

DSAA Computer Assignment 2

Section 1 Linear Convolution

Functions

1. I have written functions for calculating the linear convolution which I will be showing it below. It needs two parameters to be convoluted.

```
function t = lincon(x, h)
    l1 = length(x);
    l2 = length(h);
    l = l1+l2;
    a = (x').*h;
    f = zeros(size(l));
    t = zeros(size(l-1));
    for k=1:l
        sum = 0;
        for i=1:l1
            for j=1:l2
                if i+j == k
                    sum = sum+a(i,j);
                end
            end
        end
        f(k) = sum;
    end
    for k=1:l-1
        t(k) = f(k+1);
    end
end
```

2. I have also created the plotting of stem function according to index needed. It also requires two parameters an array of elements to be printed and the index of the starting point where the graph starts.

```
function f = stemplot(x, in)
    l = length(x);
    t = 1:l;
    t = t-1+in;
    stem(t, x);
    xlim([-1+in, l+in]);
end
```

Question 1

Ques 1a

```
x1 = [1, 2, 3, 8, 9];
x2 = [1, 0, 1, 0];
h = [1, 2, 3, 2, 1];
t1 = lincon(x1, x2);
a1 = lincon(t1, h);
s1 = conv(x1, x2);
b1 = conv(s1, h);
if (a1 == b1)
    disp("Both y1 are same");
else
    disp("Both y1 are different");
end

t2 = lincon(x1, h);
a2 = lincon(t2, x2);
s2 = conv(x1, h);
b2 = conv(s2, x2);
if (a2 == b2)
    disp("Both y2 are same");
else
    disp("Both y2 are different");
end
```

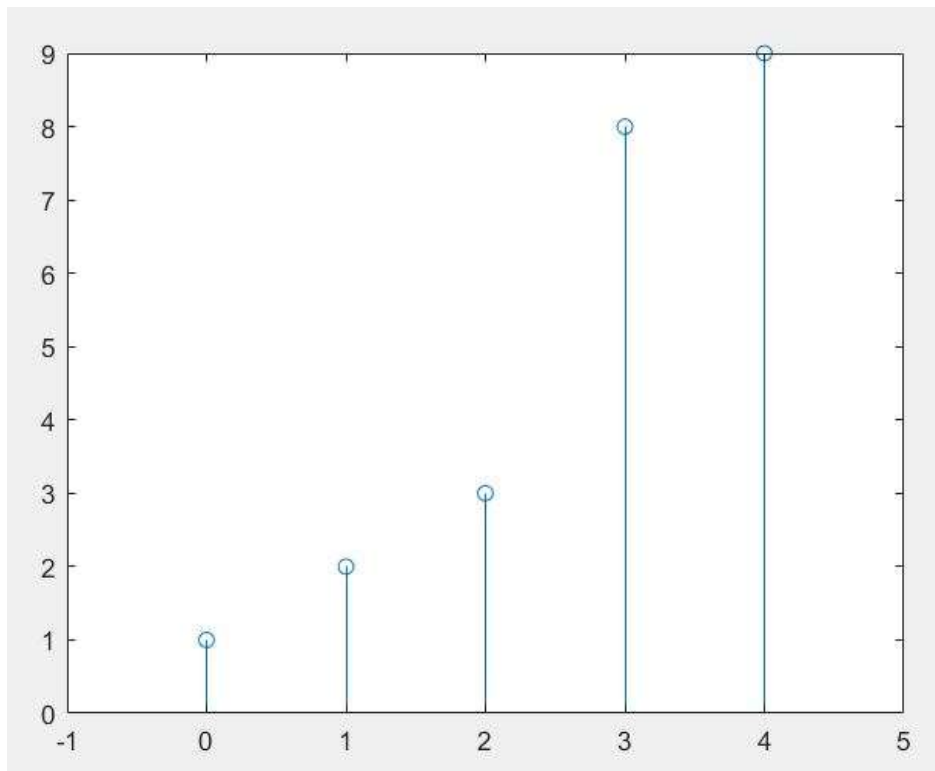
Ques 1b

```
x1 = [1, 2, 3, 8, 9];
x2 = [1, 0, 1, 0];
h = [1, 2, 3, 2, 1];
t1 = lincon(x1, x2);
a1 = lincon(t1, h);
t2 = lincon(x1, h);
a2 = lincon(t2, x2);
if (a1 == a2)
    disp("y1 and y2 are same");
else
    disp("y1 and y2 are different");
end
```

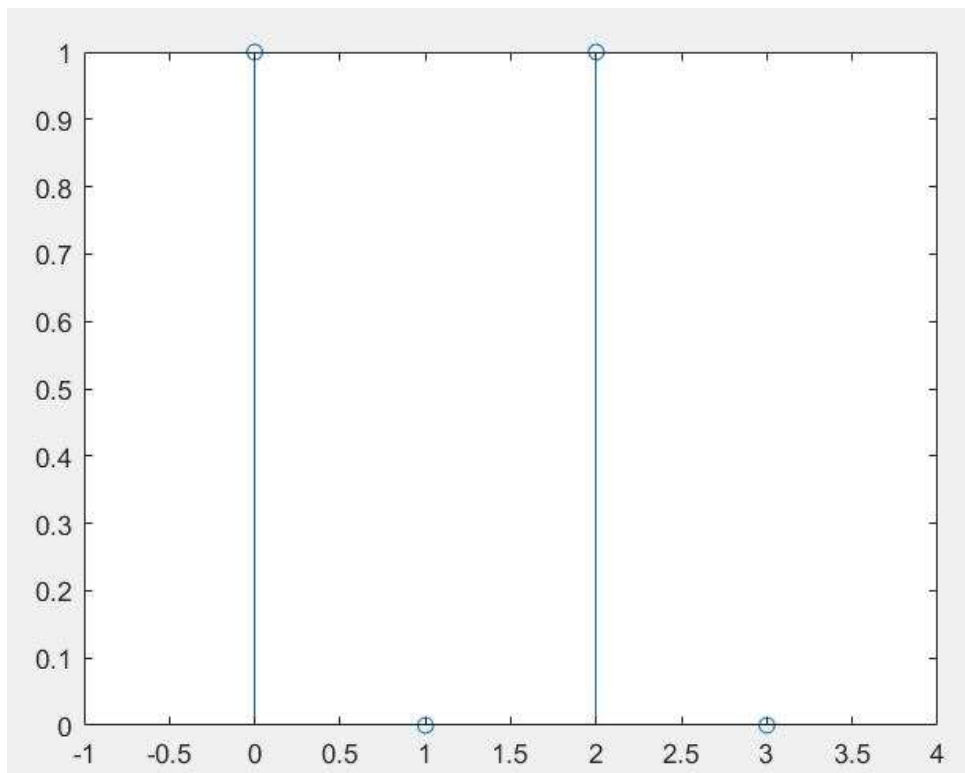
Ques 1c

```
x1 = [1, 2, 3, 8, 9];
x2 = [1, 0, 1, 0];
h = [1, 2, 3, 2, 1];
sb1 = 0;
sb2 = 0;
```

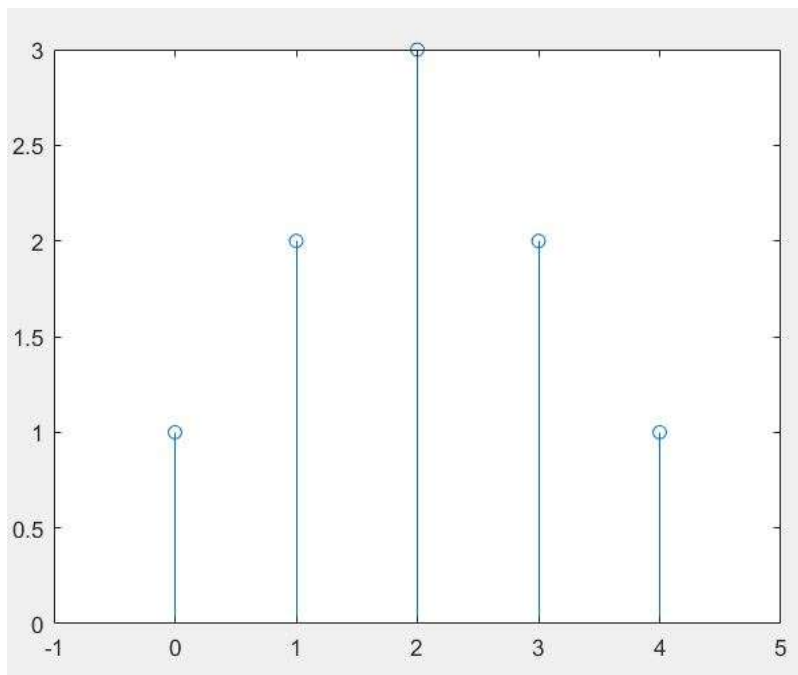
```
sbh = 0;  
stemplot(x1, sb1);
```



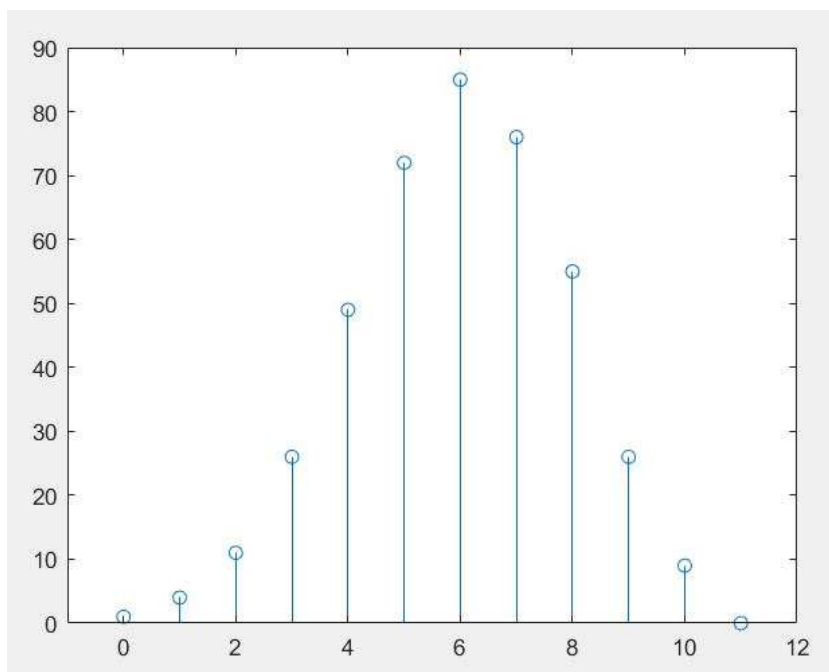
```
stemplot(x2, sb2);
```



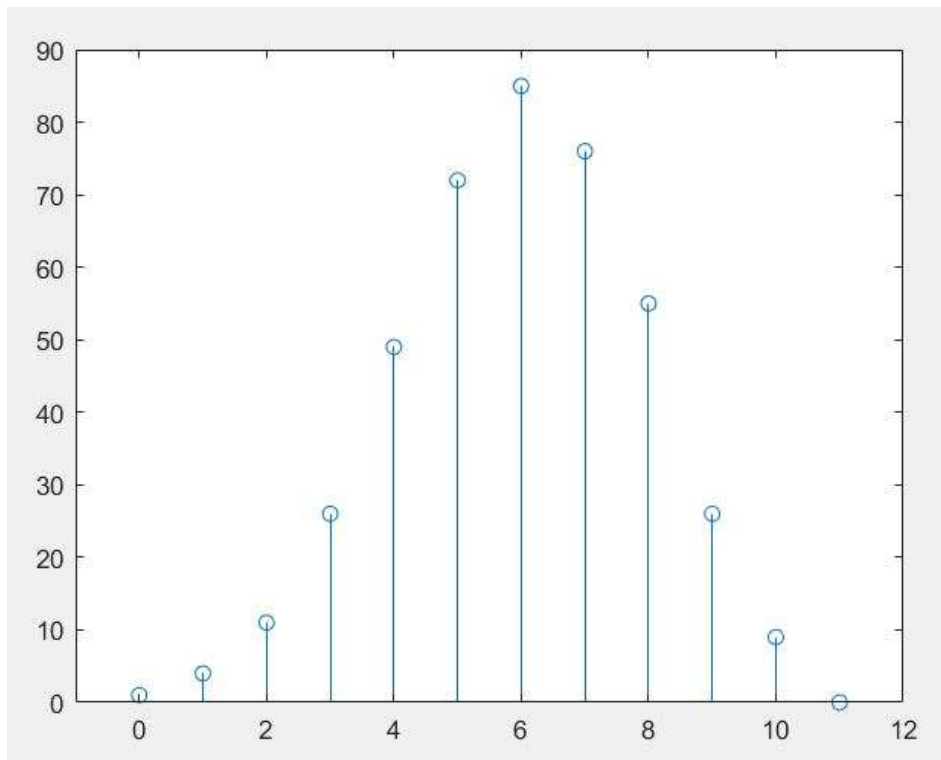
```
stemplot(h, sbh);
```



```
t1 = lincon(x1, x2);  
y1 = lincon(t1, h);  
t2 = lincon(x1, h);  
y2 = lincon(t2, x2);  
sba1 = sb1;  
sba2 = sb1;  
stemplot(y1, sba1);
```



```
stemplot(y2, sba2);
```



