14:332:347 Linear Systems & Signals Lab

Experiment # 1: Some Common Signals

Do all the following problems and submit a report consisting of all the plots. Name the plots properly. Make appropriate comments about the obtained results whenever warranted. Your lab report must indicate clearly what you are doing in each problem and the results you obtained. Show all the MATLAB programs.

1. Do Problem 1.1 (b) of the text book by Kamen and Heck. Note that all the given signals can be obtained by appropriately combining rectangular and triangular pulses. In the text book the rectangular pulse is denoted by $p_r(t)$ and the triangular pulse is given by $\Delta_r(t) = (1 - 2|t|/\tau)p_r(t)$, see page 11.

2. Do Problem 1.3 of the text book by Kamen and Heck.

3. Do Problem 1.4 (e) of the text book by Kamen and Heck.

4. Do Problem 1.7(b) of the text book by Kamen and Heck. Only figures (b) and (d) need to be plotted.

5. Do Problem 1.11 (e) of the text book by Kamen and Heck.

6. Do Problem 1.21 (d) of the text book by Kamen and Heck.

7. Do Problem 1.32 (b),(c), and (d) of the text book by Kamen and Heck.

8. Do Problem 1.33 (b),(c), and (d) of the text book by Kamen and Heck.

9. For the following signals take $t = 0 : 0.1 : 6.28$.
   (a) Plot all the three signals $y_1(t) = \sin(t)$, $y_2(t) = \sin(2t)$, and $y_3(t) = \sin(5t)$ in the same figure.
   (b) Plot all the three signals $\tilde{y}_1(t) = \sin(t_s t)$, $\tilde{y}_2(t) = \sin(2t_s t)$, and $\tilde{y}_3(t) = \sin(5t_s t)$ in the same figure where $t_s$ is the time-scale factor derived from your name.
   Comment on the effect of time-scaling.

10. Plot $\text{sinc}(t) = \frac{\sin(\pi t)}{\pi t}$ for $-5 \leq t \leq 5$ (see page 165 of the text book by Kamen and Heck). Use time increment equal to 0.1. The sinc function can be obtained as $\text{sinc}(t) = \sin(\pi t) / \pi t$. We note that the operation ./ stands for pointwise division. MATLAB also has a built-in function sinc. In order to get information about any MATLAB function type help function-name, in this case type help sinc.