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

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

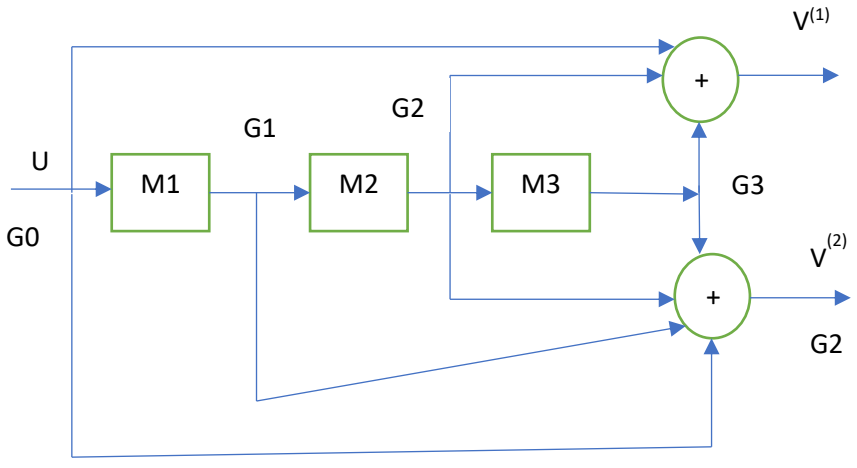
Programme: B.E. **Semester: V**
Branch: Electronics and Communication Engineering **Duration: 3 hrs.**
Course Code: 23EC5PCDCT **Max Marks: 100**
Course: Digital Communication Theory

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)	What insights about signal quality can be derived by analyzing eye patterns? State two applications of eye pattern.	CO 2	PO 2	6
	b)	Derive an expression for signal to quantization noise ratio in an n-bit binary PCM system, where n is the number of bits uniquely assigned to each of the L quantization levels.	CO 2	PO 2	8
	c)	For a binary sequence 0100000001011 Construct the line code format i) Bipolar RZ & NRZ ii) polar RZ & NRZ iii) Manchester	CO 1	PO 1	6
		OR			
2	a)	A signal m(t) band-limited to 3 kHz is sampled at a rate 33.33% higher than the Nyquist rate. The maximum acceptable error in the sample amplitude is 0.5% of the peak amplitude m_p. The quantized samples are binary coded. Find the minimum bandwidth of a channel required to transmit the encoded binary signal. If 24 such signals are time-division multiplexed, determine the minimum transmission bandwidth required to transmit the multiplexed signal.	CO 3	PO 3	8
	b)	With illustration explain in detail Quantization Process and the types of Quantization ?	CO 2	PO 2	6
	c)	Show that for large values of μ =A, the μ law and A law have the same companding gain.	CO 1	PO 1	6
		UNIT - II			
3	a)	Distinguish between coherent and non-coherent reception.	CO 1	PO 1	4
	b)	A binary data stream 0011010010 is transmitted using DPSK. Show the reconstruction of the DPSK signal.	CO 2	PO 2	6
	c)	Derive the expression for Bit error probability for a BPSK.	CO 1	PO 1	10
		OR			
4	a)	Discuss the properties of matched filter	CO 2	PO 2	5

		b)	A BFSK system employs two signalling frequencies f_1 and f_2. The lower frequency f_1 is 1200HZ and the signalling rate is 500 Baud. Compute f_2? Find the error probability of the system if the PSD of white noise $N_o/2 = 10^{-10}$watt/Hz. Amplitude of the carrier is A=1mv at the receiver input and the frequency of the baseband NRZ signal is f_b=1kHz	***CO 2***	***PO 2***	**5**
		c)	Discuss the generation of Binary Amplitude Shift Keying Signal write the supporting diagram, mathematical expression and waveform also show how the message is detected from the BASK?	***CO 1***	***PO 1***	**10**
			UNIT - III			
	5	a)	Discuss frequency hop spread spectrum technique. Compare Slow and Fast frequency hopping?	***CO 2***	***PO 2***	**10**
		b)	A PN sequence is generated using a 4 stage linear feedback shift register given below with initial condition 1000. This sequence is used in Slow Frequency Hopping FSK System. The FH-MFSK signal has the following parameters the Number of bits per MFSK symbol, K=2 , Number of MFSK tones, $M = 2^k = 2^2 = 4$, Length of PN segment per hop, k=3, Total Number of Frequency hops, $2^k = 2^3 = 8$ a) Determine the period of PN sequence? b) PN sequence for one periodic length? c) Illustrate the variation of FHFSK signal for one complete period of the PN sequence. Assume that the carrier hops to a new frequency after transmitting two MFSK symbols or four information bits. Assume binary data sequence to be 1000110100011111001 d) Sketch the variation of dehopped frequency with time?	***CO 3***	***PO 3***	**10**
			OR			
	6	a)	Discuss the model of a spread spectrum digital communication system? If this system is characterized by T_b=4095sec and T_c= 1μsec calculate the processing gain and jamming margin if E_b/N_o=10 and $P_e = 10^{-5}$?	***CO 2***	***PO 2***	**10**
		b)	Generate the maximum length PN sequence generator for n=3 and having feedback tap at (3,1). Explain the generation of Maximum length PN sequence step by step. State and Verify all its properties assuming the initial state of the shift registers as 111.	***CO 3***	***PO 3***	**10**
			UNIT - IV			
	7	a)	An event has six possible outcomes with probabilities {1/2, 1/4, 1/8, 1/16, 1/32, 1/32}. Solve for the entropy of the system. Explain Entropy and its Properties for the above system?	***CO 2***	***PO 2***	**12**
		b)	Source emits one of the four symbols A, B, C and D with probabilities 1/3, 1/6, 1/4 respectively the emissions of symbols by the source are statistically independent. Design a Shannon Fano code for the source. Determine the average code length and efficiency	***CO 3***	***PO 3***	**8**

			OR			
	8	a)	Construct binary code using compact code procedure for the following probability symbols {0.2, 0.18, 0.12, 0.1, 0.1, 0.08, 0.06, 0.06, 0.06, 0.04}. Calculate the entropy of the source, average code Length, efficiency, redundancy and variance	***CO 3***	***PO 3***	**10**
		b)	Discuss binary symmetric channel? Derive channel capacity formula for symmetric Channel	***CO 2***	***PO 2***	**10**
			UNIT - V			
	9	a)	For a systematic linear block code, the three parity check digits P_1, P_2, P_3 are given by $P_{k, n-k}$ = 101 111 110 011 (i) Construct generated matrix. (ii) Assess the code generated by the matrix. (iii) Determine error correcting capacity. (iv) Decode the received words with an example.	***CO 3***	***PO 3***	**10**
		b)	Assume that the code word 10110 for a (6, 3) block code is transmitted and vector R= 001110 is received. Show how a decoder using the syndrome look up table can correct the error. The Generator matrix G = 110100 011010 101001	***CO 3***	***PO 3***	**10**
			OR			
	10	a)	The parity check matrix for a (7,4) block code is given below 1 1 1 0 1 0 0 1 1 0 1 0 0 0 1 0 1 1 0 0 1 a) Find the generator Matrix b) List all the code vectors	***CO 3***	***PO 3***	**6**
		b)	Describe the matrix representation of linear block codes?	***CO 2***	***PO 2***	**6**
		c)	Find the encoded output of the convolution encoder shown below. Consider the input stream to be u = 10111. Find output till memory reset to zero?	***CO 3***	***PO 3***	**8**
						

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