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

Autonomous Institute Affiliated to VTU

July 2024 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Electronics and Communication Engineering **Duration: 3 hrs.**
Course Code: 22EC5PCDCT **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)		Describe the significance line coding. Given the data stream 101011100. Sketch the transmitted sequence of pulses for each of the following line code. (i) Unipolar NRZ (ii) Polar NRZ (iii) Unipolar RZ (iv) bipolar RZ (v) Manchester code	*CO1*	*PO1*	**07**
	b)		With a neat block diagram of digital communication systems, explain the source and channel encoder/decoder functions.	-	-	**07**
	c)		Derive the expressions of Nyquist criterion for distortion less baseband binary transmission or zero ISI.	*CO1*	*PO1*	**06**
			OR			
2	a)		Derive the expression for Signal-to-Quantization noise ratio (SQNR). Consider an audio signal with spectral component limited to the frequency band 3.4 kHz. Required output SQNR is 30dB. a) What is the minimum number of quantization levels needed and number of bits per sample needed? b) Calculate minimum bandwidth required.	*CO1*	*PO1*	**10**
	b)		What is TDM PCM? Design the structure of T carrier system for multiplexing up to T4 (fourth) level, indicating number of voice channels that can be accommodated at each stage and corresponding bitrate.	*CO3*	*PO3*	**10**
			UNIT - II			
3	a)		Define binary phase shift keying. With a neat block diagram explain the generation of BPSK signal.	-	-	**06**
	b)		The bit steam (10010011) 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.	*CO3*	*PO3*	**10**

		c)	List the properties of matched filter used in optimum receivers	-	-	**04**
			OR			
	4	a)	Draw the waveform for the binary data sequence 101100 Modulated using FSK and PSK. Compare the probability of error of PSK with that of FSK .What is the Bandwidth requirement if the BPSK signal modulated with a carrier frequency of 140MHz modulated by data bits at a rate of 2400bits/sec	*CO1*	*PO1*	**06**
		b)	Sketch Binary PSK and FSK waveforms for the sequence 101101 to the scale. If a rectangular polar pulse baseband signal is used to modulate an RF carrier in FSK with the data rate of 200 kbps and the two RF frequencies are 150KHz apart, determine the bandwidth. Write constellation diagram.	*CO1*	*PO1*	**08**
		c)	With a neat diagram explain the generation of QPSK signals	-	-	**06**
			UNIT - III			
	5	a)	Design a sequence generator to generate a maximum length sequence 10011101 considering a 3 stage feedback shift register with a feedback tap (3,1) and check for its properties to be a PN sequence.	*CO3*	*PO3*	**08**
		b)	With a neat block diagram explain the frequency hopped spread spectrum.	-	-	**06**
		c)	Explain the basic base band OFDM system with block diagram	-	-	**06**
			UNIT - IV			
	6	a)	A source emits symbols [S0, S1, S2, S3, S4] with probabilities indicated in table at the rate 8400 symbols/sec. Symbol Xi | Probabilities p(Xi) S0 | 0.2 S1 | 0.15 S2 | 0.25 S3 | 0.25 S4 | 0.15 a) Apply Shannon-Fano coding and compute Average length and efficiency. b) What will be symbols sent if received sequence is 1101111000011010110	*CO1*	*PO1*	**10**
		b)	Design the binary Huffman code for the source with five symbol a) [S0, S1, S2, S3, S4] having probabilities [1/3, 1/5, 1/5, 2/15, 2/15]. Check if this code is uniquely decodable? b) When all symbols [S0, S1, S2, S3, S4] are equally probable, what is the Huffman code generated? c) Computing H(x) and efficiency in both the cases. Analyze and comment on results obtained.	*CO3*	*PO3*	**10**
			UNIT - V			
	7	a)	Design a (7,4) linear block code for the given parity matrix and write all the code vectors. Draw implementation circuit of	*CO3*	*PO3*	**10**

			encoder and decoder. **Analyze** its error detecting and correcting capability. Given parity matrix $P = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 1 \end{bmatrix}$			
		b)	For a (3,1,2) Convolutional code, the generator matrix are given below $g^1 = 110$ $g^2 = 101$ $g^3 = 111$ Design a encoder diagram of the same. Find the code word for the message [11101] using time domain and transfer domain approach.	*CO3*	*PO3*	**10**

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