Reading Assignments:

Chapter 2 of Oppenheim and Willsky (O&W)

Section 1. Problems from textbook (O&W):

2.22: c, d, e  2.23  2.25  2.39

Section 2.

Problem 1.
Compute the convolution \( y[n] = x[n] \ast h[n] \) of each of the following pairs of signals:

a) \( x[n] \) and \( h[n] \) are depicted below:

b) \( x[n] = u[n + 4] - u[n - 1], h[n] = 2^n u[2 - n] \)

Problem 2.
Compute the convolution \( y(t) = x(t) \ast h(t) \) for each of the following pairs of signals:

a) \( x(t) = e^t u(t + 1), h(t) = e^{2t} u(-t) \)

b) \( x(t) \) and \( y(t) \) are depicted below:
Problem 3.
The following are impulse responses of either discrete-time or continuous-time LTI systems. Determine whether each system is causal and/or stable. Justify your answers.

a) \( h[n] = 2^n u[3 - n] \)

b) \( h(t) = u(1 - t) - \frac{1}{2} e^{-t} u(t) \)

c) \( h[n] = [1 - (0.99)^n] u[n] \)

d) \( h(t) = e^{15t}[u(t - 1) - u(t - 100)] \)

Section 3. MATLAB Assignment

Write a MATLAB program to compute and plot the convolution of \( y(t) = x(t) * h(t) \) which the \( x(t) \) and \( h(t) \) are functions in Problem 2 from Section 2.

a) Write a program to generate and display the Unit step function, \( U(t) \).

b) Write a program to generate and display the \( x(t) \) and \( h(t) \).

c) Write a program to generate and display the \( y(t) \).

d) Plot each convolution result for \(-1 \leq t < 3\).

e) Your figures must have axis labels and title which the title is the time index \( t \) and the name of result signal.

Hint: The convolution operation \( y[n] = x[n] * h[n] \) can be implemented in Matlab, Using the command \texttt{conv}, provided that the two signals to be convolved are both of finite length. Use help \texttt{conv} for more details.

Please send your answers for the MATLAB section to “ce40242@gmail.com”. Don’t forget to name your attachments as "Matlab-assignment#1_student number", and send them with similar subject.

You can contact “jabarvand@gmail.com” in case you have questions about MATLAB assignment.