EGR 261 Due date: _____
Signals and Systems (See Due Dates Table)
File: N261H4

Homework Assignment #4 – Properties of Signals & Systems

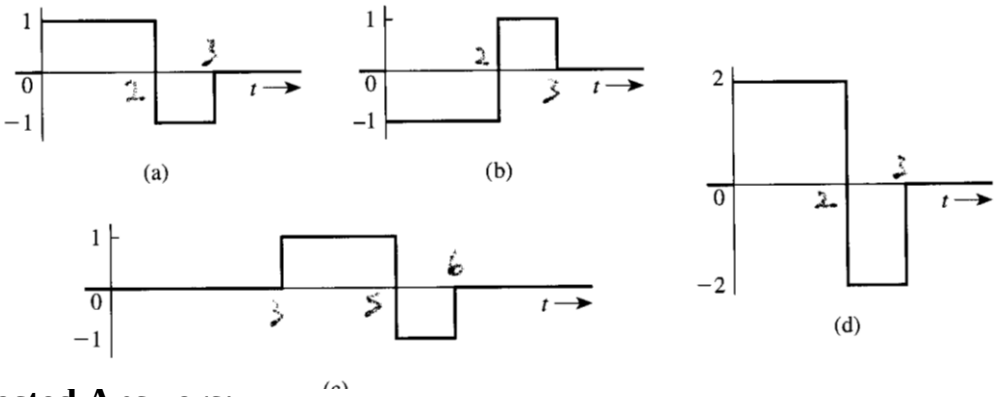
Reading Assignment:

Ch. 1, Sect. 1-4, 6-8 in *Linear Signals & Systems, 2nd Ed.* by Lathi

Problem Assignment:

Work the following problems from Chapter 1 in *Linear Signals & Systems, 2nd Ed.* by Lathi:
1.1-1, 1.1-2, 1.1-5, 1.1-6 (See note on problem 1.1-1 below)
1.2-2, 1.2-3 (find $x_1(t)$ and $x_2(t)$ only)
1.4-1, 1.4-2, 1.4-3, 1.4-4
1.7-1, 1.7-7, 1.7-8, 1.7-11
1.8-1, 1.8-2

Problem 1.1-1) The waveforms in the text left off the time values on the t axis. They are shown below.



Selected Answers:

1.1-1 3, 3, 3, 12
1.1-2 1/3, 1/3, 1/3, 1/3, 4/3
1.1-5 75, 178, 51, 25, 25, 1/2
1.1-6 $P_x = A^2/6$, $E_x = \infty$
1.2-3 $x_1(t) = x(t + 1) + x(1 – t)$, $x_2(t) = x([t + 1]/2) + x([1 – t]/2)$
1.4-2 $x_1(t) = (4t + 1)[u(t + 1) – u(t)] + (-2t + 4)[u(t) – u(t – 2)]$
$x_2(t) = t^2[u(t) – u(t – 2)] + (2t – 8)[u(t – 2) – u(t – 4)]$
1.4-3 0, $2/9\delta(w)$, $1/2\delta(t)$, $-1/5\delta(t – 1)$, $1/(2\text{-}j3)\ \delta(w + 3)$, $k\delta(w)$
1.4-4 x(t), x(t), 1, 0, e^3, 5, x(-1), $-e^2$
1.7-1 Only b, f, and h are linear. Use the procedure discussed in Example 1.9 for each part.
1.7-7 Only part a is causal. Explain why in each case!
1.7-8 a) Invertible. Inverse system equation is $y(t) = dx/dt$.
b) Non-invertible. Why? c) Non-invertible. Why?
d) Invertible (but noncausal). Inverse system equation is $y(t) = x(t/3 + 3)$
e) Non-invertible. Why? f) Invertible. $x(t) = \ln[y(t)]$

1.7-11 No, Yes, No, Yes, Yes (explain why in each case)

1.8-1 $\frac{d}{dt}y_1(t) + 3y_1(t) = x(t)$ or $(D+3)y_1(t) = x(t)$

$\frac{d}{dt}y_2(t) + 3y_2(t) = \frac{d}{dt}x(t)$ or $(D+3)y_2(t) = Dx(t)$

1.8-2 $\frac{d^2}{dt^2}y_1(t) + 2\frac{d}{dt}y_1(t) + 2y_1(t) = \frac{d^2}{dt^2}x(t)$ or $(D^2+2D+2)y_1(t) = D^2x(t)$

$\frac{d^2}{dt^2}y_2(t) + 2\frac{d}{dt}y_2(t) + 2y_2(t) = \frac{d}{dt}x(t)$ or $(D^2+2D+2)y_2(t) = Dx(t)$