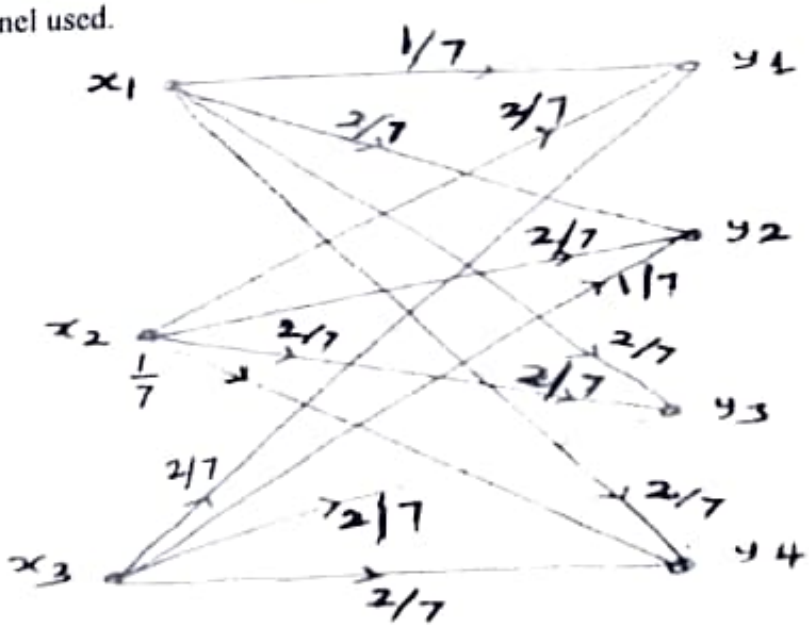
VIT
Vellore Institute of Technology

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

B.Tech (ECE) **SLOT: A1** **Marks: 50**

Q. No	Answer All Questions	Marks	CO	BL
1	a) Verify the rule of additivity for the following symbols S = { A , B, C, D} and their corresponding probabilities are P = {1/8, 1/8, 1/4, 1/2 } b) A binary source generates symbols {0, 1} and their corresponding probabilities are {0.25, 0.75}. The binary source is extended in such a way to generate second order extension. Calculate the entropy of extended source and also verify the extension property.	6 4	CO1	L2
2	A transmitter transmits 5 symbols X_1, X_2, X_3, X_4, X_5 and the receiver receives 4 symbols Y_1, Y_2, Y_3, Y_4. The joint probability matrix for the communication is given below in Figure 1. Determine H(X), H(Y), H(X, Y), H(X/Y) and H (Y/X). $\begin{bmatrix} 0.25 & 0 & 0 & 0 \\ 0.1 & 0.3 & 0 & 0 \\ 0 & 0.05 & 0.10 & 0 \\ 0 & 0 & 0.05 & 0.1 \\ 0 & 0 & 0.05 & 0 \end{bmatrix}$ Figure 1	10	CO1	L2
3	A discrete memory less source emits messages $\{x_1, x_2, x_3\}$. The source is connected to the receiver as shown in Figure 2. Find the capacity of the channel used.  Figure 2	10	CO2	L2

4	A BSC has the following noise matrix with source probabilities $P(x_1) = 1/2$ & $P(x_2) = 1/2$. The noise matrix P(yj/xi) is given below in Figure 3. $\begin{bmatrix} 1/2 & 1/2 \\ 1/2 & 1/2 \end{bmatrix}$ Figure 3 Determine all entropies, channel capacity and channel efficiency.	10	C
5	The following output has been generated by a discrete memoryless source in 1 minute duration. a c d a e c a c b a a b c a b a d b a f Apply Shannon-Fano Coding techniques with coded alphabets {0, 1, 2} and calculate the efficiency of the code generated.	10	