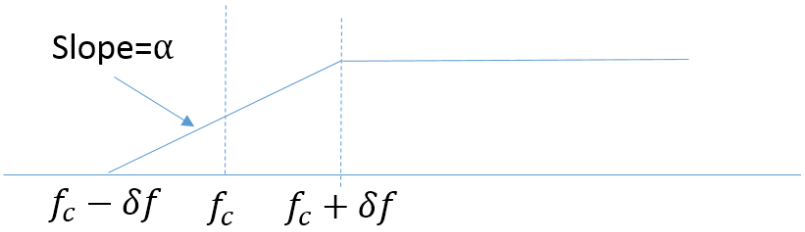
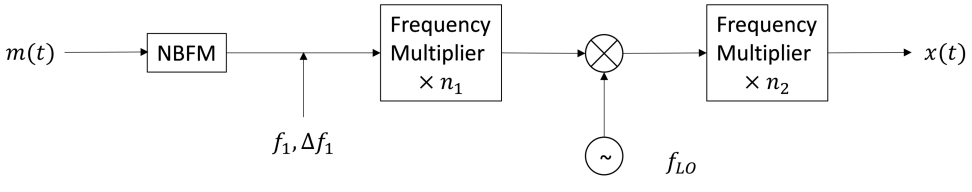
Sub Code: ECT041 **ROLL NO**……..……..

EVEN SEMESTER EXAMINATION, 2023 – 24
2nd Year B.Tech. – Electronics & Communication Engineering
Analog Communication Systems

Duration: 3:00 hrs **Max Marks: 100**

Note: - Attempt all questions. All Questions carry equal marks. In case of any ambiguity or missing data, the same may be assumed and state the assumption made in the answer.

Q 1.	Answer any four parts of the following. a) What is Sampling? What is the Sampling Theorem? b) What are the needs for modulation? Also, define Frequency Modulation. c) The output of an Amplitude Modulated (AM) is given as: $y(t) = 8\cos(3600\pi t) + 32\cos(4000\pi t) + 8\cos(4400\pi t)$. If the signal is expressed as: $y(t) = A(1 + \mu\cos(2\pi f_m t))\cos(2\pi f_c t)$, then find $\{f_m, f_c\}$. Note that, f_m is the bandwidth of the baseband signal while f_c is the frequency of the carrier. d) If a message, m(t) with bandwidth B is modulated with a carrier frequency f_c with $f_c \gg B$. To form a VSB signal, this modulated signal is passed through a high pass filter with maximum gain 1 and slope α (as shown in Figure below). Find out the excess bandwidth it requires as compared to its SSB-modulated counterpart.  e) What is the relation between total power and carrier power? A 400W carrier is modulated to a depth of 75 %. Calculate the total power in the modulated wave. f) Define Pulse Code Modulation. Why DPCM is better than PCM?	5x4=20
Q 2.	Answer any four parts of the following. a) Define PAM and write down its drawbacks**.** b) What is under sampling? State the advantages of super heterodyning. c) A block diagram of an Armstrong FM transmitter is shown in the following figure. 	5x4=20

	The parameters are as follows: $f_1 = 400kHz$, $f_{LO} = 21.6MHz$, $\Delta f_1 = 50Hz$, $n_1 = 64$, $n_2 = 48$: The center frequencies of the signal obtained at the output of the local oscillator (f_{LO}) are: d) Find the Hilbert transform, $m_h(t)$, of the following signal: $m(t) = \sin(\omega_1 t) \sin(\omega_2 t)$. (Assume $\omega_1 > \omega_2$). e) The energy contained within the band [0, f], f > 0, E(f) of a signal is given by the following expression: $E(f) = \{(1 + f + f^2) \exp(-f)\}$. Then the energy spectral density, S(f), for any f > 0 can be defined as: f) Explain the Quantization process in detail.	
Q 3.	Answer any two parts of the following. a) Explain the functional description of the digital communication system in detail. b) Briefly describe the Quadrature Amplitude Modulation with the schematic diagram. c) Obtain the mathematical expression of the following: ➢ Modulated wave of DSBSC. ➢ Bandwidth of DSBSC wave. ➢ Power calculations of DSBSC wave.	10x2= 20
Q 4.	Answer any two parts of the following. a) Do a comparative analysis of all the digital modulation techniques. b) Obtain the mathematical expression of the error probability of the ASK. c) Calculate the Figure of Merit (FoM) of the following: 1. DSB-SC 2. SSB-SC	10x2= 20
Q 5.	Answer any two parts of the following. a) Explain Delta Modulation in detail. b) Obtain the mathematical expression of the WBFM for the modulated signal and do the spectrum analysis for it. c) Classify and discuss all possible signals used in any communication system.	10x2= 20

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