



School of Electronics Engineering
Winter Sem 2023-2024
Continuous Assessment Test - I
BECE313L – Information Theory and Coding

B.Tech (ECE)

SLOT: A2

Marks: 50

Q. No	Answer All Questions	Marks	CO	BL
1.	a) Verify the rule of additivity for the following probability schemes. $S = \{A, B, C, D\}$; $P = \{1/3, 1/3, 1/6, 1/6\}$.	6	CO1	L2
	b) Derive a relationship of mutual information in relation to the entropy of the source.	4		
2.	A quaternary channel has the following channel noise matrix. $P(Y/X) = \begin{pmatrix} 0.2 & 0.2 & 0.3 & 0.3 \\ 0.4 & 0.15 & 0.3 & 0.15 \\ 0.1 & 0.4 & 0.2 & 0.3 \\ 0.3 & 0.3 & 0.1 & 0.3 \end{pmatrix}$ Find all the entropies if $P(X) = \{1/2, 1/4, 1/8, 1/8\}$.	10	CO1	L2
3.	Identify the type of channel from the given noise matrix $P(Y/X) = \begin{pmatrix} 3/5 & 1/5 & 1/5 \\ 1/5 & 3/5 & 1/5 \\ 1/5 & 1/5 & 3/5 \end{pmatrix}$ a. Calculate the mutual information if $P(X) = \{0.125, 0.25, 0.625\}$ b. Calculate also the channel capacity.	10	CO2	L2
4.	Alphanumeric data are entered into a computer from a remote terminal through a voice grade telephone channel. The channel has a bandwidth of 3.4 kHz and output SNR of 20 dB. The terminal has a total of 128 symbols which may be assumed to occur with equal probabilities and that the successive transmissions are statistically independent. i) Calculate the channel capacity ii) Calculate the maximum symbol rate for which error free transmission over the channel is possible. iii) If the channel SNR changes to 10 dB, will error free transmission holds true- justify your answer.	10	CO2	L2
5.	Apply ternary partitioning techniques for encoding the following messages with Shannon- Fano procedure. Find average length of the code and also code efficiency. $S = \{m_1, m_2, m_3, m_4, m_5, m_6\}$ $P = \{3/8, 1/6, 1/8, 1/8, 1/8, 1/12\}$	10	CO3	L2

0 1 1 2 2 2
0 1 0 1 2