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24EC41

Fourth Semester B.E. Degree Examination, May 2026
PRINCIPLES OF COMMUNICATION SYSTEMS

TIME:3 hrs. Max.Marks:100

Note: 1. Answer any FIVE full questions, choosing ONE question from each MODULE
2. M: Marks, L: Bloom's level,C: Course outcomes.

		Module-1	M	L	C
Q.1	a	What is amplitude modulation? Obtain the expression for AM by both time and frequency domain representation with necessary waveforms.	8	L2	CO1
	b	Obtain the expression for total power and modulation index of AM wave	8	L3	CO1
	c	Consider a message signal $m(t) = 20\cos(2\pi t)$ volts and a carrier signal $c(t) = 50\cos(100\pi t)$ volts. Find and sketch the resulting AM wave for 75% modulation. Sketch the spectrum of this AM wave. Find the power dissipated across a load of 100 ohms.	4	L3	CO1
		OR			
Q.2	a	Explain the generation of AM waves using switching modulators with block diagram, derive the equation and draw the spectra with filter specifications.	8	L3	CO1
	b	Explain the working of envelope detector in detail.	6	L2	CO1
	c	An audio frequency signal $5\sin 2\pi (1000)$ t is used to amplitude modulate a carrier of $100\sin 2\pi (106)$ t. Assume modulation index is 0.4. Find a) Side Band Frequencies. b) Amplitude of each sideband c) Bandwidth required d) Total power delivered to a load of 100 Ω.	6	L3	CO1
		Module–2			
Q.3	a	With neat diagram, describe the direct method of generating FM. Also explain feedback scheme for frequency stabilization of a frequency modulator in direct method.	8	L2	CO2
	b	With neat circuit diagram and necessary waveform, explain the working of balanced slope detector.	8	L2	CO2
	c	List the advantages and Disadvantages of Frequency Modulation	4	L2	CO2
		OR			
Q.4	a	Define frequency modulation. Derive the time domain expression for frequency modulated wave& also sketch necessary waveforms.	6	L3	CO2
	b	Explain super heterodyne receiver with neat block diagram	8	L2	CO2
	c	Give the comparison between Narrow Band FM and wide Band FM.	6	L3	CO2
		Module–3			
Q.5	a	Explain Thermal noise with necessary diagrams and equations	4	L2	CO3
	b	Derive the expression for figure of merit for AM receiver and show that it is equal to $\mu^2/2+ \mu^2$	8	L3	CO3
	c	Derive an expression for noise equivalent bandwidth.	8	L3	CO3

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		OR			
Q.6	**a**	Define Noise figure and explain its significance with derivation	**6**	**L2**	**CO3**
	b	Derive the FOM for a DSB-SC system employing coherent detector.	**10**	**L3**	**CO3**
	c	Find the FOM of AM receiver when depth of modulations i)100% ii)50% iii)30%	**4**	**L3**	**CO3**
		Module–4			
Q.7	**a**	State and Prove Sampling theorem for band limited signals	**8**	**L3**	**CO4**
	b	With relevant waveforms, mathematical expressions explain the generation and Detection of PAM Waves	**8**	**L2**	**CO4**
	c	An analog signal is expressed by the equation $X(t) = 3\ Cos50\ \pi t + 10\ Sin\ 300\ \pi t + Cos\ 100\ \pi t$. Calculate the Nyquist rate and the Nyquist interval for this signal.	**4**	**L3**	**CO4**
		OR			
Q.8	**a**	Explain the working of TDM system with necessary block diagram.	**8**	**L2**	**CO4**
	b	With neat diagram, explain the generation of and Detection of PPM Waves.	**8**	**L2**	**CO4**
	c	Twenty four voice signals are sampled uniformly and then time division multiplexed. The highest frequency component for each voice signal is 3.4 kHz. i) If the signals are pulse amplitude modulated using Nyquist rate sampling, what is the minimum channel bandwidth required? ii) If the signals are pulse code modulated with an 8 bit encoder, what is the sampling rate? The bit rate of system is 1.5×10^6 bits/sec.	**4**	**L3**	**CO4**
		Module–5			
Q.9	**a**	What is quantization noise? Derive the output signal to noise ratio of a uniform quantizer	**8**	**L3**	**CO5**
	b	With the aid of relevant block diagrams and mathematical equations explain Delta Modulation and Demodulation	**8**	**L2**	**CO5**
	c	An analog waveform with bandwidth 15 kHz is to be quantized with 200 levels and transmitted in binary PCM signal. Find the rate of transmission and bandwidth required. If 10 such signals are to be multiplexed, find the bandwidth requirement.	**4**	**L3**	**CO5**
		OR			
Q.10	**a**	With neat block diagram, explain the generation & reconstruction of PCM Signal.	**8**	**L2**	**CO5**
	b	A TV signal with bandwidth of 4.2Mhz is transmitted using binary PCM.The number of representation levels is 512.Calculate i)Codeword Length ii)Final bit rate iii) Transmission bandwidth	**6**	**L3**	**CO5**
	c	Represent the given binary data 10011101in the following line codes: i. Unipolar NRZ ii. Polar NRZ iii. Unipolar RZ iv. Bipolar RZ v. Manchester code	**6**	**L3**	**CO5**

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