ELE632 Lab 1 Report

Table of Contents

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Part A: Signal Transformation

A.1:

```
% A.1-I
impulse = @(n) (n == 0) * 1.0 .* (mod(n, 1) == 0);
a = impulse(n-3);

%A.1-II
u = @(n) (n >= 0) * 1.0 .* (mod(n,1)==0);
    %Creates a unit step function that is usable by
    %calling u(n), the (mod(n,1)==0) term forces the function to be a
    %discrete time function by only saving the values of integer
 values
    %of n
b = u(n+1);

%A.1-III
x = @(n) u(n) .* cos((n .* pi) / 5);
c = x(n);

%A.1-IV
x1 = @(n) x(n-3);
d = x1(n);

%A.1-V
x2 = @(n) x(-n);
e = x2(n);

plots = {a,b,c,d,e}; % a cell of objects that holds variables
titles = {"delta[n-3]", "u[n+1]", "x[n]=cos(pi*n/5)*u[n]", ...
            "x1[n]=x[n-3]", "x2[n]=x[-n]"};

n = [-10:10];   %Creates the range of n, (-10 < n < 10) with steps
                %of 1 in between

figure
for i = 1:length(plots)
```

```
 subplot(length(plots),1,i);
 stem(n,plots{i}); %indexing into a cell using {i} to get
                        %the i'th element
    title(titles{i});
end

% X1[n] is being time shifted. X2[n] is being time reversed.
```

```
Error using stem (line 43)
X must be same length as Y.

Error in lab1_report (line 40)
 stem(n,plots{i}); %indexing into a cell using {i} to get
```

A.2

```
%A.2-I
u = @(n) (n >= 0) * 1.0 .* (mod(n,1)==0);
y = @(n) 5*exp(-n/8).*(u(n)-u(n-10));
a = y(n);

%A.2-II
y1 = @(n) y(3*n);
b = y1(n);

%A.2-III
y2 = @(n) y(n/3);
c = y2(n);

plots = {a,b,c};
titles = {"y[n]=5*exp(-n/8)*(u(n)-u(n-10))","y[3n]","y[n/3]"};

%Note that the range was shortened to -5:35 instead of the original
%-10:70 since there was a lot of unnecessary empty space.
n = [-5:35];

figure
for i = 1:length(plots)
 subplot(length(plots),1,i);
 stem(n,plots{i});
    title(titles{i});
end

%y1[n] and y2[n] are time scaling transforms, a compression and
 expansion
%respectively
```

A.3

```
u = @(n) (n >= 0) * 1.0 .* (mod(n,1)==0);
y = @(n) 5*exp(-n/8).*(u(n)-u(n-10));
y2 = @(n) y(n/3);
```

```
%A.3-I
u1 = @(n) (n >= 0) * 1.0;
z = @(n) 5*exp(-n/8).*(u1(n)-u1(n-10));
y3 = @(n) z(n/3) .* (mod(n,1)==0);
n = [-5:0.1:35];

figure
subplot(2,1,1);
stem(n,y2(n));
title("y2[n] from A.2-III");

subplot(2,1,2);
stem(n,y3(n));
title("y3[n]=z[n/3]");

%We notice that y3[n] has more data values than y2[n] because of the
%fact that the signal transformation was applied to the continuous
 signal
%first, allowing the sampling to sample values that NOW exist in
 discrete
%integer values, which previously didn't before stretching the
 continuous
%function.
```

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