Bangladesh University of Engineering and Technology

Department of Electrical and Electronic Engineering (EEE)

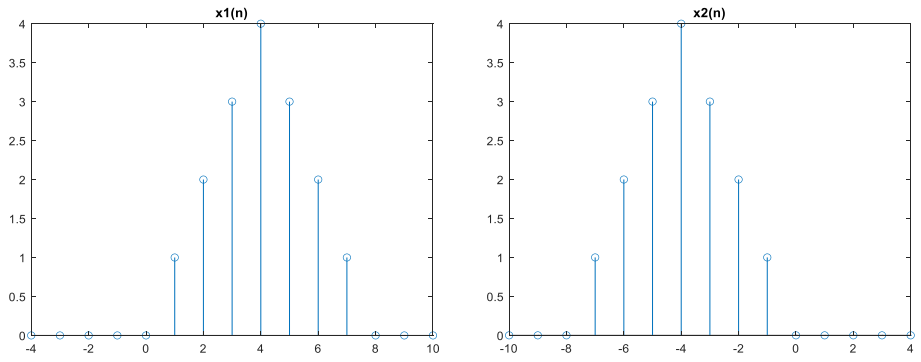
Course No.: EEE 312 **Section:** A2

Experiment No. 2

Assignment – 2 (Part B): Convolution & LCCDE

Instructions: *Include your Matlab code snippets and all necessary command window output+plots in your report.*

1. Two signals are provided: $x_1(n)$ and $x_2(n)$. They are shifted triangular signals with a peak value of P. $x_1(n)$ starts from 0 and $x_2(n)$ ends at 0. The figure below illustrates the two signals graphically with $P = 4$. The x-axis (sample axis) can be set to any arbitrarily large range as long as the entire signal is included.



Now, for $P = (5 + \boldsymbol{Last\ Digit\ of\ your\ ID})$, perform the following operations:

a. $x_1(n) * x_2(n)$.

b. $x_1(P - n) * x_2(P - n)$.

c. $x_1(n) * [x_2(n) * x_2(-n)]$.

d. $[x_1(n).u(3 - n)] * [x_2(n).u(n - 3)]$.

2. Consider the following difference equation. You **must** do this task manually with loops. Find the system function.

$$y(n) + \frac{4y(n-1)}{Last\ Digit\ of\ your\ ID + 8} = x(n)$$

3. Consider the system described by the following difference equation:

$$y(n) + A_1 y(n-1) + A_2 y(n-2) = x(n) + 3x(n-3);\ \ A_1, A_2 \geq 0$$

Use a bounded input of your choice. Find the stability status of the system by varying:

a. The coefficient A_1 and plot the transition points. For this, assume $A_2 = 0.5$.

b. The coefficient A_2 and plot the transition points. For this, assume $A_1 = 0.5$.

4. Consider the two systems described by the following difference equations:

$$(i)\ \ y(n) + \frac{y(n-1)}{6.5 - Last\ Digit\ of\ your\ ID} + \frac{y(n-2)}{7.5 - Last\ Digit\ of\ your\ ID} = 4x(n)$$

$$(ii)\ \ y(n) + \frac{5y(n-1)}{Last\ Digit\ of\ your\ ID - 1.5} + \frac{y(n-2)}{Last\ Digit\ of\ your\ ID - 1.5} = x(n) + x(n-3)$$

In the range of $-10 \leq n \leq 50$ for both described systems:

a. Plot $h(n)$.

b. Plot the unit step response.

c. Plot the response if your input is $2e^{-n}.\cos(4n)\,.u(n)$.

d. Plot the response if your input is $x_1(n)$ [from Q-1] with $P = 4$.

e. Are any of the systems BIBO stable?