Optional Homework

(12/3/13)

ENG EC/ME/SE 501:

Exercises (Set 8)  (Practice for Hour Quiz)

1. Find the steady-state density for the stochastic differential equation

\[ \ddot{x} + \dot{x} + x = \dot{w} \]

where \( \dot{w} \) is a unit variance white noise process. (i.e., \( w \) is a unit variance Wiener process.)

2. Consider the linear stochastic system

\[
\begin{pmatrix}
\dot{x}_1(t) \\
\dot{x}_2(t)
\end{pmatrix} = \begin{pmatrix}
-1 & 1 \\
0 & -1
\end{pmatrix} \begin{pmatrix}
x_1(t) \\
x_2(t)
\end{pmatrix} + \begin{pmatrix}
0 \\
1
\end{pmatrix} \dot{w}(t)
\]

\[ y(t) = x_1(t) + \dot{v}(t), \]

where \( x_1(0) = x_2(0) = 0 \), and \( w \) and \( v \) are Wiener processes with variances \( q \) and 1 respectively. Write down the equations for the Kalman filter for this system.