U.S.N.										

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

Autonomous Institute Affiliated to VTU

February 2025 Semester End Main Examinations

Programme: B.E. | **Semester: IV**
Branch: Electronics and Communication Engineering | **Duration: 3 hrs.**
Course Code: 23EC4PCPCS / 22EC4PCPCS | **Max Marks: 100**
Course: Principles of Communication Systems

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

				CO	PO	Marks
			UNIT – I			
	1	a)	What are the key differences in terms of signal representation in PWM and PPM.	CO 2	PO2	04
		b)	Compare Amplitude Modulation (AM) in the time domain versus the frequency domain. How does these help in understanding AM signal characteristics?	CO 2	PO2	06
		c)	How is the message signal recovered from an AM signal using envelope detector? Discuss practical considerations when designing an envelope detector for AM demodulation.	CO 2	PO2	10
			OR			
	2	a)	How is AM generated using square law modulator? Derive relevant expressions?	CO 2	PO2	8
		b)	Explain the power relation between carrier and sidebands in AM for sinusoidal modulation, after deriving the fundamental voltage equation for AM.	CO 1	PO1	6
		c)	A carrier wave of frequency 10 MHz and peak value 10V is amplitude modulated by a 5 KHz sine wave of amplitude 6V. Determine the modulation index and amplitude of the side frequencies.	CO 1	PO1	6
			UNIT – II			
	3	a)	For a ring modulator with input signals $m_1(t)=A_1\cos(\omega_1 t)$ and $m_2(t)=A_2\cos(\omega 2t)$, where A_1 and A_2 are amplitudes and ω_1 and ω_2 are angular frequencies, derive the expression for the output signal s(t) with a neat block diagram. Assume ideal ring modulator characteristics. If the input signals to a ring modulator have power levels P_1=5 mW, and P_2=10 mW, and assuming an ideal ring modulator with no losses, calculate the power of the DSBSC output signal.	CO 3	PO3	10
		b)	How does Quadrature Carrier Multiplexing achieve the separation of two different signals on the same carrier frequency?	CO 1	PO1	05
		c)	Explain how the Phase Discrimination method is used to generate an SSBSC Signal having only the lower sidebands.	CO 1	PO1	05

			OR			
	4	a)	Explain the Costas loop receiver for the demodulation of DSBSC signal with a neat block diagram. A DSBSC signal has a carrier frequency of 100 MHz and a baseband signal bandwidth of 10 kHz. If the carrier amplitude is 10 V and the modulating signal amplitude is 2V, calculate the power of the DSBSC signal.	***CO*** 1	***PO1***	**10**
		b)	Explain the role of the vestigial sideband filter in VSB modulation. Why is VSB a preferred modulation scheme.	***CO*** 2	***PO2***	**04**
		c)	Explain generation of SSB-SC frequency discrimination method. What are the desirable filter characteristics? Why is frequency up conversion required at the end of SSB generation.	***CO*** 1	***PO1***	**06**
			UNIT - III			
	5	a)	Explain how FM can be generated using PM and vice versa using relevant block diagrams and expressions	***CO*** 1	***PO1***	**06**
		b)	Explain how WBFM can be generated using the Armstrong method. What is the advantage of using the crystal oscillator in this method over the direct method. Given the modulation index of an FM wave is 4,find the number of significant sidebands that can be considered for calculating the BW of the WBFM signal.	***CO*** 1	***PO1***	**08**
		c)	Explain how down conversion of a DSBSC wave is achieved. What is the advantage of performing this frequency conversion?	***CO*** 1	***PO1***	**06**
			OR			
	6	a)	Describe the Carson's rule and its application in determining the bandwidth of WBFM signals. An FM signal has a carrier frequency of 100 MHz and a maximum frequency deviation of 5 kHz. If the modulating signal frequency is 1 kHz, determine whether the signal is NBFM or WBFM.	***CO*** 1	***PO1***	**06**
		b)	Explain how FM can be generated using Hartley oscillator with a neat circuit diagram.	***CO*** 1	***PO1***	**06**
		c)	Explain using a circuit diagram, how a Zero crossing detector can be used to retrieve the message signal in FM.	***CO*** 1	***PO1***	**08**
			UNIT – IV			
	7	a)	Explain the various sources of noise in a communication system that degrades the performance of the system.	***CO*** 1	***PO1***	**04**
		b)	Explain pre-emphasis and de-emphasis. What is the advantage that is offered by pre emphasis and de emphasis.	***CO*** 1	***PO1***	**06**
		c)	Show that the Figure of Merit for a DSBSC receiver is unity.	***CO*** 2	***PO2***	**10**
			OR			
	8	a)	Draw and explain pre-emphasis and de-emphasis circuits used in FM.	***CO*** 2	***PO2***	**6**

		b)	Derive expression for the figure of merit of an FM system.	***CO*** 1	***PO1***	**6**
		c)	Explain about noise effect in DSB-SC and obtain necessary expression for figure of merit.	***CO*** 1	***PO1***	**8**
			UNIT – V			
	9	a)	Explain the concept of Nyquist rate. How is it related to the Sampling Theorem? Given a sampling rate of 44.1 kHz, what is the highest frequency that can be accurately represented in the sampled signal?	***CO*** 1	***PO1***	**06**
		b)	What is quadrature sampling? Explain its significance in the context of bandpass signals. A quadrature sampling system samples a bandpass signal with a center frequency of 5 MHz and a bandwidth of 500 kHz. If the I/Q components are sampled at 2 MHz, what is the effective sampling rate for the bandpass signal?	***CO*** 1	***PO1***	**06**
		c)	Define Pulse Amplitude Modulation (PAM) in detail. If a baseband signal with a bandwidth of 4 kHz is sampled using PAM, what is the minimum sampling rate required to avoid aliasing? What do you understand by the term aliasing?	***CO*** 1	***PO1***	**08**
			OR			
	10	a)	State and prove sampling theorem & its reconstruction for low-pass signals.	***CO*** 2	***PO2***	**6**
		b)	Compare PAM, PWM and PPM pulse modulation techniques.	***CO*** 1	***PO1***	**7**
		c)	Explain generation of PAM with mathematical analysis.	***CO*** 2	***PO2***	**7**

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