THAPAR INSTITUTE OF ENGINEERING AND TECHNOLOGY, PATIALA

Department of Electronics and Communication Engineering

UEC310 – Information and Communication Theory

TUTORIAL - 10

Q1	A continuous signal is band limited to 10 KHz. The signal is quantized in 4 levels of a PCM system with the probabilities 0.5, 0.25, 0.125, 0.125. Determine the Entropy and rate of information.
Q2	A discrete source transmits symbols or message $x_1,\ x_2,\ and\ x_3\ \ with\ the\ probabilities$ 0.25, 0.5 *and* 0.25. The channel matrix is shown below $$P(Y/X) = \begin{bmatrix} p(y_1/x_1) & p(y_2/x_1) & p(y_3/x_1) \\ p(y_1/x_2) & p(y_2/x_2) & p(y_3/x_2) \\ p(y_1/x_3) & p(y_2/x_3) & p(y_3/x_3) \end{bmatrix}$$ $$P(Y/X) = \begin{bmatrix} 0.6 & 0.4 & 0 \\ 0 & 1 & 0 \\ 0 & 0.3 & 0.7 \end{bmatrix}$$ $$P(X) = [0.25 \quad 0.5 \quad 0.25]$$ Determine all Entropies and mutual Information
Q3	Consider a discrete memory less channel with independent input and output. Determine P[X], P[Y], all Entropies and mutual Information $P(X,Y) = \begin{bmatrix} 0.25 & 0.25 \\ 0.25 & 0.25 \end{bmatrix}$