ECE 353 Probability and Random Signals - Homework 7

Spring 2019
Instructor: Dr. Raviv Raich
School of Electrical Engineering and Computer Science
Oregon State Univeristy

Due: May 21, 2019

Q1. X is a continuous uniform (-5,5) random variable, i.e. $X \sim \text{U}[-5, 5]$

(a) Write the PDF $f_X(X)$?

(b) Compute $E[X]$ and $E[X^2]$.

(c) Compute $E[e^X]$.

Q2. Suppose that X, the inter arrival time between two packets from two different sources at a router, satisfies

$$P(x > t) = \alpha e^{-t} + \beta e^{-2t}, t \geq 0 \qquad (1)$$

Where $\alpha + \beta = 1$ and $\beta \geq 0$. Calculate the mean of X.

Q3. The random variable X has CDF

$$F_X(x) = \begin{cases} 0, & x < -3 \\ 0.4, & -3 \leq x < 5 \\ 0.8, & 5 \leq x < 7 \\ 1, & x \geq 7. \end{cases}$$

Let $B = \{X > 0\}$, find $P_{X|B}(x)$, $E[X|B]$ and $Var[X|B]$?

Q4 $X \sim \text{U}[0, 1]$ and $Y = -\log(X)$.

(a) Find the $f_Y(y)$.

(b) Compute $E[Y]$.

(c) Compute $E[Y^2]$.

(Hint: $\int_0^\infty t^n e^{-t} dt = n!$)