430.306: Signals and Systems

Electrical and Computer Engineering, Seoul National Univ.
Spring Semester, 2018
Homework #2, Due: In class @ April 4

Problem 1) Suppose that $x[n]$ is an input signal to an LTI system whose impulse response function is $h[n]$, and let $y[n]$ be the corresponding output signal. Prove that

$$y[n] = x[n] * h[n].$$

State where you use the linearity or time invariance property.

Problem 2) Prob. 2.3 of Oppenheim (p.138)

Problem 3) Solve the Problem 2.4 of Oppenheim (p.138) by using Matlab program. In fact, there is a convolution (conv) function in Matlab. Do not use this function for this problem. Make your own function calculating convolution.

Problem 4-1) Prob 2.5 of Oppenheim (p.138)

Problem 4-2) In this problem, you will examine whether your answer for Problem 4-1 is correct. For determined N, check that $y[4] = 5$ and $y[14] = 0$ by using Matlab program.

Problem 5) Prob. 2.8 of Oppenheim (p.139)

Problem 6) Prob. 2.19 of Oppenheim (p.140)

Problem 7) Prob. 2.31 of Oppenheim (p.145)

Problem 8) Prob. 2.32 of Oppenheim (p.145)

Problem 9) Suppose that $x[n]$ is an input signal to a causal LTI system such that $x[n] = 0$ if $n < 0$. Prove that the corresponding output signal $y[n]$ satisfies that $y[n] = 0$ for $n < 0$.

Problem 10) In class, we prove that absolute summability of an impulse response function is a sufficient condition for BIBO stability of an LTI system. In this problem, we will show that it is also a necessary condition. Solve the Problem 2.49 of Oppenheim (p.153)

Problem 11) Prob. 2.45 of Oppenheim (p.151)