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

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Electronics and Communication Engineering **Duration: 3 hrs.**
Course Code: 19EC5PCCT1 **Max Marks: 100**
Course: Communication Theory I

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)	State and explain three properties of autocorrelation function	**06**
	b)	Obtain the expression for AM wave considering a single tone message signal? A broadcast AM transmitter radiates 50 kilowatts of carrier power. What will be the radiated power at 85% Modulation? When the Modulation percentage is 75, an AM transmitter produces 10KW. How much of this is the carrier power?	**08**
	c)	Explain the COSTAS loop receiver with neat diagram	**06**

OR

2	a)	Analyze the working of a diode circuit for generating a modulated wave with only two sidebands. Draw the spectrum and provide design specification of band pass filter to extract desired modulated wave.	**08**
	b)	Show that $2/3^{rd}$ power is required to transmits only carrier in standard AM when the modulation index is 100%.	**06**
	c)	Define a Random Variable with an example. State the properties of CDF and PDF of a random variable.	**06**

UNIT - II

3	a)	Obtain the expression for VSB modulated wave by transmitting upper side band along with the vestige of the lower side band.	**08**
	b)	State and prove the properties of Hilbert Transform	**06**
	c)	In coherent detection of SSB wave, if the reference signal is $\cos(2\pi f_c t+\varphi)$, Prove that there is a phase error in the output and the output consist not only the message signal but also its Hilbert Transform	**06**

OR

4	a)	What is frequency Translation? With a Spectrum diagram Explain the operation of frequency translation?	**06**
	b)	Show that a SSB signal can be demodulated by the synchronous detector shown in fig 1. Sketch the spectrum of the signal at each point and also write down the expression of the signal at each point	**10**

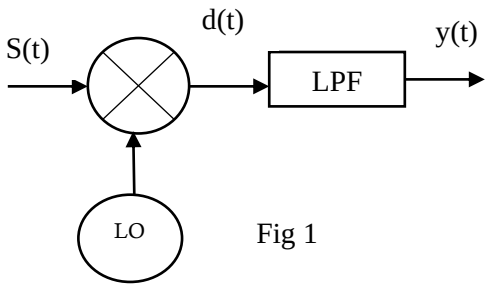

Fig 1

c) A transmitter with a 10KW carrier transmits 11.2 KW when modulated with a single sine wave: - **04**
i) Calculate the modulation index.
ii) If the carrier is also simultaneously modulated with another sine wave at 50%

UNIT - III

5 a) Starting from basic principle explain the generation of FM from PM and PM from FM and also derive the necessary expressions. **08**

b) Explain with neat diagram FM stereo multiplexing. **07**

c) The equation of an FM wave is $S(t)=10\sin[5.7*10^8t+5\sin 12*10^3t]$ Calculate Carrier frequency, Modulating Frequency, Modulating Index, Frequency Deviation, and Transmission Bandwidth **05**

OR

6 a) Analyze the generation of FM using direct method. What are its disadvantages? Explain how to overcome this? **10**

b) Explain with neat diagram demodulation of FM using PLL **10**

UNIT - IV

7 a) Define Noise. Explain different types of noises encountered in the communication system. Explain **10**

b) Obtain the Figure of Merit (FOM) of AM receiver. **10**

OR

Prove that Narrowband FM offers no improvement in SNR over AM?

8 a) Explain (i) Signal to Noise Ratio (ii) Figure of merit **10**

b) Find the figure of merit of an AM system when the depth of modulation is (i) 100% (ii)50% (iii) 30% **05**

c) **05**

UNIT - V

9 a) Define and differentiate Analog and Digital Communication. List the advantages of Digital Communication over Analog Communication. **10**

b) State and prove the sampling theorem for low pass signal **10**

OR

10 a) Explain natural and flattop sampling techniques **06**

b) Sketch the spectrum of sampled signal at (i) fs=2fm; (ii) fs>2fm and (iii) fs<2fm **08**

c) Write the advantages and disadvantages for PAM **06**

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