GEORGIA INSTITUTE OF TECHNOLOGY
School of Electrical and Computer Engineering

ECE 4270
Fundamentals of Digital Signal Processing

Assigned: Thursday, Aug. 20, 2009
Due: Thursday, Aug. 27, 2009

Problem Set #1

Reading: Read the following sections from Oppenheim and Schafer:
Chapter 2, Sections 2.1–2.4, pp. 8–34.

Problem 1.1: Work Oppenheim and Schafer Problem 2.21 on page 74.

Problem 1.2: Work Oppenheim and Schafer Problem 2.22 on page 74.

Problem 1.3: Work Oppenheim and Schafer Problem 2.25 on page 75.

Problem 1.4: Work Oppenheim and Schafer Problem 2.30 on page 76.

Problem 1.5: The system L in Figure 1 is known to be **linear**. Shown are three output signals, $y_1[n]$, $y_2[n]$, and $y_3[n]$, in response to the input signals $x_1[n]$, $x_2[n]$, and $x_3[n]$, respectively.

(a) Determine whether the system L could be time invariant.

(a) If the input $x[n]$ to the system L is $\delta[n]$, what is the system response $y[n]$?

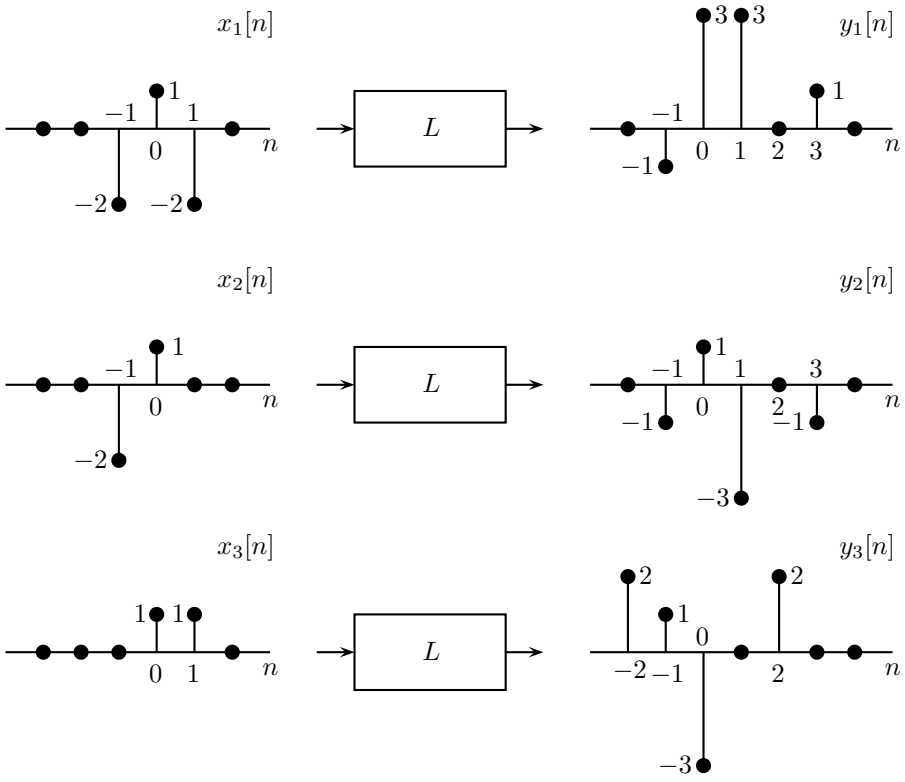
$x_1[n]$
1
−1
1
0
n
−2
−2
L
$y_1[n]$
3
3
1
−1
−1
0
1
2
3
n
$x_2[n]$
1
−1
0
n
−2
L
$y_2[n]$
1
−1
1
3
0
2
n
−1
−1
−3
$x_3[n]$
1
1
0
1
n
L
$y_3[n]$
2
2
1
0
−2
−1
2
n
−3

Figure 1: