

EEE 391
Basics of Signals and Systems
Computer Assignment 2
Due: 10 December 2019 by 23:55 on Moodle

Discrete-Time Convolution:

Write a MATLAB program that calculates the discrete convolution sum of two discrete-time sequences of finite length.

input: two arrays and their first time indices with non-zero values (lengths, if necessary).

output: resulting array and its first time index with non-zero value (length, if necessary).

You may limit the index of the input arrays to the interval $[-100, 100]$ and the output array to the interval $[-200, 200]$. Make sure there are no out-of-bound index errors.

Given two discrete-time sequences $x_1[n]$ and $x_2[n]$ as below, find the results of the convolutions: $x_1[n] * x_1[n]$, $x_2[n] * x_2[n]$, and $x_1[n] * x_2[n]$:

$$1) \quad x_1[n] = \begin{cases} 1, & \text{if } 0 \leq n \leq 19 \\ 5, & \text{if } 20 \leq n \leq 39 \\ 0, & \text{otherwise} \end{cases} \quad \text{and} \quad x_2[n] = \begin{cases} |n|, & \text{if } |n| \leq 5 \\ 0, & \text{otherwise} \end{cases}$$

$$2) \quad x_1[n] = u[-2n + 4] - u[-n - 3] \quad \text{and} \quad x_2[n] = 7\delta[-n - 10] - 14\delta[-n + 10]$$

$$3) \quad x_1[n] = \begin{cases} 10 e^{-|n|}, & \text{if } |n| \leq 25 \\ 0, & \text{otherwise} \end{cases} \quad \text{and} \quad x_2[n] = 4\delta[n + 3] - 8\delta[n] + 4\delta[n - 3]$$

Plot the sequences and the convolution results using the `stem(·)` command in MATLAB.

Please do not use the `conv(·)` command in MATLAB. You may only use it to cross-check your results.

Submit the results of your own work in the form of a well-documented report on Moodle. Borrowing full or partial code from your peers or elsewhere is not allowed and will be punished. Please include all evidence (plots, screen dumps, MATLAB codes, MATLAB command window print-outs, etc.) as needed in your report. Append your MATLAB code at the end of your assignment, do not upload it separately. The axes of all plots should be scaled and labeled. Typing your report instead of handwriting some parts will be better. Please do not upload any photos/images of your report. Your complete report should be uploaded on Moodle as a single good-quality pdf file by the given deadline. Please try to upload several hours before the deadline to avoid last minute problems that may cause you to miss the deadline. Please **DO NOT** submit any hardcopies or files by e-mail or on memory stick/CD.