Signal & Systems

Lecture # 14

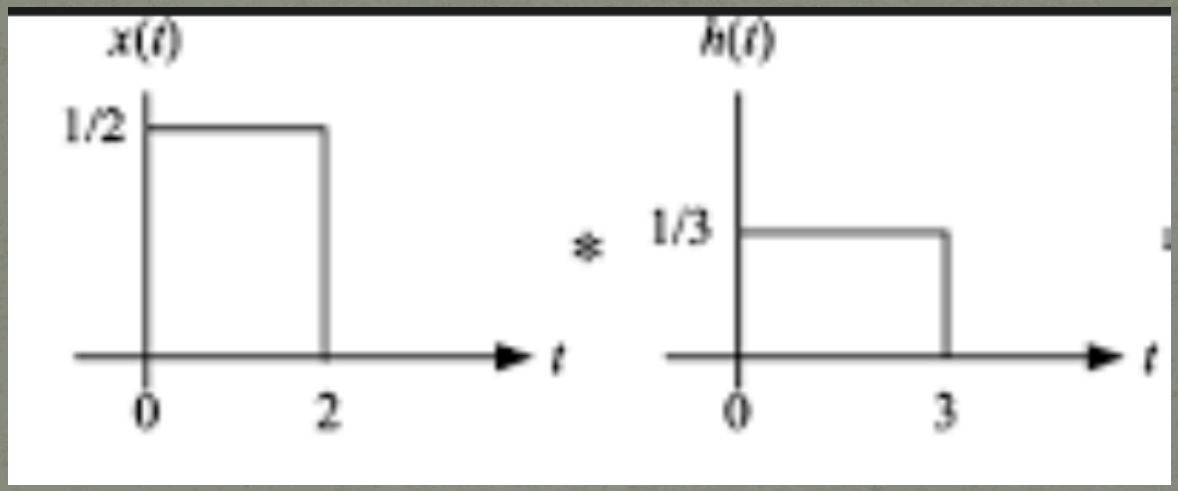
Revision

11th January 18

Convolution

Example #1

- Convolve the following signals:



Fourier Series

Example #2

- Determine the complex exponential Fourier series representation for the following signal:

$$x(t) = \cos(4t) + \sin(6t)$$

Example #3

- Determine the Fourier series coefficients of the following signal:

$$x(t) = \cos\left(2t + \frac{\pi}{4}\right)$$

Example #4

- Determine the Fourier series coefficients of the following signal:

$$x[n] = \cos^2\left(\frac{\pi}{8}n\right)$$

Fourier Transform

Example #5

- Using the convolution theorem, find the inverse Fourier transform x[n] of:

$$X\left(e^{j\omega}\right) = \frac{1}{\left(1 - ae^{-j\omega}\right)^2} \quad |a| < 1$$

Example #6

- A causal discrete-time LTI system is described by:

$$y[n]-\frac{1}{2}y[n-1]=x[n]+\frac{1}{2}x[n-1]$$

- Where x[n] and y[n] are the input and output of the system.
  - (a): Determine the frequency response $H(e^{j\omega})$.
  - (b): Find the impulse response h[n] of the system.

Z-Transform

Example #7

- A finite sequence x[n] is defined as:

$$x[n] = \left\{5, 3, \underset{\uparrow}{-2}, 0, 4, -3\right\}$$

- Find X(z) and its ROC.

Example #8

- Find the z-transform X(z) and sketch the pole-zero plot with the ROC for each of the following sequence:

$$x[n]=\left(\frac{1}{2}\right)^{n}u[n]+\left(\frac{1}{3}\right)^{n}u[n]$$

Example #9

- Find the inverse z-transform of:

$$X(z) = \frac{z}{z(z-1)(z-2)^2} \quad |z| > 2$$

The End