

ECE 341: Probability and Random Processes for Engineers, Spring 2012

Homework 10

Name:

Assigned: 03.28.2012

Due: 04.04.2012

Problem 1. Textbook problem 5.4.5. Do it on your own rather than looking at the solution.

Solution 1:

Problem 2. Textbook problem 5.6.1. Do it on your own rather than looking at the solution.

Solution 2:

Problem 3. Textbook problem 5.7.1. Do it on your own rather than looking at the solution.

Solution 3:

Problem 4. Suppose X and Y are jointly Gaussian distributed with parameters $E[X] = \mu_x$, $E[Y] = \mu_y$, $Var(X) = \sigma_X^2$, $Var(Y) = \sigma_Y^2$ and $E[XY] = \rho_{XY}$. Are the following statements true or false?

1. X and Y are then also Gaussian with $X \sim \mathcal{N}(\mu_X, \sigma_X^2)$, and $Y \sim \mathcal{N}(\mu_Y, \sigma_Y^2)$.
2. If $\rho_{XY} = 0$ then X and Y are independent.
3. $Z = aX + bY$ for known constants a, b is Gaussian with mean $a\mu_X + b\mu_Y$.
4. $Z = aX + bY$ for known constants a, b is Gaussian with variance $a^2\sigma_X^2 + b^2\sigma_Y^2$.
5. The linear minimum mean squared estimator of X in terms of Y is $\hat{X} = \mu_X + \rho_{XY}(Y - \mu_Y)\frac{\sigma_X}{\sigma_Y}$.
6. The conditional distribution of $Y|X$ is Gaussian.
7. $E[X|Y] = \mu_X + \rho_{XY}(Y - \mu_Y)\frac{\sigma_X}{\sigma_Y}$.

Solution 4:

Problem 5. Suppose X and Y are zero-mean unit-variance jointly Gaussian random variables with correlation coefficient $\rho = 0.5$.

1. Find $\text{Var}(3X - 2Y)$.
2. Find the numerical value of $P[(3X - 2Y)^2 \leq 28]$.
3. Find the numerical value of $E[Y|X = 3]$.

Solution 5: