Question Bank

Analog and Digital Communication

1.	Find the Fourier series for the square wave function $f(x)=-1$ for $-\pi<x<0$, $f(x)=1$, for $0<x<\pi$, and $f(0)=0$. Discuss the convergence (pointwise, uniform) of this Fourier series and find the limit function of it.
2.	Using the linearity of Fourier series and the previous problem, find the Fourier series of $f(x)=0$ for $-\pi<x<0$ and $f(x)=1$ for $0<x<\pi$
3.	Find the Fourier series for the function x(t) which has fundamental frequency ω_0 $x(t)=1+\sin\omega_0 t+2\cos\omega_0 t+\sin(2\omega_0 t+\pi/4)$
4.	Let $x_1(t)$ be a continuous-time periodic signal with fundamental frequency ω_1 and Fourier coefficients a_k. Given that $x_2(t)=x_1(1-t)+x_1(t-1)$, how is the fundamental frequency ω_2 of $x_2(t)$ related to ω_1? Also, find a relationship between the Fourier series coefficients b_k of $x_2(t)$ and the coefficients a_k.
5.	Draw the basic elements of communication system. Write function of communication channel in it.
6.	Define: 1. Modulation, 2. Modulation index of AM and 3. Deviation ratio of FM
7.	For an AM, DSBFC modulator with a carrier frequency fc=100KHz and a maximum modulating signal frequency fm=5KHz, determine: a. Frequency limits for upper and lower side band b. Bandwidth c. Draw the output frequency spectrum c. State two advantages and two disadvantages of FM over AM
8.	Find the carrier and modulating frequencies, the modulation index, and the maximum deviation of FM wave represented by the voltage equation v=10sin(5.5x108t + 4sin1250t). What power will this FM wave dissipate in a 15Ω resistor?
9.	For AM Fc = 100KHz, Fm = 5KHz determine: a. Upper and lower side band frequencies b. Bandwidth
10.	Draw the block diagram of Phase Lock Loop as FM detector and state the function of Voltage control oscillator.
11.	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%.

12.	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.
13.	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.
14.	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 106W at 100% modulation. The internal loss is 20 W (i).What is unmodulated carrier power? (ii). What is the side band power?
15.	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 over loading.
16.	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
17.	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.
18.	Find the various frequency components and their amplitude in the Voltage given below E=50(1+0.7cos5000t-0.3cos1000t) $\sin 5x10^6 t$. Draw the single sided spectrum. Also evaluate the modulated and sideband powers.
19.	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.
20.	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.
21.	a) Explain about FM generation using transistor reactance modulator. b) Explain balanced ratio detector for detecting FM signal.
22.	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 3kHz. Calculate the bandwidth needed for the link. What will be the bandwidth if the deviation is reduced to 15 kHz?
23.	Determine the amplitude spectrum of the filter output for FM wave with modulation index $\beta = 1$ 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.
24.	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?
25.	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.
26.	Explain the demodulation procedure for PWM signal demodulation.
27.	What Is The Difference Between Coherent And Non-coherent Demodulation?
28	Determine the power efficiency η and the percentage of total power carried by the sidebands of the AM wave for tone modulation when $\mu=0.5$ and $\mu=0.3$
29	Write the advantages of digital communication over analog communication.
30	What is ISI? Explain Nyquist's frist criteria for zero ISI.
31	State and explain sampling theorem in detail. Also explain aliasing.
32	Sketch the waveform of PSK for binary sequence 1100101
33	Differentiate QPSK and BPSK
34	Draw PWM and PPM waveforms
35	Define ASK, PSK and FSK
36	Draw FSK Transmitter and explain
37	Differentiate ASK and FSK
38	For a BPSK modulator with a Carrier frequency of 70 MHz and an input bit rate of 10 Mbps, determine the maximum and minimum upper and lower side frequencies, draw the output spectrum, determine the minimum Nyquist bandwidth
39	Compare the various types of digital modulation techniques
40	What is known as Binary phase shift keying? Discuss in detail the BPSK transmitter and Receiver and also obtain the minimum double sided Nyquist bandwidth
41	What is aliasing? How to avoid aliasing effect.

42	For the signal $m(t) = 3\cos 500*3.14t + 4\sin 1000*3.14t$, Determine the Nyquist sampling rate.
43	State and prove Sampling theorem.
44	Describe in detail the PCM technique with focus on its sampling rate, and signal to quantization Noise ratio
45	Define Hamming Distance and calculate its value for two code words 11100 and 11011
46	State the significance of minimum distance of a block code.
47	Construct a single error correcting (7, 4) linear block code and the corresponding decoding table.
48	For a (6,3) code, the generator matrix G is For all eight possible data words, $G = \begin{bmatrix} 1 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 \end{bmatrix}$ find the corresponding codewords and verify that this code is a single correcting code.
49	Find a generator polynomial for a (7, 4) cyclic code and hence find the code word for [1 1 0 0]
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