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Department of Electronics & Communication Engg.

Question Bank

Subject: Communication Theory

code:19EC4DCOT

UNIT 1	
1	Explain the need for modulation
2	Define amplitude modulation , Derive the expression of AM by both time domain and Frequency domain representation with necessary waveforms
3	Derive the expression for modulation index in terms of A_{max} and A_{min}
4	Explain the generation of AM wave using square law modulator, show the spectrum before and after filtering process
5	
6	What is the significance of double side band suppressed carrier modulation? Explain with time domain and frequency domain description
7	Explain the operation of the envelope detector with circuit diagram and waveforms
8	With a neat block diagram explain the balanced modulator method of generating DSB-SC wave
9	What do you mean by coherent detection? What is quadrature null effect
10	Explain the operation of coherent detection of DSBSC modulating wave and show that the overall output $V_o(t) = \frac{1}{2}[A_c \cos \phi m(t)]$. Explain frequency error and phase error
11	What is the significance of single side band modulation? Give the frequency domain description of the same
12	What is the significance of Vestigial side band modulation? Give the frequency domain description of the same
13	Compare different amplitude modulation Techniques
14	Consider a DSBSC modulated signal as a input to a mixer, specify the parameters of the filter and local oscillator components of a mixer to do the downward frequency translation with spectrum diagram
15	What is FDM. With neat block diagram the working of FDM technique

16	An Amplitude modulated signal is given $S(t) = [10 \cos (2\pi \times 10^6 t) + 5 \cos (2\pi \times 10^6 t) \cos (2\pi \times 10^3 t) + 2 \cos (2\pi \times 10^6 t) \cos (4\pi \times 10^3 t)]$ Volts Find the i) Total modulated power ii) Side band power and iii) Net modulation index
17	The antenna current of an AM transmitter is 10 Amp when it is modulated to a depth of 30% by an audio signal. It increases to 11 Amp, when another signal modulates the Carrier. What is the modulation index due to second wave?
18	Using the message signal $m(t) = t / 1+t^2$. Determine and sketch the modulated wave for amplitude modulation whose percentage modulation equals i) 50% ii) 100% iii) 125%
19	Consider a message signal $m(t) = 20 \cos (2\pi t)$ volts and a carrier signal is $c(t) = 50 \cos (100\pi t)$ volts i) sketch to scale resulting AM wave for 75% modulation ii) find the power delivered across a load of 100Ω due to this AM wave
20	An Amplitude modulated signal is given $S(t) = 20 \cos (2\pi \times 10^6 t) + 16 \cos (2\pi \times 10^6 t) \cos (2\pi \times 10^3 t) + 10 \cos (2\pi \times 10^6 t) \cos (4\pi \times 10^3 t)$ Volts . Determine various frequency components present and the corresponding modulation indices. Draw the spectrum and find the bandwidth
21	Consider a message signal $m(t)$ with a spectrum of bandwidth $w = 1\text{KHz}$.this signal is applied to a product modulator, together with a carrier $V_c \cos 2\pi f_c t$ producing the DSBSC modulated signal $S(t)$.Determine the spectrum when i) $f_c = 1.25\text{kHz}$ ii) $f_c = 0.75\text{kHz}$ iii) what is the lowest carrier frequency for which each component of the modulated signal $S(t)$ is uniquely determined by $m(t)$
22	Related numericals for the above topics

UNIT 2	
1	Define angle modulation, frequency modulation and phase modulation. Clearly explain the concept of instantaneous frequency.
2	Derive the expression for FM and hence explain how FM and PM are related With the help of block diagram
3	Derive the equation for FM wave. Define modulation index, max deviation and bandwidth of a FM signal
4	Explain different types of FM
5	Explain with neat diagram the generation of NBFM.
6	Derive time domain expression for a wide band FM wave

7	Show that the spectrum of FM contains infinite number of sidebands
8	What do you mean Transmission Bandwidth of FM. Explain different methods of finding Transmission Bandwidth of FM.(using carson's rule n universal curve)
9	Explain the generation of wideband frequency modulated wave by Armstrong method
10	With the help of block diagram, explain indirect method of generation of FM
11	With neat circuit diagram, describe the direct method of generating FM. Also explain feedback scheme for frequency stabilization of a frequency modulator for the same.
12	Explain the demodulation of FM signal using Zero crossing detector
13	A 100MHz carrier wave has a peak voltage of 5 volts. The carrier is frequency modulated by a sinusoidal modulating waveform of frequency 2 KHz such that the frequency deviation is 75KHz. The modulated waveform passes through zero and is increasing at time $t = 0$. Write the expression for frequency modulated signal
14	An angle modulated signal is represented by $S(t) = 10\cos(2\pi 10^6 t + 5\sin 2000\pi t + 10\sin 3000\pi t)$ volts. Find the following i) The power in the modulated signal ii) Frequency deviation Δf iii) Deviation ratio iv) Phase deviation $\Delta\theta$ Approximate transmission bandwidth
15	Determine the instantaneous frequency in Hz for each of the following signals i) $S(t) = 10\cos(200\pi t + (\pi/3))$ ii) $S(t) = 10\cos(200\pi t + \pi t^2)$ iii) $S(t) = \cos(200\pi t)\cos(5\sin 2\pi t) + \sin(200\pi t)\sin(5\sin 2\pi t)$
16	An FM generator with 2 multipliers is used to transmit audio signals in the range 50 Hz to 15kHz . A narrow band phase modulator is supplied with a carrier wave of frequency $f_1=200\text{kHz}$. The desired FM at the output has a carrier frequency of 108 MHz and frequency deviation is 75kHz. Design multiplier and mixer oscillator frequencies. Assume $\beta = 0.2$
17	Related numericals for the above topics