SS-Computer Assignment - 01 - Spring 2019

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1 Signal Transformations:

- Given u[n] the unit step sequence using the stem function plot the following
  u[n - 5] - u[n - 10]
  u[6 - n] - u[3 - n]
  u[8 - n]

Function :

unitstep.m :

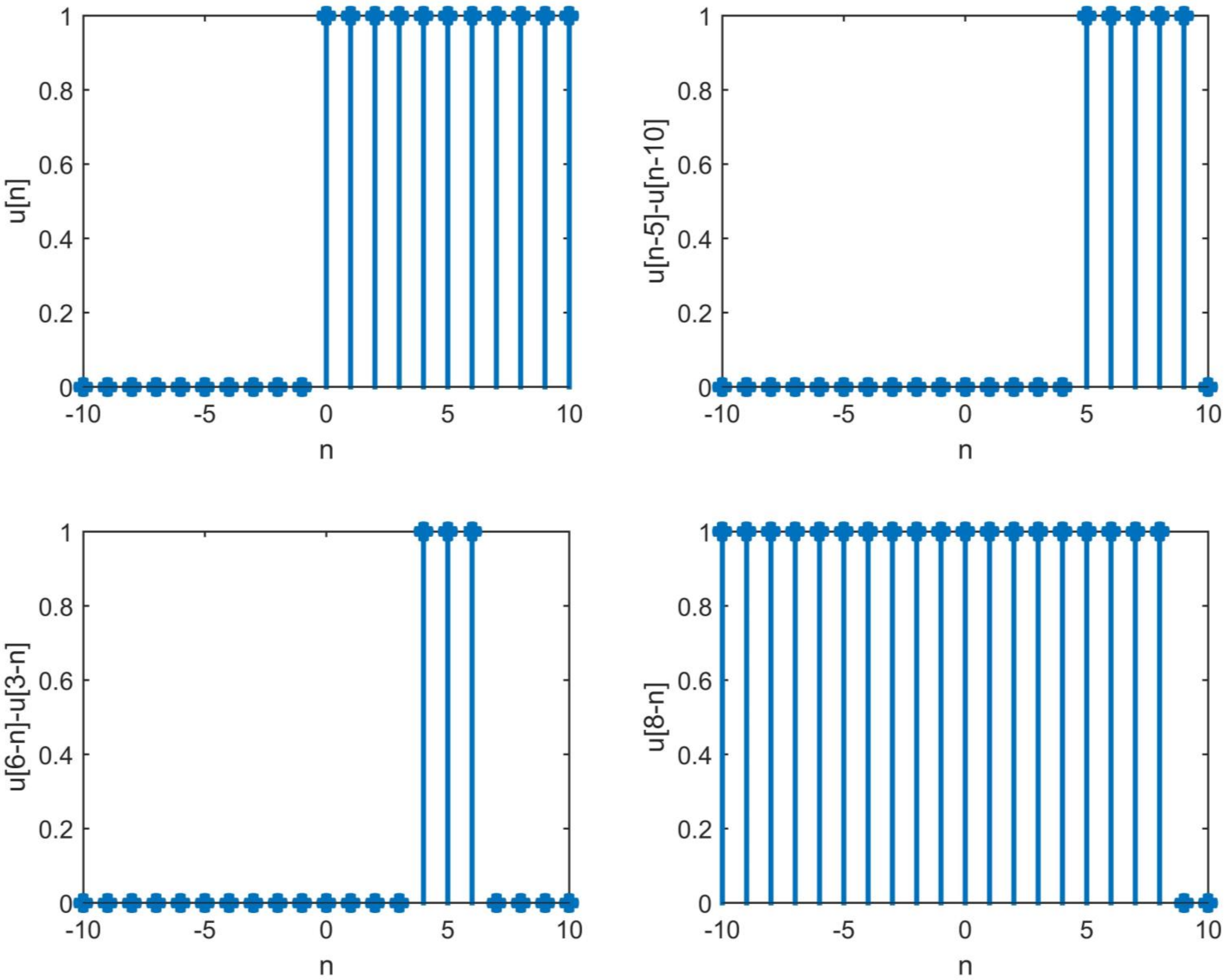
```
function ut=Unitstep(t)
    ut = zeros(size(t));
    ut(t>=0) = 1;
return;
```

