KOM505E – Probability Theory and Stochastic Processes (CRNs 14105-6)

Homework 3: Due December 13th, 2016, TUESDAY, Noon (13:15pm) at the latest!

This is an individual homework. Although you can discuss the problems with your friends, you must write your own solutions, your own code and report independently.

Your textbook refers to: "Intuitive Probability and Random Processes using MATLAB", by Steven Kay.

Problem 14.10 (see below with the given extra problem part) from the "Problems from your textbook" section, and Problem 1 from the Computer Assignments section below will be graded. Those will constitute 50% of the total score.The rest of the questions will be checked for completeness (will constitute 50% of the total score).

For questions related to this homework, you can talk to or write to Prof. Gozde Unal at gozde.unal at itu.edu.tr

Submissions: Write a simple report that contains your name/number/email. Your written solutions for the problems should be clearly readable and neat. For Matlab problems, include your Matlab codes, and figures, if any, in your report. PRINT-OUT and submit your HARDCOPY report to the Box (KOM505E is indicated on the box) at Department Secretary Office of Computer Engineering. **No Late** reports are accepted. Furthermore, your emailed Homeworks are also **NOT** accepted.

Problems from your textbook:

Solve the following problems from your textbook:

1. From Chapter 7, solve 7.3, 7.5, 7.19, 7.28, 7.35, 7.37, 7.42 , 7.45
2. From Chapter 8, solve 8.3 8.5 (a) 8.11 8.17 8.20 8.27
3. From Chapter 9, solve 9.7 9.9 9.13 9.26
4. From Chapter 12, solve 12.6 12.15 12.22 12.26 12.29 12.44
5. From Chapter 13, solve 13.3 13.8 13.16
6. From Chapter 14, solve 14.20 14.21 14.10. In 14.10, also: State explicitly the resulting transformation that takes place on the random vector $[X_1 X_2 ... X_N]^T$.

Computer assignments from your textbook:

1. (i) Plot the contours of constant PDF for the bivariate Gaussian PDF which has a mean vector $[1\ \ 2]^T$ and covariance matrix: $C = [2\ \ -1; -1\ \ 2]$. Next, find the minimum mean square error prediction of Y given X=x. Plot it on top of the contour plot. Write down the prediction equation explicitly, also stating the correlation coefficient value.

   (ii) Repeat (i) for the covariance matrix: $C = [1\ \ -0.99; -0.99\ \ 1]$.

   (iii) Explain the significance of these plots. Also explain what difference you observe between the two plots in (i) and (ii) and what the reasons could be for that difference.
2. Generate computer simulations for solving the problems 7.49 9.34-9.35 9.36 12.5 12.41 14.11 from your textbook using Matlab.