Q. Code:415407

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

B.E. / B.TECH. DEGREE EXAMINATIONS, MAY 2024

Fifth- Semester

EC18501 – DIGITAL COMMUNICATION

(Electronics and Communication Engineering)

(Regulation 2018/2018A)

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

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Develop source coding schemes for real time applications.	**3**
CO 2	Develop PCM systems.	**3**
CO 3	Distinguish the base band transmission schemes and band pass signaling schemes for any communication system.	**3**
CO 4	Determine and manipulate the spectral characteristics of band pass signaling schemes and their noise performance of a communication system.	**3**
CO 5	Develop error control coding schemes for real time applications.	**3**

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Give the relationship between information carried by the symbol with its probability of occurrence in the channel?	**1**	**2**
2.	Compute the channel capacity, if the signal to noise ratio is 16 and the channel is bandlimited to 3 kHz?	**1**	**3**
3.	Find the Nyquist rate and Nyquist interval for $x(t) = \sin(400\pi t) + \cos(200\pi t)$	**2**	**3**
4.	Three low-pass signals of equal bandwidth are sampled and time division multiplexed using PAM. The TDM signal is passed through a Low-pass filter & then transmitted over a channel with a bandwidth of 30KHz. What is the maximum sampling rate for each channel? What is the maximum frequency allowable in each signal?	**2**	**3**
5.	List the Usefulness of Eye diagram.	**3**	**2**
6.	List the desirable characteristics of line codes.	**3**	**2**
7.	Define QAM and draw the constellation diagram of 8-QAM.	**4**	**2**

8.	Draw the FSK and PSK waveforms for the given binary sequence – 1 1 0 0 1 0 1 0 1	**4**	**3**
9.	Determine the Hamming Weights of the code C1 and C2 and also find the Hamming distance between them. C1 = 10101010; C2 = 01011001	**5**	**3**
10.	Enumerate the properties of cyclic codes.	**5**	**2**

PART- B (5 x 14 = 70 Marks)

		Marks	CO	RBT LEVEL
11. (a)	Using Huffman coding method, encode the symbols {S1, S2, S3, S4, S5, S6} of the discrete memoryless source with the probability distribution, 0.35, 0.2, 0.15, 0.15, 0.1, 0.05 and compute the efficiency, variance and redundancy.	**(14)**	**1**	**3**
	(OR)			
(b)	Using the Shannon Fano code, Find the code efficiency, code variance and redundancy. for the symbols {S1, S2, S3, S4, S5, S6} with the probabilities {0.25, 0.2, 0.15, 0.15,0.01, 0.01, 0.01, 0.02, 0.2}, respectively.	**(14)**	**1**	**3**
12. (a)	Explain the generation and detection of differential pulse code modulated signal. Also compare the performance of DPCM system with PCM system.	**(14)**	**2**	**4**
	(OR)			
(b)	Explain the model based encoding using linear predictive coding in detail with all necessary block diagrams. Why is the transmission rate and bandwidth requirement very less in this system?	**(14)**	**2**	**4**
13. (a)	What is correlative coding? Explain duo binary encoding with suitable block diagram. Also, highlight the necessity of including precoder in duo binary encoder.	**(14)**	**3**	**4**
	(OR)			
(b)	Derive the Nyquist criterion for distortionless baseband binary transmission and highlight the significance of pulse shaping.	**(14)**	**3**	**4**
14. (a)	Define QAM. Explain in detail the generation and detection of QAM	**(14)**	**4**	**2**

signal.

(OR)

(b)	Describe the generation and detection of DPSK signal. With neat diagram.	**(14)**	**4**	**2**

15. (a)	**(i)**	Draw the convolutional encoder having a constraint length of '3' and code rate r =1/2, with the given generator sequences. $(g¿¿0^1, g¿¿1^1, g_2^1)=(1,1,1)\wedge¿¿¿¿, g_1^2, g_2^2¿=(1,1,0)$.	**(4)**	**5**	**3**
	(ii)	For (7, 4) Hamming code, the code word comprises [m1, m2, m3, m4, p1, p2, p3] where the three parity check bits p1, p2 and p3 are formed from the message bits as follows: p1= m1⊕m2⊕m4; p2 = m1⊕m3⊕ m4; p3 = m2⊕m3⊕m4. Find the (a) Generator matrix G and the parity check matrix H (4 Marks) (b) Code words for the messages 1111 and 1100 (4 Marks) (c) Syndrome, for the received codewords 1110101 (2 Marks)	**(10)**	**5**	**3**

(OR)

(b)	For a (7,4) cyclic code the generator polynomial is $g(D)=1+D^2+D^3$ (a) Draw and explain the operation of the cyclic encoder and decoder. (b) Obtain the code words for the (7,4) cyclic code (message 1010 and 0011) (c) Check if the received code word 1010111 has error.	**(14)**	**5**	**3**

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	Comment on inter symbol interference in digital communication systems and discuss on the experimental set-up used and its significance to study the ISI.	**(10)**	**3**	**5**

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