CBCS SCHEME

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BEC503

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Digital Communication

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2 .M : Marks , L: Bloom's level , C: Course outcomes.

			M	L	C
		Module – 1			
Q.1	a.	What is Hilbert Transform? Summarize the properties of Hilbert Transform.	10	L2	CO1
	b.	Describe with the mathematical expression of canonical representation of Bandpass signals.	10	L2	CO1
		OR			
Q.2	a.	Tabulate the steps used in Gran-Schmidt orthogonalization procedure.	10	L2	CO1
	b.	Outline the detector diagram of correlation receiver.	10	L2	CO1
		Module – 2			
Q.3	a.	Derive an expression for probability of error calculation binary PSK using coherent detection.	10	L2	CO2
	b.	Explain with neat diagrams generation and coherent detection of QPSK signals.	10	L2	CO2
		OR			
Q.4	a.	Develop signal space diagram of M-array QAM for M = 16.	10	L3	CO2
	b.	Outline the generation and detection of non-coherent DPSK signals with a necessary diagram.	10	L2	CO2
		Module – 3			
Q.5	a.	Outline the properties of entropy. Derive an expression for average information content of symbols in long independent sequences.	10	L2	CO3
	b.	A source has an alphabet of 7 symbols with probabilities as given below : Symbol: S1, S2, S3, S4, S5, S6, S7 Probability: 1/4, 1/4, 1/8, 1/8, 1/8, 1/16, 1/16 Construct Huffman binary code and find its efficiency.	10	L3	CO3
		OR			
Q.6	a.	Briefly explain the following properties of mutual information i) Symmetry property ii) Non negativity property	10	L2	CO3
	b.	Derive an expression for Information Capacity Law.	10	L2	CO3

		Module – 4			
Q.7	a.	Consider a (6, 3) linear code whose generator of matrix is $G = \begin{bmatrix} 1 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 & 1 \end{bmatrix}$ Calculate : i) All code vectors ii) All the hamming weight and distances iii) Minimum weight parity check matrix iv) Draw the encoder circuit.	10	L3	CO4
	b.	For a systematic (6, 3) linear block code, the parity matrix 'P' is given by $[P] = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \end{bmatrix}$ Calculate all possible vectors.	10	L3	CO4
		OR			
Q.8	a.	The parity check bits of a (7, 4) Hamming code are generated by $C_5 = d_1 + d_3 + d_4$, $C_6 = d_1 + d_2 + d_3$, $C_7 = d_2 + d_3 + d_4$, where d_1, d_2, d_3 and d_4 are the message bits. i) Compute the generator matrix [G] and parity check matrix [H] for this code ii) Show that $GH^T = 0$.	10	L3	CO4
	b.	Briefly, explain the following terms Hamming weight, Hamming distance and minimum distance of LBC with suitable examples.	10	L2	CO4
		Module – 5			
Q.9	a.	Consider the (3, 1, 2) convolutional code with $g^{(1)} = (110)$, $g^{(2)} = (101)$ and $g^{(3)} = (111)$. i) Draw the encoder block diagram ii) Calculate the generator matrix	10	L3	CO5
	b.	Briefly, describe the following terms : i) Code tree ii) Trellis graph iii) State Graph	10	L2	CO5
		OR			
Q.10	a.	Describe the steps of viterbi algorithm in detail.	10	L3	CO5
	b.	Discuss with diagram of the following transconvolutional encoder, generator polynomial of path 1 and path 2.	10	L3	CO5

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