Reg. No.															

Question Paper Code	13982

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

Fifth Semester

Electronics and Communication Engineering

20ECPC501 - DIGITAL COMMUNICATION

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Mutual Information is represented as,_____ (a) I(X/Y) (b) I(X;Y) (c) I(X,Y) (d) I(X:Y)	1	K1	CO1
2.	The channel capacity is a measure of (a) entropy rate (b) maximum rate of information a channel can handle (c) information contents of messages transmitted in a channel (d) none of these	1	K1	CO1
3.	What coding technique assigns variable-length codes to input characters, with shorter codes assigned to more frequent characters? (a) Shannon-Fano Coding (b) Huffman Coding (c) Gray Coding (d) Run-Length Encoding	1	K1	CO2
4.	Entropy of probabilities of source symbols 0.5, 0.25, 0.25 in bits/symbol can be given as (a) 2 bits/symbol (b) 3 bits/symbol (c) 1.5bits/symbol (d) 4 bits/symbol	1	K1	CO2
5.	Waveform coding techniques are (a) DM, FSK and DPCM (b) ADPCM, PSK, DM (c) DPCM, DM, ADM (d) none of the above	1	K1	CO3
6.	Which of the following systems is not digital? (a) Differential PCM (b) DM (c) ADPCM (d) PAM	1	K1	CO3
7.	Operating Mode of an Adaptive Equalizer is (a) Training Mode (b) Deterministic Mode (c) Random Mode (d) Aperiodic Mode	1	K1	CO4
8.	Raised Cosine Filter in reducing ISI is a (a) Signal Removal filter (b) Pulse Shaping filter (c) Noise Enhancing filter (d) Median Filter	1	K1	CO4
9.	QPSK is a modulation scheme where each symbol consists of (a) 4 bits (b) 2 bits (c) 1 bits (d) M number of bits	1	K1	CO5
10.	A (n, k) Linear Block Code (LBC) hamming weight is represented by the number of (a) zero elements codeword (b) nonzero elements in codeword (c) not predefined (d) infinite	1	K1	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

		Marks	K – Level	CO
11.	Define Shannon's channel coding theorem.	2	K2	CO1
12.	Define information rate. Give its formula.	2	K2	CO1
13.	Calculate the Entropy H(x) in bits/symbol for the probabilities of source symbols {0.6, 0.3, 0.1}.	2	K3	CO2
14.	Calculate the Average Length of the Code Words in Huffman coding Procedure if the probabilities are 0.3 and 0.7.	2	K3	CO2
15.	Compare Differential Pulse Code Modulation (DPCM) and Adaptive DPCM (ADPCM).	2	K2	CO3
16.	State any four desirable properties of a line code.	2	K2	CO3
17.	Compare and Contrast Correlative Coding Schemes with and without precoder.	2	K2	CO4
18.	Outline the available Pulse shaping filters for minimizing ISI.	2	K2	CO4

19.	Distinguish between QPSK and QAM.		2	K2	CO5
20.	Illustrate the constellation diagram of Binary Phase Shift Keying (BPSK).		2	K2	CO5
21.	Compute the Hamming distance between the code words 11010 and 00110.		2	K2	CO6
22.	Obtain the number of parity bits in a Linear Block Code (LBC) having 4 input bits and 7 output bits.		2	K2	CO6

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Define entropy and explain it briefly along with the properties of entropy.	11	K2	CO1
		OR				
	b)	Explain Binary Symmetric Channel and Binary Erasure Channel with neat diagram. Derive for Capacity.	11	K2	CO1
24.	a)	Apply Shannon Fano coding procedure for probabilities 0.12, 0.25, 0.20, 0.08, 0.05, 0.3 and obtain the Codewords, Average Codeword Length, and Efficiency of Code words.	11	K3	CO2
		OR				
	b)	Construct Huffman coding for the symbol probabilities 0.1, 0.2, 0.1, 0.2, 0.4 and obtain the Codewords, Average codeword length, Efficiency of Codewords.	11	K3	CO2
25.	a)	Explain the operation of a Delta Modulation (DM) system. Explain the Slope Overload Distortion and Granular Noise in DM.	11	K2	CO3
		OR				
	b)	Analyze operation of Differential Pulse Code Modulation (DPCM) so as to obtain its Signal to Noise Ratio (SNR) with neat transmitter and receiver diagrams.	11	K2	CO3
26.	a)	Explain the operating modes of an Adaptive Equalizer using block schematic and how does Decision Feedback Equalizer operate to eliminate ISI.	11	K2	CO4
		OR				
	b)	Explain modified Duobinary signalling scheme with a neat diagram.	11	K2	CO4
27.	a)	Explain Binary Phase Shift Keying (BPSK) digital modulation scheme using concepts of signal model, constellation diagram, transmitter and receiver diagram.	11	K2	CO5
		OR				
	b)	Explain Binary Frequency Shift Keying (BFSK) digital modulation scheme, and derive its Probability of Error.	11	K2	CO5
28.	a)	Design a code rate 1/2 convolutional encoder with constraint length K=3 having generator sequence g1=[1 1 1]; g2=[1 0 1]; Draw the encoder and state diagram, code tree and trellis diagram and determine the output sequence for the message sequence 10011.	11	K3	CO6
		OR				
	b)	A (7,4) linear block code whose parity check matrix is given by $H = \begin{bmatrix} 1110100 \\ 1101010 \\ 1011001 \end{bmatrix}$ i) Find the Generator Matrix. ii) Develop the Codeword Table, Hamming weight and Hamming distance iii) Propose the Error Correction and Error Detection capabilities of the code. iv) Formulate the Syndrome and Error Pattern.	11	K3	CO6