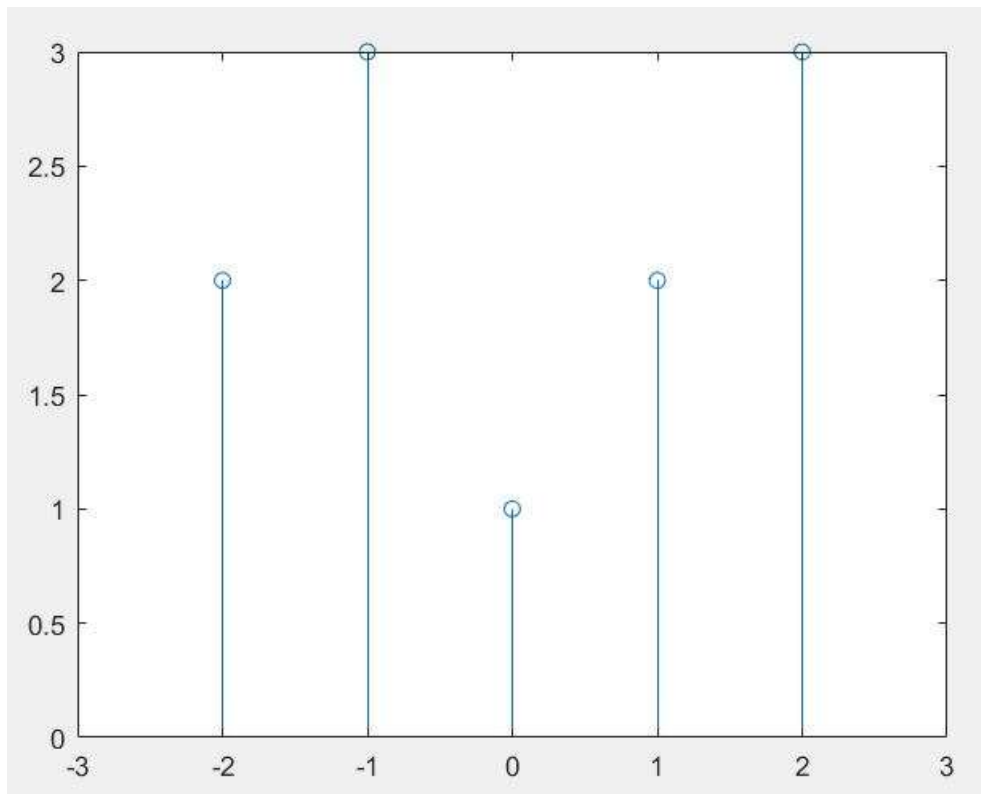
Question 2

Ques 2a

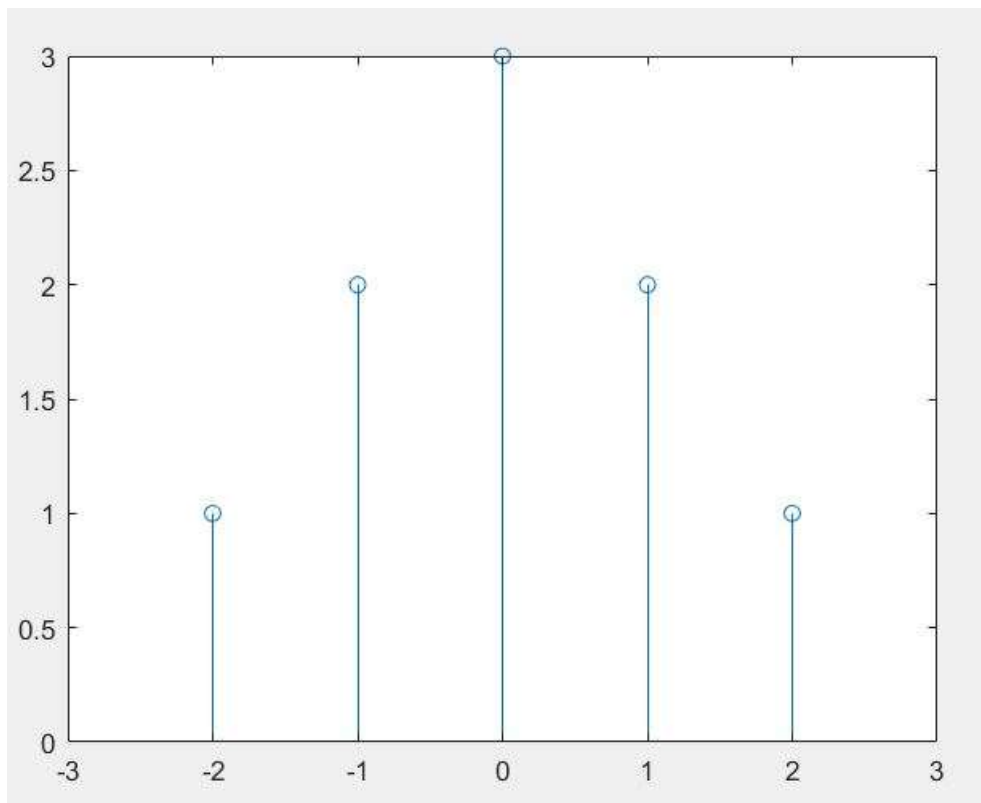
```
x = [2, 3, 1, 2, 3];  
h = [1, 2, 3, 2, 1];  
a1 = lincon(x, h);  
a2 = conv(x, h);  
if (a1 == a2)  
    disp("Both y are same");  
else  
