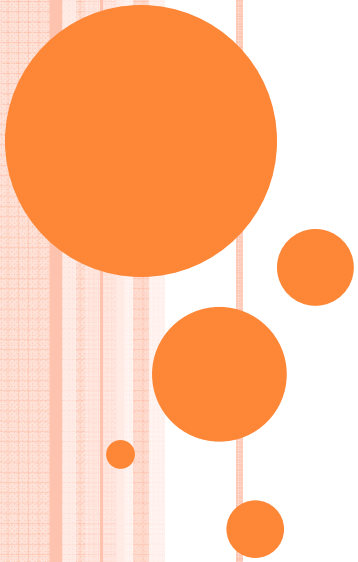
COMMUNICATION ENGINEERING

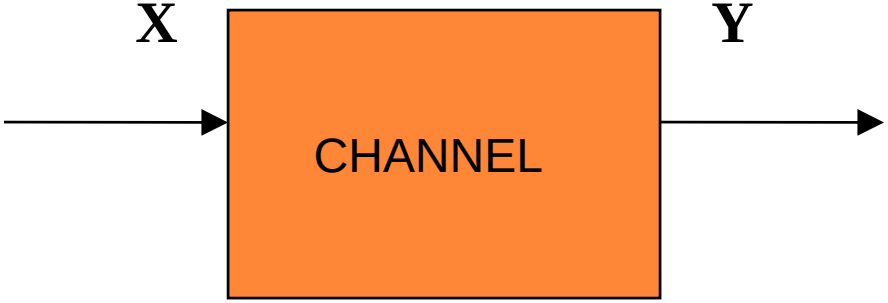
Channel Capacity



CHANNEL CAPACITY

- **Mutual information =I(X;Y) = H(X) - H(X|Y)**
  = H(Y) – H(Y|X)

- **H(X)** **X** **Y** **H(X|Y)**



- **CHANNEL CAPACITY**
  C= max (I(X;Y)

- capacity depends on input probabilities because the transition probabilites are fixed

MUTUAL INFORMATION

- $I(x_j, y_k)$ =initial uncertainty –final uncertainty

  $= -\log p(x_j) - (-\log p(x_j \mid y_k))$

  $I(x_j, y_k) = \log (p(x_j \mid y_k)/ p(x_j))$

  Also, $= \log (p(y_k \mid x_j)/ p(y_k))$

  $I(x_j, y_k) = I(y_k, x_j)$

- Average of mutual information is the entropy corresponding to mutual information

$$I(X;Y) = \overline{I(x_j, y_k)}$$

- $I(X;Y) = H(X) - H(X|Y)$

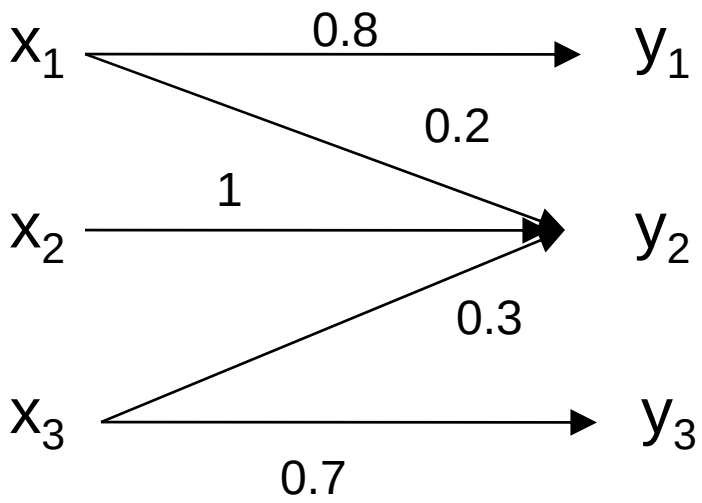
  $= H(Y) - H(Y|X)$

  $= H(X) + H(Y) - H(X,Y)$

- It is a measure of information transferred through the channel also called transferred information of the channel or trans information of the channel

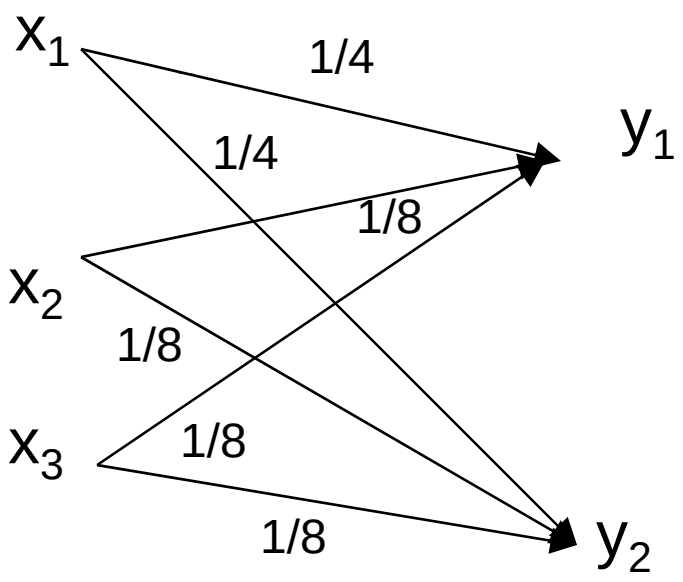
PROBLEMS

1. A discrete source transmits messages x_1 , x_2 , x_3 with probabilities 0.3,0.4 and 0.4 The source is connected to the channel given in figure. Calculate all the associated entropies and mutual information.



PROBLEMS

2.Find the mutual information of the channel



THANK YOU