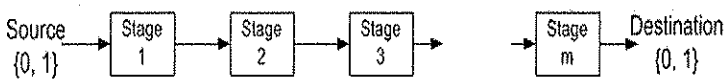
ECE560 Lecture#10 Extra-Credit Questions

Name: Solution

A communication system transmits the digit 0 and 1 through several stages. At each stage, there is a probability of 0.75 that the output will be the same digit as the input.



What is the probability that a 1 that is entered at the first stage is output as a 0 from the 2nd stage? $\pi_0(2)$?

$$\pi(2) = \pi(0) \cdot P^2 \qquad \pi(0) = (\pi_0(0), \pi_1(0)) = (0, 1)$$

$$P = \begin{bmatrix} 0.75 & 0.25 \\ 0.25 & 0.75 \end{bmatrix}$$

$$P^2 = P \cdot P = \begin{bmatrix} 0.625 & 0.375 \\ 0.375 & 0.625 \end{bmatrix}$$

$$\pi(2) = (\pi_0(2), \pi_1(2)) = (0 \;\; 1) P^2 = (0 \;\; 1) \begin{bmatrix} 0.625 & 0.375 \\ 0.375 & 0.625 \end{bmatrix}$$

$$= (0.375 \quad 0.625)$$

$$\pi_0(2) = 0.375$$