CMPE323 Signals and Systems Fall 2014
Homework #3 rev 1 Assigned 9/19/2016, **Due 10/3/2016 (Monday)**

Your Name Here
"CMPE323" Here
Due Date: Here

Rules for all homework:

1. $8\frac{1}{2}\times 11$ paper, no perforations. (Not torn from spiral bound notebook) Lined, unlined, or grid is OK.
2. Name, date, and CMPE323 HW## on all assignments in upper right of first page.
3. You may write on both sides of paper. Include MATLAB code listings for MATLAB exercises and plotted output. You don't need to include MATLAB code if you just use MATLAB to sketch the required outputs.
4. Single staple in upper left. STAPLE – NOT FOLD! STAPLE – NOT PAPER CLIP! STAPLE!

Failure to follow these simple rules will result in a score of 0 for that homework.

NOTE THE DUE DATE!

CMPE323 HW03

1. **Convolution Practice**

   Using the $x(t),\ \text{and}\ h(t)$ defined in the following figure, and with $y = x * h$, demonstrate by direct analytical computation (i.e., integrals, not MATLAB) the following convolution properties. Include a sketch of each $y(t)$.

   a) The convolution operator is commutative.
   b) Combination of durations.
   c) Using $x(t-1.5)\ \text{and}\ h(t-2.5)$, demonstrate the combination of delays.
   d) Let $c = 0.25$ and demonstrate the time scaling property of convolution by computing $y(ct)$.
   e) Time reversal
   f) Demonstrate the time cross correlation, $y = x(t) * h(-t)$
   g) Demonstrate the area property using $A_x,\ \text{and}\ A_h$.

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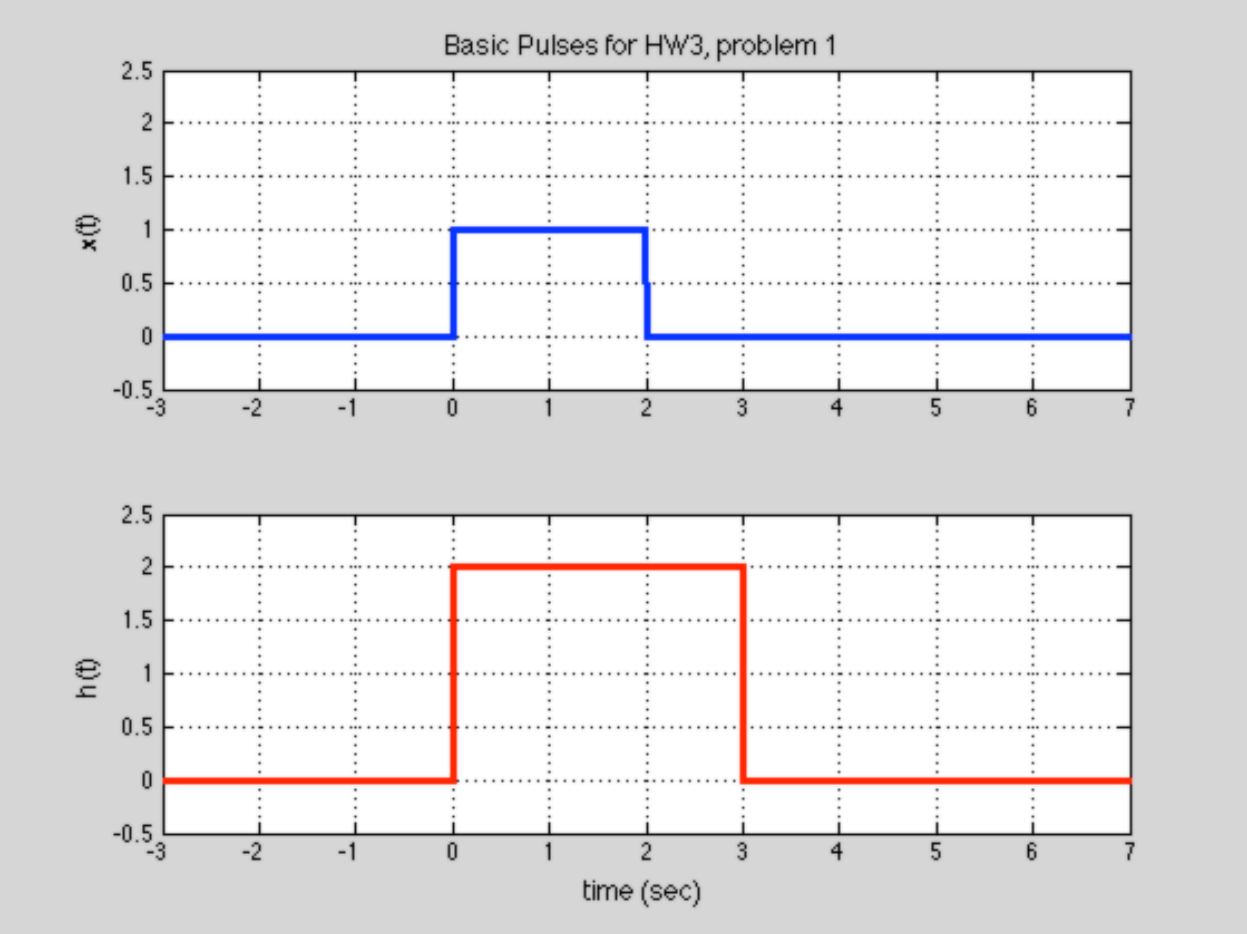

2. **More practice. Using the same** $x(t)$ and $h(t)$

   a) Find and sketch the even and odd parts of $x(t)$: $x_e(t)$ and $x_o(t)$

   b) Let $g(t) = h(t-2.5)$. Find and sketch the even and odd parts of $g(t)$: $g_e(t)$ and $g_o(t)$.

   c) Use $x_o(t), g_o(t)$ to demonstrate the even/odd property for $w(t) = x_o(t) * g_o(t)$.

   d) Use $x_e(t), g_o(t)$ to demonstrate the even/odd property for $v(t) = x_e(t) * g_o(t)$.

3. **MATLAB practice**
   Using MATLAB, compute and plot the results of 1b, 1d, 1g, 2a, and 2c. Your plots should be clearly and professionally labeled, and should show both the computed version modeled with MATLAB and the theoretical/analytical answer you obtained in parts 1 and 2.

4. **LTI Systems**
   Show (prove) that the convolution of two linear and time invariant systems is itself linear and time invariant.