ECE 581 Homework 6

Due Tuesday 5 AM October 6, 2015, (20 Hmwk points total) Show work.
Electronic Submission – Please submit via "Assignment" under Sakai

1. (4 points Total The random variable X has a probability density function $f_X(x) = \frac{2}{3}\delta(x) + \frac{1}{3}\delta(x-2)$. Another random variable, Y, has a probability density function $f_Y(y) = \frac{1}{2}\delta(y) + \frac{1}{2}\delta(y-3)$. X and Y are statistically independent. (a) (2 points) Obtain an analytical expression for the probability density function of Z, where $Z = X + Y$. (b) (2 points) Also, sketch and completely label your result.

2. (4 points Total) The random variable X is uniformly distributed between -2 and 0, and the random variable Y is uniformly distributed between 0 and 4. X and Y are statistically independent. (a) (2 points) Obtain an analytical expression for the probability density function of Z, where $Z = X + Y$. (b) (2 points) Also, sketch and completely label your result.

3. (10 points Total) The joint probability density function of the two random variables X and Y is given by $f_{XY}(x,y) = \frac{1}{4}\delta(x-0, y-0) + \frac{3}{8}\delta(x-0, y-1) + \frac{1}{4}\delta(x-1, y-0) + \frac{1}{8}\delta(x-2, y-1)$. The notation $\frac{1}{8}\delta(x-a, y-b)$ represents a probability in the x y plane of $\frac{1}{8}$ at the point $(x = a, y = b)$

(a) (2 points) Are X and Y statistically independent? Prove your answer.
(b) (2 points) What is the conditional pdf $f(x|y)$? Sketch and completely label.
(c) (2 points) What is the conditional pdf $f(y|x)$? Sketch and completely label.
df) (2 points) What is the conditional expected value, $E(Y|X = x]$, which is sometimes written using the notation $E(Y|x]$ Sketch and completely label.
(e) (2 points) What is the probability distribution function of the sum, $F_Z(z)$, where $Z = X + Y$?

4. (2 points Total) Jointly Gaussian random variables Do Therrien Problem 5-30. See separate pdf file called Therrien530.pdf