Reg. No. | | | | | | | | | | | | | |

B.E. / B.TECH. DEGREE EXAMINATIONS, MAY 2023

Fifth Semester

EC18501 – DIGITAL COMMUNICATION

(Electronics and Communication Engineering)

(Regulation 2018)

TIME: 3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Ability to distinguish the base band transmission schemes and band pass signaling schemes for any communication system.	2
CO 2	Determine and manipulate the spectral characteristics of band pass signaling schemes and their noise performance of a communication system.	3
CO 3	Develop error control coding schemes for real time applications.	4

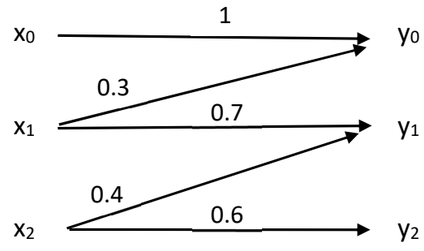
PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	The probability P_k of a symbol S_k is 0.5. What is the amount of information carried by the symbol?	1	3
2.	Find the average information H for 16 equally likely messages.	1	3
3.	Find the transmission rate in Hz, if 4 independent messages with the bandwidths 100 Hz. 100 Hz, 200 Hz and 400 Hz are sampled at the Nyquist rate, and are Time Division Multiplexed (TDM) and transmitted.	2	3
4.	Find the Nyquist rate in Hz and Nyquist interval in seconds for the transmitted signal $x(t) = \sin(400\pi t) + \cos(2\pi 200t)$.	2	3
5.	Draw the Polar NRZ and Manchester line coding formats for the following data sequence 1 0 1 0 1 1 1 0 0 0.	2	3
6.	What is equalization? Why is it needed?	2	4
7.	Why is an Eye diagram important?	2	4
8.	Draw the constellation diagram of 8-QAM.	2	2
9.	What is the constraint length of a convolutional encoder, if there are M memory elements in the encoder.	3	2
10.	Find the Hamming weights of the given code words and the Hamming distance between them, $C_1 = 11101101$ and $C_2 = 10011100$.	3	3

PART- B (5 x 14 = 70 Marks)

		Marks	CO	RBT LEVEL
11. (a)	The probability distribution of the set of symbols {S1, S2, S3, S4, S5} in a discrete memoryless source is given as {0.1, 0.15, 0.15, 0.2, 0.4}. Determine the Shannon Fano codes for the source symbols. Also find the coding efficiency and code variance.	(14)	1	3
	(OR)			
(b)	Compute the mutual information for the given discrete memoryless channel. The probabilities of the source symbols $\{x_0, x_1, x_2\}$ are {0.25, 0.35, 0.4} respectively.	(14)	1	3



12. (a)	Derive the signal to quantization noise ratio of a uniform quantizer. Comment on the SNR value of the PCM transmission system for every increase in bit per sample.	(14)	2	3
	(OR)			
(b)	Explain Differential Pulse Code Modulation and Demodulation with necessary block diagrams. Comment on the dependency of output SNR on the variance of the prediction error.	(14)	2	3
13. (a)	Derive the power spectral density of NRZ Bipolar format and analyze the same.	(14)	2	4
	(OR)			
(b)	What is the significance of Correlative Coding? With necessary block diagrams discuss about the usage of correlative coding in Duo Binary Encoding and Modified Duo Binary Encoding.	(14)	2	4

Q. Code: 325279

14. (a)	With suitable block diagrams, explain the generation and detection of coherent QPSK signal. Draw the signal space diagram.	**(14)**	**2**	**2**
	(OR)			
(b)	With suitable block diagrams explain the generation and detection of BFSK signal. Draw the signal space diagram.	**(14)**	**2**	**2**
15. (a)	**(i)** Draw the convolutional encoder having a constraint length of '3' and code rate r =1/2, for the given generator sequence. $(g_0^1, g_1^1, g_2^1) = (1,0,1)\ and\ (g_0^2, g_1^2, g_2^2) = (1,1,0)$.	**(4)**	**3**	**3**
	(ii) Using the above encoder, determine the code words using 'time domain approach' and 'transform domain approach' for the input message sequence (111010).	**(10)**	**3**	**3**
	(OR)			
(b)	The parity check matrix of a (7, 4) linear block code is given by	**(14)**	**3**	**3**

$$H = \begin{bmatrix} 1 & 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$$

(a) Find the generator matrix (G). (3 Marks)

(b) List all the code vectors. (4 Marks)

(c) How many errors can be detected? (2 Marks)

(d) How many errors can be corrected? (2 Marks)

(e) Check if the received code (1010111) has error or not. (3 Marks)

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	Justify that the bandwidth requirement of Model Based Encoding using Linear Predictive Coding is remarkably less compared to the various other temporal waveform coding techniques.	**(10)**	**2**	**5**

****