.
42. Explain Super heterodyne working principle.
43. Define image frequency.
44. Define Image frequency rejection ratio.
45. Compare Continuous wave and pulse modulation technique.
46. State Sampling Theorem.
47. Write Merits and Demerits of PAM.
48. Compare PAM, PPM and PWM.
49. List out the applications of pulse modulation techniques.

**Long answer questions:**

1. a) Explain AM with necessary expressions, waveforms and spectrums.

b) The output power of an AM transmitter is 1KW when sinusoidally modulated to a depth of 100%. Calculate the power in each side band when the modulation depth is reduced to 50%.

1. a) Discuss the main objectives of a communication system design? What are the primary resources of any communication system?

b) The RC load for a diode envelope detector consists of a 1000 pF capacitor in parallel with a 10-K resistor. Calculate the maximum modulation depth that can be handled for sinusoidal modulation at a frequency of 10 KHz if diagonal peak clipping is to be avoided.

1. a) Sketch the one cycle of AM wave and calculate the modulation index of it in terms of Vmax and Vmin voltages.

b) A modulating signal consists of a symmetrical triangular wave having zero dc component and peak to peak voltage of 12V. It is used to amplitude modulate a carrier of peak voltage 10V. Calculate the modulation index and the ratio of the side lengths L1/L2 of the corresponding trapezoidal pattern.

1. a) Plot the one cycle of AM wave and calculate the modulation index of it in terms of Vmax and Vmin voltages.

 b) The rms antenna current of AM transmitter is 10A when un-modulated and 12 A when sinusoidally modulated. Calculate the modulation index.

1. a) Explain the collector modulation method for generating AM wave with a neat circuit diagram and waveforms.

b) An AM amplifier provides an output of 106 W at 100% modulation. The internal loss is 20W (i) What is un-modulated carrier power? (ii) What is the side band power?

1. a) Write AM equation. Define modulation index, and percentage modulation.

b) Define under-modulation and over modulation. Explain why over modulation is undesirable.

1. a) Explain operation of square law detector with circuit diagram and waveforms.

b) An AM transmitter has un-modulated carrier power of 10 KW. It can be modulated by sinusoidal modulating voltage to a maximum depth of 40%, without overloading. If the maximum modulation index is reduced to 30 %. What is the extent up to which the unmodulated carrier power can be increased to avoid overloading.

1. Sketch the one cycle of AM wave and calculate the modulation index of it in terms of Vmax and Vmin voltages.
2. a) Define communication. Explain with block diagram the basic communication system.Write about modern communication system.

b) A carrier wave of frequency 10 MHz and peak value of 10 V is amplitude modulated by a 5 KHz sine wave of amplitude 6 V. Determine the modulation index and draw the one sided spectrum of modulated wave.

1. a) Explain about the quadrature null effect of coherent detect.

b) In DSB-SC, suppression of carrier so as to save transmitter power results in receiver complexity - Justify this statement.

1. a) Describe the time domain band-pass representation of SSB with necessary sketches.

b) Find the percentage of power saved in SSB when compared with AM system.

1. Find the various frequency components and their amplitude in the Voltage given below E=50(1+0.7cos5000t-0.3cos1000t) sin 5x106t.Draw the single sided spectrum. Also evaluate the modulated and sideband powers.
2. a) Why VSB system is widely used for TV broadcasting - Explain?

b) An AM transmitter of 1KW power is fully modulated. Calculate the power transmitted if it is transmitted as SSB.

1. Describe the single tone modulation of SSB. Assume both modulating and carrier signals are sinusoids. Write SSB equation and plot all the waveforms and spectrums.
2. a) Explain the Third method of generating SSB modulated waves.

b) Explain the coherent detection of SSB signals.

1. a) Explain about Diagonal Clipping in a diode detector. How to avoid it?

b) A 45Volts(rms) sinusoidal carrier is amplitude modulated by a 30Volts(rms) sinusoidal base band signal. Find the Modulation index of the resulting signal.

1. Calculate the filter requirement to convert DSB signal to SSB Signal, given that the two side bands are separated by 200HZ. The suppressed carrier is 29MHZ.
2. a) Explain the envelope detection of VSB wave plus carrier.

b) Calculate the percentage power saving when the carrier and one of the sidebands are suppressed in an AM wave modulated to a de

1. An angle modulated signal has the form v(t) = 100 cos(2πfct+4 sin 2000 πt) when fc =10 MHz i. Determine average transmitted power. ii. Determine peak phase deviation. iii. Determine the peak frequency deviation iv. Is this an FM or a PM signal? Explain.
2. a) Explain about FM generation using transistor reactance modulator.

b) Explain balanced ratio detector for detecting FM signal.

1. a) Give the procedure to determine the effective bandwidth of an signal FM

b) Which method of FM signal generation is the preferred choice, when the stability of the carrier frequency is of major concern? Discuss about the method in detail.

1. a) Compute the bandwidth requirement for the transmission of FM signal having a frequency deviation 75 KHz and an audio bandwidth of 10KHz.

b) An FM radio link has a frequency deviation of 30 kHz. The modulating frequency is 3 kHz. Calculate the bandwidth needed for the link. What will be the bandwidth if the deviation is reduced to 15 kHz?

1. a) Explain the operation of limiter circuit in fm demodulation.

b) An FM radio link has a frequency deviation of 30 kHz. The modulating frequency is 3KHz. Calculate the bandwidth needed. What will be the bandwidth if the deviation is reduced to 15 kHz?

1. Determine the amplitude spectrum of the filter output for FM wave with modulation index β = 1 is transmitted through an ideal band pass filter with mid band frequency fc and bandwidth is 5fm, where fc is the carrier frequency and fm is the frequency of the sinusoidal modulating wave.
2. a) Explain the working of zero crossing detector.

b) Compare frequency modulation with amplitude modulation.

1. Explain the noise performance of SSB - SC receiver and prove its S/N Ratio is unity.
2. a) Derive the expression for the S/N ratio of AM system.

b) Compare noise performance of PM and FM system.

1. Explain the noise performance of DSB -SC scheme with the help of block diagram.
2. Prove that the figure of merit of AM system for single tone modulation with 100% modulation is 1/3.
3. Derive the expression for figure of merit of AM system for large value of modulation index (m>1).
4. An AM system with envelope detection is operating at threshold. Determine the power gain in decibels needed at the transmitter to produce (S/N)o = 30dB for tone modulation with m = 1.
5. Explain the need for Pre-emphasis and De-emphasis circuits in FM system.
6. a) List and discuss the factors influencing the choice of the intermediate frequency for a radio receiver.

b) What is simple automatic gain control? What are its functions?

1. In a broadcast super heterodyne receiver having no RF amplifier, the loaded Q of the antenna coupling circuit is 100. If the IF frequency is 455 kHz, determine the image frequency and its rejection ratio for tuning at 1.1 kHz a station.
2. a) How is PDM wave converted into PPM system?

b) Explain why a single channel PPM of system requires the transmission of synchronization signal, where as a single channel PAM or PDM system does not it.

1. a) Explain working of TRF receiver. Also explain the basic super heterodyne principle.

b) List out the advantages and disadvantages of TRF receiver.

1. Explain the working of FM receiver and compare with AM receiver.
2. Describe how different signals can be multiplexed using TDM system.
3. Explain the demodulation procedure for PWM signal demodulation.