
Problem Set #2,
Upsampling and Downsampling
ECE-439, Fall 2015
Introduction to DSP
Date Assigned: 09/08/2015
Date Due: 09/15//2015

Problem # 1.0

In class, we looked at the upsampling system defined via the input-output mapping:

$$y_1[n] = L_1(x[n]) = x[n/L]$$

Here wish to study this mapping further by looking at its properties:

1. show that this system is a *linear time-varying* (LTV) system
2. Is this system causal?
3. Is this system memoryless?
4. Is this system BIBO stable?

Problem # 2.0

For the down-sampling system studied in the class, defined via the mapping:

$$y_2[n] = L_2(x[n]) = x[Mn]$$

1. Show that this system is also a LTV system.
2. Is this system BIBO stable?
3. Is this system causal and/or memoryless?