    disp("Both y are different");  
end
```

Ques 2b

```
x = [2, 3, 1, 2, 3];  
h = [1, 2, 3, 2, 1];  
sbx = -2;  
sbh = -2;  
  
stemplot(x, sbx);
```



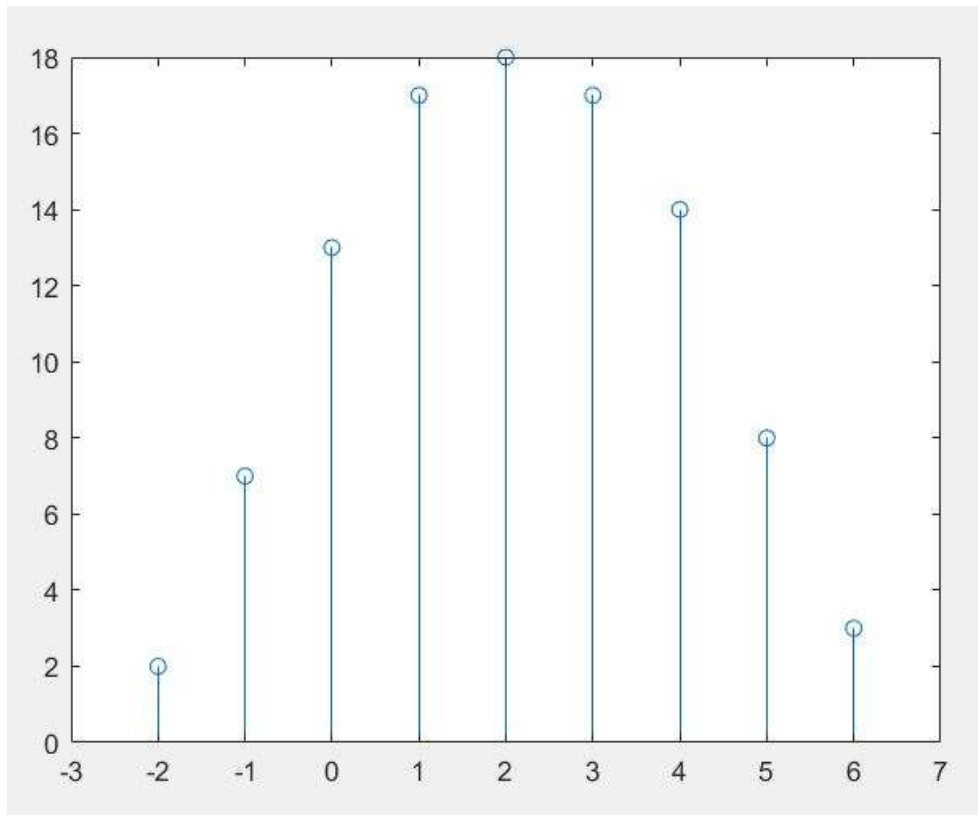
```
stemplot(h, sbh);
```



```

y = lincon(x, h);
sby = sbx;
stemplot(y, sby);