Main Code :

```
%%
nstart = -10;
nend = 10;
n = nstart:nend;

%%
%Plotting u[n] using unitstep function
u1 = unitstep(n);

subplot(221);
stem(n,u1,'filled','LineWidth',2);
xlabel('n');   ylabel('u[n]');

%%
%Plotting u[n-5]-u[n-10]
n21 = n-5;
u21 = unitstep(n21);

n22 = n-10;
u22 = unitstep(n22);

r1 = u21-u22;

subplot(222);
stem(n,r1,'filled','LineWidth',2);
xlabel('n');   ylabel('u[n-5]-u[n-10]');

%%
%Plotting u[6-n]-u[3-n]
n31 = 6-n;
u31 = unitstep(n31);

n32 = 3-n;
u32 = unitstep(n32);

r2 = u31 - u32;
```

```
subplot(223);
stem(n,r2,'filled','LineWidth',2);
xlabel('n');   ylabel('u[6-n]-u[3-n]');

%%
%Plotting u[8-n]
n41 = 8-n;
u41 = unitstep(n41);

subplot(224);
stem(n,u41,'filled','LineWidth',2);
xlabel('n');   ylabel('u[8-n]');
```

PLOTS :

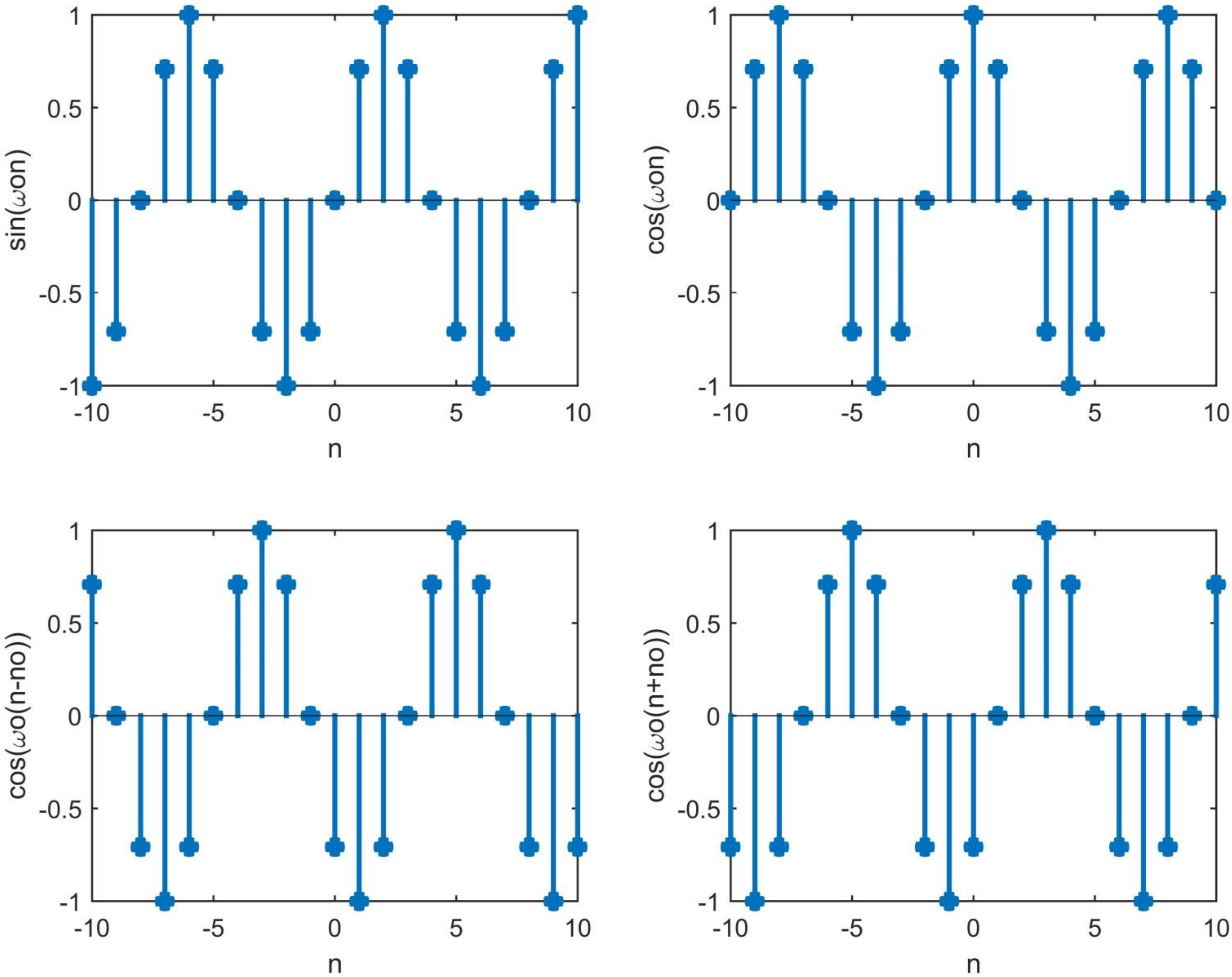


- Given the signal $sin[\omega_0 n]$, plot the following: Assume the unknown values
  - $cos[\omega_0(n - n_0)]$
  - $cos[\omega_0(n + n_0]$

Code :

```
%%

nstart = -10;
nend = 10;
n = nstart:nend;
Wo = pi/4;
no = 5;

%%
%Plotting sin(Won)
subplot(221);
stem(n,sin(Wo*n),'filled','LineWidth',1.5);
xlabel('n');   ylabel('sin(\omegaon)');

%%
%Plotting cos(Won)
cos = sin((pi/2)-(Wo*n));

subplot(222);
stem(n,cos,'filled','LineWidth',1.5);
xlabel('n');   ylabel('cos(\omegaon)');

%%
%Plotting cos(Wo(n-no))
cos1 = sin((pi/2)-(Wo*(n-no)));

subplot(223);
stem(n,cos1,'filled','LineWidth',1.5);
xlabel('n');   ylabel('cos(\omegao(n-no))');

%%
%Plotting cos(Wo(n+no))
cos2 = sin((pi/2)-(Wo*(n+no)));

subplot(224);
stem(n,cos2,'filled','LineWidth',1.5);
xlabel('n');   ylabel('cos(\omegao(n+no))');
```

PLOTS:



- Given the signal $x(t)$

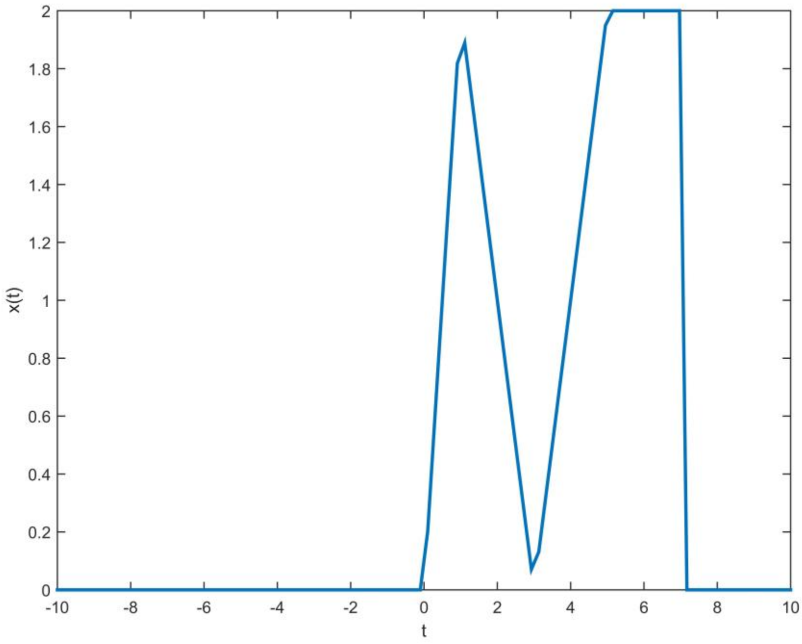
$$x(t) = \begin{cases} 0 & t < 0 \\ 2t & 0 \leq t < 1 \\ 3 - t & 1 \leq t < 3 \\ t - 3 & 3 \leq t < 5 \\ 2 & 5 \leq t < 7 \\ 0 & t \geq 7 \end{cases}$$

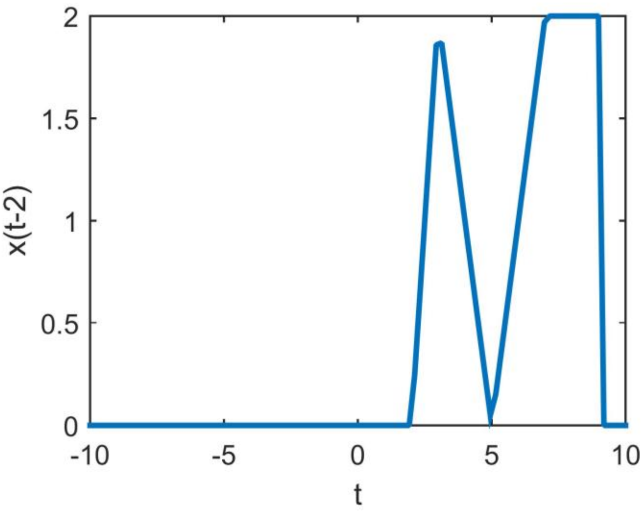
  – Plot the following
    - $x(t-2)$
    - $x(t+3)$
    - $x(3t-4)$
    - $x(1-3t)$

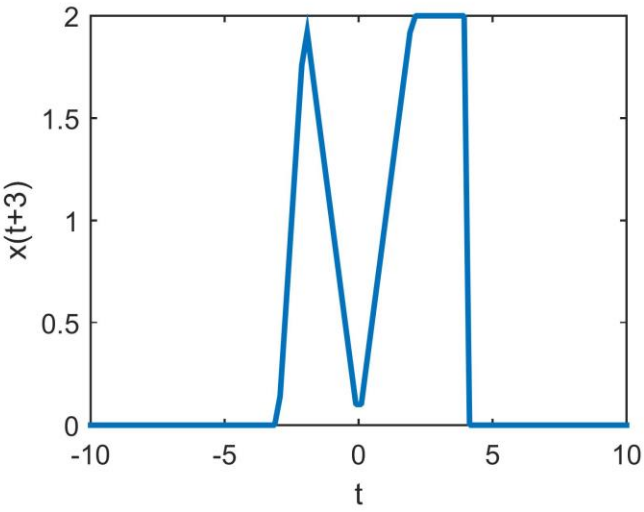
Code :

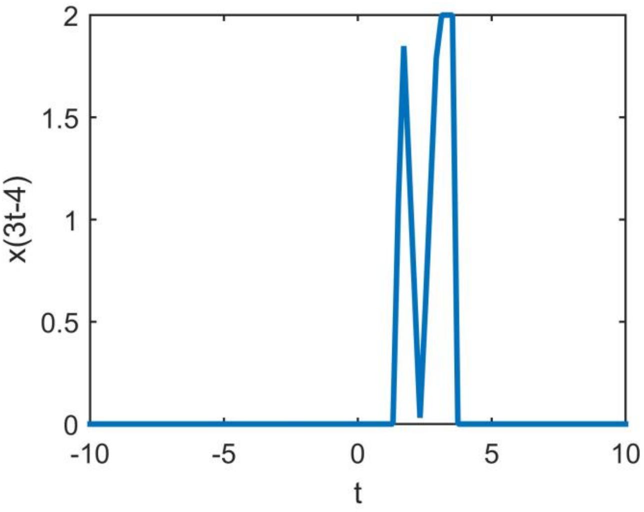
```
%%
tstart = -10;
tend = 10;
t = linspace(tstart,tend);

%%
%Defining Signal
x= @(t) [0.*(t>=7 & t<0) + 2*t.*(t>=0 & t<1) + (3-t).*(t>=1 & t<3) + (t-3).*(t>=3 &
t<5) + 2.*(t>=5 & t<7)];

%%
%Plotting x(t)
plot(t,x(t),'LineWidth',2);
xlabel('t');   ylabel('x(t)');
figure();

%%
%Plotting x(t-2)
t1 = t-2;;

subplot(221);
plot(t,x(t1),'LineWidth',2);
xlabel('t');   ylabel('x(t-2)');

%%
%Plotting x(t+3)
t2 = t+3;

subplot(222);
plot(t,x(t2),'LineWidth',2);
xlabel('t');   ylabel('x(t+3)');

%%
%Plotting x(3t-4)
t3 = 3*t-4;

subplot(223);
plot(t,x(t3),'LineWidth',2);
xlabel('t');   ylabel('x(3t-4)');

%%
%Plotting x(1-3t)
t4 = -((t-1)*3);

subplot(224);
plot(t,x(t4),'LineWidth',2);
xlabel('t');   ylabel('x(1-3t)');
```

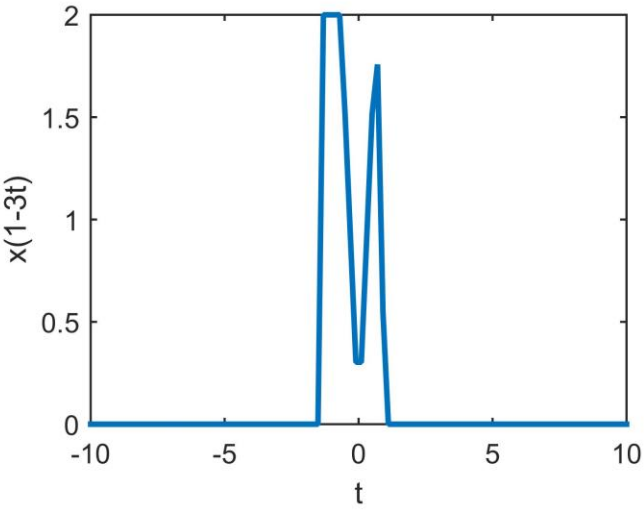
PLOT S:











- Given the discrete signal,

$$x[n] = [\underset{\uparrow}{-1}, \ -2, \ -3, \ 4, \ -2]$$

plot the following transformations

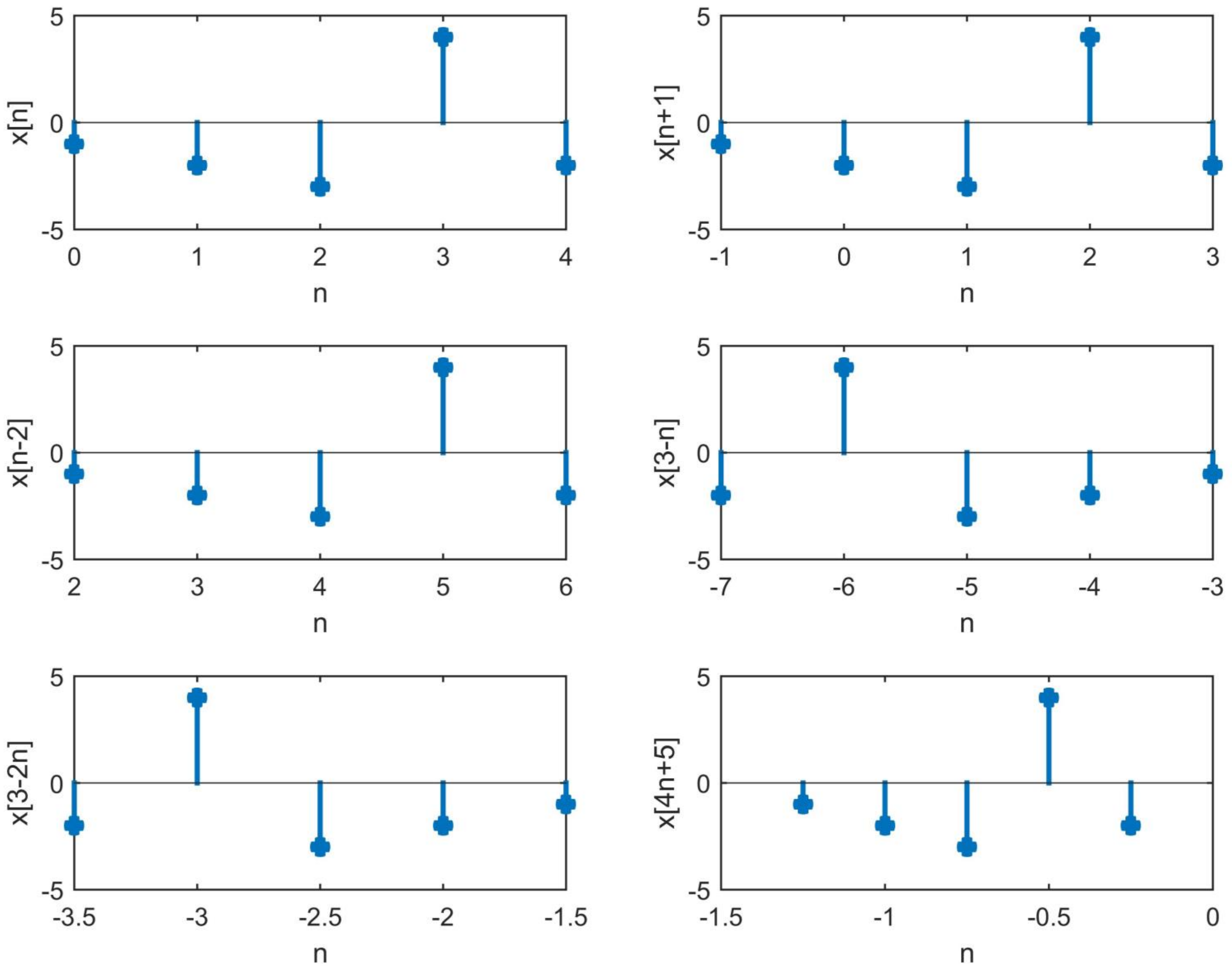
- $x[n+1]$
- $x[n-2]$
- $x[3-n]$
- $x[3-2n]$
- $x[4n+5]$

