Random signal analysis I (ECE673)
Assignment 2

The due date for this assignment is Wednesday Sept. 20

Please provide detailed answers.

1. What is the probability of having only females in a class of N students?

2. (Problem 4.9) Provide a counterexample to show that the statement $P[A|B]+P[A|B^c] = 1$ is false.

3. (Problem 4.13) A digital communication system transmits one of the three values $-1, 0, 1$. Due to impairments on the channel, the receiver sometimes makes an error. The error rates are 12.5% if -1 is transmitted, 75% if 0 is transmitted and 12.5% if 1 is transmitted. If the probabilities for the various symbols being transmitted are $P[-1] = P[1] = 1/4$ and $P[0] = 1/2$, find the probability of error. Repeat the problem with $P[-1] = P[1] = P[0]$ and explain your results.

4. (Problem 4.15) A sample space is given by $\mathcal{S} = \{(x, y) : 0 \leq x \leq 1, 0 \leq y \leq 1\}$. Determine $P[A|B]$ for the events

$$\begin{aligned} A &= \{(x, y) : y \leq 2x, 0 \leq x \leq 1/2 \text{ and } y \leq 2 - 2x, 1/2 \leq x \leq 1\} \\ B &= \{(x, y) : 1/2 \leq x \leq 1, 0 \leq y \leq 1\} \end{aligned}$$

   Are events A and B independent?