```



Question 3

Ques 3a

```

x = [1, -2, 3, -8, 9];
h = [1, 2, 3, 2, 1];
l1 = length(h);
l2 = length(h);

h = fliplr(h);
l = l1 + l2 - 1;
xe = zeros(size(l));
he = zeros(size(l));
for i=1:l
    if i<l1
        xe(i) = 0;
    else
        xe(i) = x(i-l1+1);
    end
end

```

```

for i=1:l
    if i<l2+1
        he(i) = h(i);
    else
        he(i) = 0;
    end
end
a1 = lincon(xe, he);
a2 = conv(xe, he);
if (a1 == a2)
    disp("Both y are same");
else
    disp("Both y are different");
end

h = fliplr(h);
x = fliplr(x);
l = l1+l2-1+2;
xe = zeros(size(l));
he = zeros(size(l));

for i=1:l
    if i<l1+1
        xe(i) = x(i);
    else
        xe(i) = 0;
    end
end

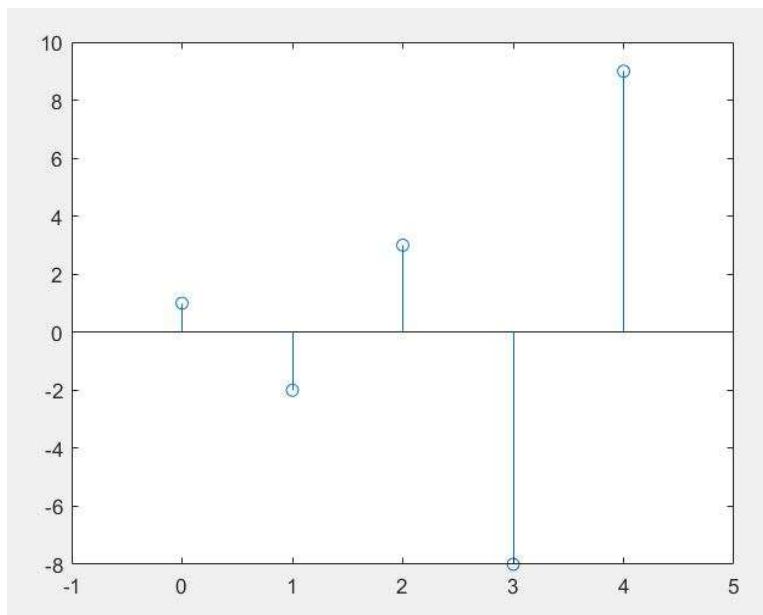
for i=1:l
    if i<l2+2
        he(i) = 0;
    else
        he(i) = h(i-1-l2);
    end
end

a1 = lincon(xe, he);
a2 = conv(xe, he);
if (a1 == a2)
    disp("Both y are same");
else
    disp("Both y are different");
end

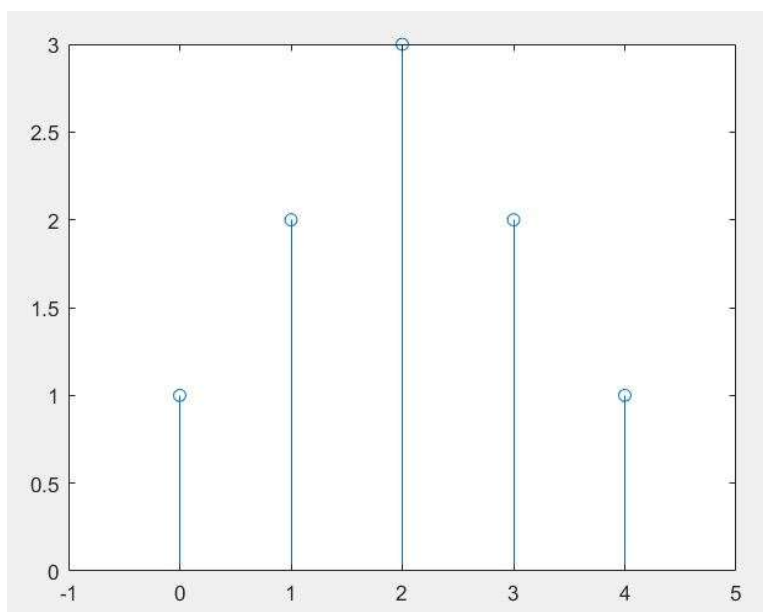
```