Code :

```
%%
%Initializing
n = [0 , 1 , 2 , 3 , 4];
x = [-1, -2, -3, 4, -2];

%%
%Plotting x[n]
subplot(321);
stem(n,x,'filled','LineWidth',2);
xlabel('n');   ylabel('x[n]');

%%
%Plotting x[n+1]
n1 = n-1;

subplot(322);
stem(n1,x,'filled','LineWidth',2);
xlabel('n');   ylabel('x[n+1]');

%%
%Plotting x[n-2]
n2 = n+2;

subplot(323);
stem(n2,x,'filled','LineWidth',2);
xlabel('n');   ylabel('x[n-2]');

%%
%Plotting x[3-n]
n3 = -n+3;

subplot(324);
stem(n3,x,'filled','LineWidth',2);
xlabel('n');   ylabel('x[3-n]');

%%
%Plotting x[3-2n]
n4 = -(n+3)/2;

subplot(325);
stem(n4,x,'filled','LineWidth',2);
xlabel('n');   ylabel('x[3-2n]');
```

```
%%
%Plotting x[4n+5]
n5 = (n-5)/4;

subplot(326);
stem(n5,x,'filled','LineWidth',2);
xlabel('n');   ylabel('x[4n+5]');
```

PLOTS :



2 Signal Generation

Consider the signal

$$x(t) = \begin{array}{ll} e^{2t} & -1 < t < 0 \\ e^{-2t} & 0 < t < 1 \\ 0 & otherwise \end{array}$$

Answer/do the following

- Plot $x(t)$
- Define $y(t)$ as a periodic signal equal to $x(t)$ in the fundamental period $T = 3$.

  Plot $y(t)$. Assume the number of pulses to be plotted as 5.

Code :

```
%%
delta = 0.001;
tstart = -1.5;
tend = 1.5;
t = tstart:delta:tend;

%%
%Defining Signal
x = @(t) [exp(2*t).*(t>-1 & t<0)+exp(-2*t).*(t>0 & t<1)+0*(t<-1 & t>1)];

%%
subplot(211);
plot(t,x(t),'b','LineWidth',2);
xlabel('t');   ylabel('x(t)');

%%
nstart = 0;
nend = 3;
n = nstart:delta:nend;

subplot(212);
for i = 1:5
    plot(n,x(t),'b','LineWidth',2);
    n = n+3;
    hold on
end
xlabel('t');   ylabel('y(t)');
```

PLOTS: