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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 Communication Engineering **Duration: 3 hrs.**

Course Code: 16EC6DCCT2 **Max Marks: 100**

Course: Communication Theory II

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)	Explain the functional Block diagram of Digital Communication System?	1	1	**07**
	b)	Analyse how to minimize the error of Slope overload distortion and improve signal quality ?	2	2	**05**
	c)	Discuss the significance of line coding in digital communication. Illustrate any two commonly used line coding techniques with waveforms and explain their suitability for specific applications. A digital signal with a data rate of 1 Mbps is to be transmitted using Manchester encoding. Calculate the minimum bandwidth required for the transmission.	1	1	**08**
		OR			
2	a)	Explain Quantization in detail?	1	1	**08**
	b)	Analyse with Mathematical Expression the Bandwidth requirement for the transmission of a Pulse code Modulated Signal?	2	2	**06**
	C)	Considering parameters like Step Size, Application, SNR, Bandwidth, Quantization Error, Feedback differentiate between PCM and Differential PCM?	2	2	**06**
		UNIT - II			
3	a)	The bit steam 01001 is differentially encoded and transmitted using DPSK Modulator. Assuming the reference bit as a '1' i) Design the DPSK modulator and demodulator structure and Illustrate the DPSK modulation and demodulation process for above bit stream ii) indicate the transmitted DPSK phase values.	1	1	**12**
	b)	Explain Matched Filters and List the properties of matched filter used in optimum receivers	1	1	**08**
		OR			

	4	a)	Design a sequence generator to generate a maximum length sequence 0011101 considering a 3 stage feedback shift register with a feedback tap (3,1) and check for its properties to be a PN sequence.	2	2	**10**
		b)	With a neat block diagram, explain the non coherent detection of binary Frequency shift keying technique?	2	2	**10**
			UNIT - III			
	5	a)	Define processing gain in the context of spread spectrum communication systems. Derive its mathematical expression and illustrate its impact using a time-domain representation. A spread Spectrum Communication system has information bit duration of 32.767ms and chip duration of 1μsec. Calculate the processing Gain in dB.	2	2	**10**
		b)	Calculate the minimum number of frequencies required for a frequency hopping Spread Spectrum Communication System if the frequency Multiplication Factor is 7.	2	2	**04**
		c)	Write a brief Comparison of the merits and demerits of Frequency Hop Spread Spectrum and Direct Spread Spectrum techniques.	2	2	**06**
			OR			
	6	a)	List and explain the salient features of Spread Spectrum Communication Systems. Support your answer with suitable examples.	1	1	**10**
		b)	Explain the working principle of Frequency Hopping Spread Spectrum (FHSS) with the help of a neat block diagram. Differentiate between slow and fast frequency hopping techniques with suitable examples.	1	1	**10**
			UNIT - IV			
	7	a)	State and explain the key properties of information in the context of digital communication systems	1	1	**10**
		b)	Consider a Discrete Memory less Source (DMS) with source alphabet $S = S_0, S_1, S_2$ whose three distinct symbols have the following probabilities {1/4,1/4, 1/2} respectively. Determine the sourse entropy.	2	2	**04**
		C)	Discuss Prefix Coding. Test whether the following code is prefix code: A 1 B 01 C 001 D 0001	2	2	**06**
			OR			
	8	a)	State the important Properties of codes ? Illustrate with examples	2	2	**06**
		b)	The five symbols S_0, S_1, S_2, S_3, S_4 of a source have the probabilities 0.4, 0.2, 0.2, 0.1, and 0.1 respectively. Find the code words and average length using Huffman's algorithm.	1	1	**08**

		c)	For the channel matrix given below, compute the channel capacity $P(Y/X) = \begin{bmatrix} 0.6 & 0.2 & 0.2 \\ 0.2 & 0.6 & 0.2 \\ 0.2 & 0.2 & 0.6 \end{bmatrix}$ with *rs* = 10000 *symbols/sec.*	2	2	**06**
			UNIT - V			
	9	a)	A generator matrix for a (6, 3) block code is given below $\begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 \end{bmatrix}$ a)List all the valid code vectors. b)Find out minimum distance & weight of the code. c) How many errors can be detected &corrected? d) State your observation on the result obtained. e)If the received vector R=[r_1 r_2 r_3 r_4 r_5 r_6] Construct the syndrome calculating circuit	2	2	**10**
		b)	Consider the (3, 1, 2) Convolution code with $g^{(1)}$=(110) $g^{(2)}$=(101) and $g^{(3)}$=(111) a) Draw the encoder block diagram. b) Find the generator matrix. c) Find the code word corresponding to the information sequence (11101) using time domain and transform domain approach.	2	2	**10**
			OR			
	10	a)	Assume that the code word 101110 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	3	3	**10**
		b)	A (15,5) linear cyclic code has a generator polynomial $g(x)=1+x+x^2+x^4+x^5+x^8+x^{10}$ (i) Draw the block diagrams of an encoder and syndrome calculator for this code (ii) Find the polynomial for the message polynomial $D(x)=1+x^2+x^4$ in the systematic form.	3	3	**10**

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