Ques 3b

```
x = [1, -2, 3, -8, 9];  
h = [1, 2, 3, 2, 1];  
sbx1 = 0;  
sbx2 = 0;  
l1 = length(h);  
l2 = length(h);  
  
stemplot(x, sbx1);
```



```
stemplot(h, sbx2);
```



```

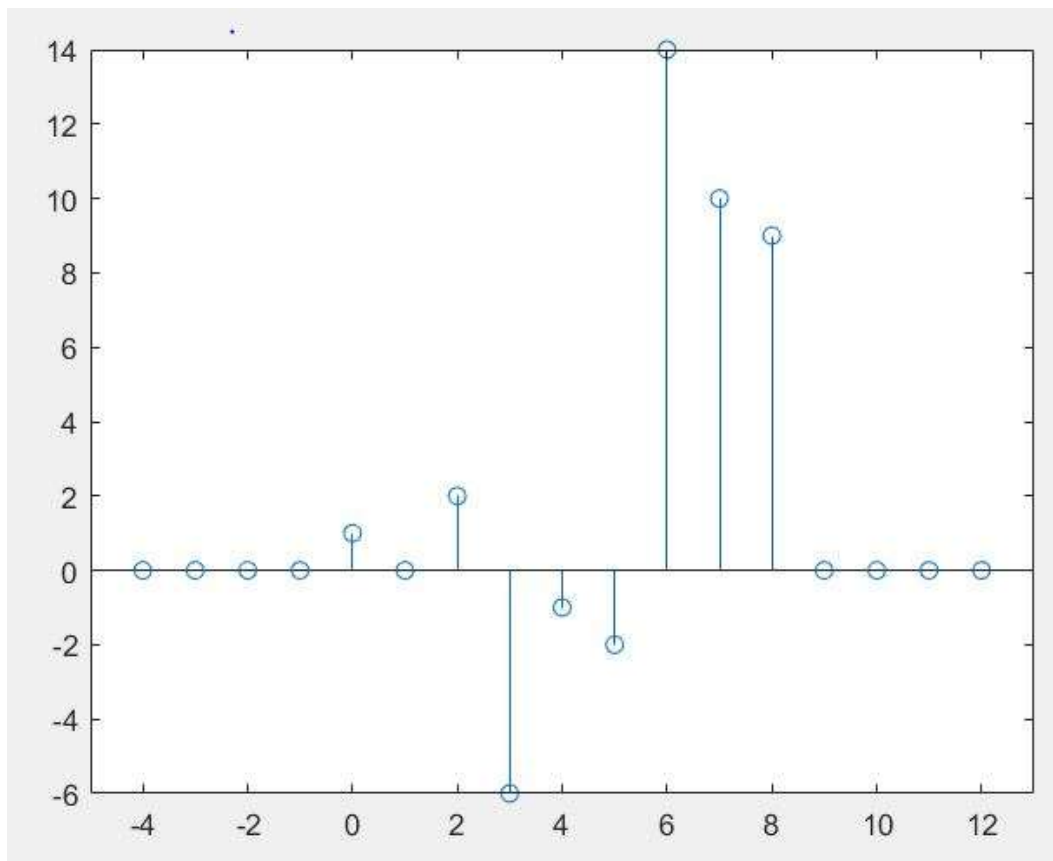
h = fliplr(h);
l = l1 + l2 - 1;
xe = zeros(size(l));
he = zeros(size(l));

for i=1:l
    if i<l1
        xe(i) = 0;
    else
        xe(i) = x(i-l1+1);
    end
end

for i=1:l
    if i<l2+1
        he(i) = h(i);
    else
        he(i) = 0;
    end
end

sbx11 = sbx1-l2+1;
y1 = lincon(xe, he);
stemplot(y1, sbx11);

```



```

h = fliplr(h);
x = fliplr(x);
l = l1+l2-1+2;
xe = zeros(size(l));
he = zeros(size(l));

for i=1:l
    if i<l1+1
        xe(i) = x(i);
    else
        xe(i) = 0;
    end
end

for i=1:l
    if i<l2+2
        he(i) = 0;
    else
        he(i) = h(i-1-l2);
    end
end

sbx12 = sbx1-l1+1-2;
y2 = lincon(xe, he);
stemplot(y2, sbx12);
disp(y2);

```

