B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2023 Semester End Main Examinations

Programme: B.E.   Semester: V
Branch: Electronics and Communication Engineering   Duration: 3 hrs.
Course Code: 16EC5DCCT1   Max Marks: 100
Course: Communication Theory-1   Date: 21.02.2023

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) Illustrate Probability Density Function-PDF along with its properties. **10**

   b) Analyze the effect of Noise in communication scenario and also brief their classification. **10**

UNIT - II

2 a) Analyze the working principle of diode square law modulator for generating AM signal. Write down the relevant equations, waveforms and Spectrum for modulated, carrier and sideband components. **10**

   b) A Carrier of 5Vrms with frequency of 1MHz and modulating signal of 2Vrms with frequency of 1KHz are applied to a circuit whose characteristics is $I=5+V+0.05V^2$. Compute the modulation Index and frequencies of total output. **10**

OR

3 a) Analyze the working principle of diode Circuit for generating a modulated wave with only two sidebands. Draw the Spectrum provide design specifications of band pass filter to extract the desired wave. **10**

   b) A carrier wave $4 \, Sin \, (2\pi*500*10^3 t)$ volts is amplitude modulated by an audio wave of $[0.2Sin3(2\pi*500t) + 0.1Sin5(2\pi*500t)]$. Determine the upper and lower sidebands and sketch the complete spectrum of modulated wave. Estimate the total power in sidebands. **10**

UNIT - III

4 a) Define Hilbert transforms state and prove its properties. **07**

   b) Apply the Hilbert transforms for the following functions
1) $Cos \, 2\pi f_c \, t$;2) $Sin \, 2\pi f_c \, t$; 3) $\delta(t)$ **08**

   c) Explain with a block diagram how SSB-SC signal is demodulated? **05**

OR

5	a)	Write short notes on 1)Vestigial sideband modulation with block diagram 2)Frequency Division Multiplexing with block diagram	**10**
	b)	Apply the Hilbert transform to derive the expression for USSB-SC (upper sideband) signal. Explain its generation by phase discrimination method with suitable block diagram and signal representation.	**10**

UNIT - IV

6	a)	With relevant expression and neat block diagram explain wideband FM from basic principles taking single tone sinusoidal modulating signal.	**08**
	b)	Compare Narrow band and Wideband FM.	**06**
	c)	A Sinusoidal modulating waveform of amplitude 5V and a frequency of 2KHz is applied to a FM generator which has a frequency sensitivity of 40Hz/volt. Calculate the frequency deviation, modulation Index and bandwidth.	**06**

UNIT - V

7	a)	State and prove the Low pass sampling theorem with waveform.	**08**
	b)	Given that Signal X(t)=10 Cos (2000πt)cos(1000πt) is sampled at its Nyquist rate, 1)Draw the spectrum of signal and its sampled version. 2)Comment on the frequency components that appear at the output of a reconstruction filter.	**08**
	c)	Compare PAM, PWM, PPM in communication system.	**04**

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