U.S.N.										

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

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

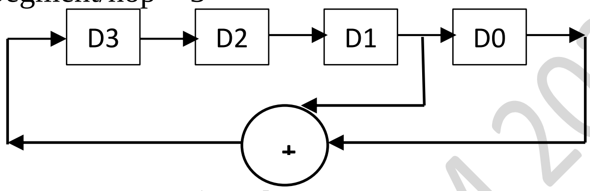
Programme: B.E. **Semester: VI**
Branch: Electronics and Telecommunication Engineering **Duration: 3 hrs.**
Course Code: 19ET6PCDCM **Max Marks: 100**
Course: Digital Communication

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

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	*CO*	*PO*	**Marks**
1	a)	From basic terminologies, derive the 6dB rule of Uniform quantization	*CO2*	*PO1*	**10**
	b)	Explain the process of natural sampling with relevant diagrams and equations.	*CO1*	-	**10**
		OR			
2	a)	Show that use of A – Law Companding and μ – Law Companding have same Companding gain if A = μ.	*CO2*	*PO1*	**10**
	b)	Consider a sinusoidal modulating signal $m(t) = A \cos \omega_m t$ is applied to a Delta modulator with a step size δ. Prove that slope overload will occur if $A > \delta / \omega_m T_s$	*CO3*	*PO2*	**10**
		UNIT - II			
3	a)	Consider a 8 bit binary sequence of alternating 1s and 0s. Sketch the waveforms for the following line codes: i. On – Off Signaling ii. Polar NRZ and RZ signaling iii. Bipolar NRZ and RZ signaling iv. Manchester Signaling	*CO2*	*PO1*	**10**
	b)	The following data is applied to a Modified duo-binary coder 0 1 1 0 1 1 0 0 1. i. Sketch the block diagram and write the equations of the Modified duo-binary coder and derive the output for the above data considering the pre-coded data as 00 ii. If an error occurs at position 5, show that the same does not get propagated to the next stages.	*CO3*	*PO2*	**10**
		OR			

	4	a)	Analyze with relevant equations and diagrams the Raised Cosine Spectrum solution for overcoming ISI.	*CO2*	*PO1*	**10**
		b)	The following data is applied to a duo-binary coder **0 1 1 0 1 1 0 0 1**. i. Sketch the block diagram and write the equations of the duo-binary coder and derive the output for the above data ii. Consider a pre – coder with initial value of **0** and solve i.	*CO3*	*PO2*	**10**
			UNIT - III			
	5	a)	State and prove the properties of the matched filter.	*CO2*	*PO1*	**10**
		b)	With relevant terminologies, derive the Probability of Error for the coherent detection of ASK.	*CO2*	*PO1*	**10**
			OR			
	6	a)	Sketch the Constellation diagrams with relevant equations for the following modulation schemes: i. BPSK ii. BFSK	*CO2*	*PO1*	**10**
		b)	In an AWGN channel, the power spectral density is 4 X 10^{-20} Watts/Hz, bit duration of 0.5μs, amplitude of received signal is 1.5μV. Calculate the probability of error for BFSK for the above data.	*CO2*	*PO1*	**10**
			UNIT - IV			
	7	a)	Explain with relevant block diagrams and equations the working of DPSK transmitter and receiver.	*CO1*	-	**10**
		b)	Explain with relevant block diagrams and equations the working of GMSK transmitter and receiver.	*CO1*	-	**10**
			OR			
	8	a)	With relevant block diagrams, analyze the concept of MQAM transmitter and receiver.	*CO1*	-	**10**
		b)	Sketch the in-phase and quadrature components of a QPSK signal for the binary sequence **1 1 0 0 1 0 1 1 1**. Assume that the carrier frequency $f_c = 1/T_b$ and choose appropriate basis functions.	*CO3*	*PO2*	**10**
			UNIT - V			
	9	a)	With relevant equations, explain the three different properties of PN Sequence.	*CO1*	-	**10**
		b)	Explain with appropriate block diagrams, equations and waveforms the generation and detection of Slow Frequency Hop Spread Spectrum technique.	*CO1*	-	**10**
			OR			

	10	a)	A three stage LFSR generates the sequence **0 1 0 1 1 1 0 0 1 0 1 1 1 0** … i. Determine the period of the given infinite sequence ii. Verify the three properties of the PN sequence for the given sequence	*CO3*	*PO2*	**10**
		b)	A PN sequence is generated using a four stage LFSR with initial condition of [$D_3D_2D_1D_0$] =**1000** as shown in ***Fig.10b***. This sequence is used in a Slow FH/MFSK system. The FH/MFSK signal has the following parameters: Number of bit/MFSK symbol = 2 Number of MFSK tones = 4 Length of PN Segment/hop = 3  ***Fig.10b*** Determine the following: i. PN Sequence for one periodic length ii. Assume binary data sequence of **1 0 0 0 1 1 0 1 0 0 0 1 1 1 1 1 1 0 0 1**, sketch the variation of de-hopped frequency with time	*CO3*	*PO2*	**10**

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