%Linear convolution

clc;

clear;

close all;

x1 = input('Enter the first sequence x1(n): ');

t1 = input('Enter origin location of x1(n): ');

x2 = input('Enter the second sequence x2(n): ');

t2 = input('Enter origin location of x2(n): ');

l1 = length(x1);

l2 = length(x2);

ln = l1 + l2 - 1;

X1 = [x1, zeros(1, l2)];

X2 = [x2, zeros(1, l1)];

y = zeros(1, ln);

for i = 1:ln

for j = 1:l1

if i-j+1 > 0

y(i) = y(i) + X1(j) \* X2(i-j+1);

end

end

end

start\_time = t1 + t2;

t = start\_time:(start\_time + ln - 1);

figure;

subplot(4, 1, 1);

stem(t1:(t1 + l1 - 1), x1, 'filled');

title('First Sequence');

xlabel('Time');

ylabel('Amplitude');

subplot(4, 1, 2);

stem(t2:(t2 + l2 - 1), x2, 'filled');

title('Second Sequence');

xlabel('Time');

ylabel('Amplitude');

subplot(4, 1, 3);

stem(t, y, 'filled');

title('Convolved Output (Manual)');

xlabel('Time');

ylabel('Amplitude');

y\_builtin = conv(x1, x2);

subplot(4, 1, 4);

stem(start\_time:(start\_time + ln - 1), y\_builtin, 'filled');

title('Convolved Output (Built-in)');

xlabel('Time');

ylabel('Amplitude');