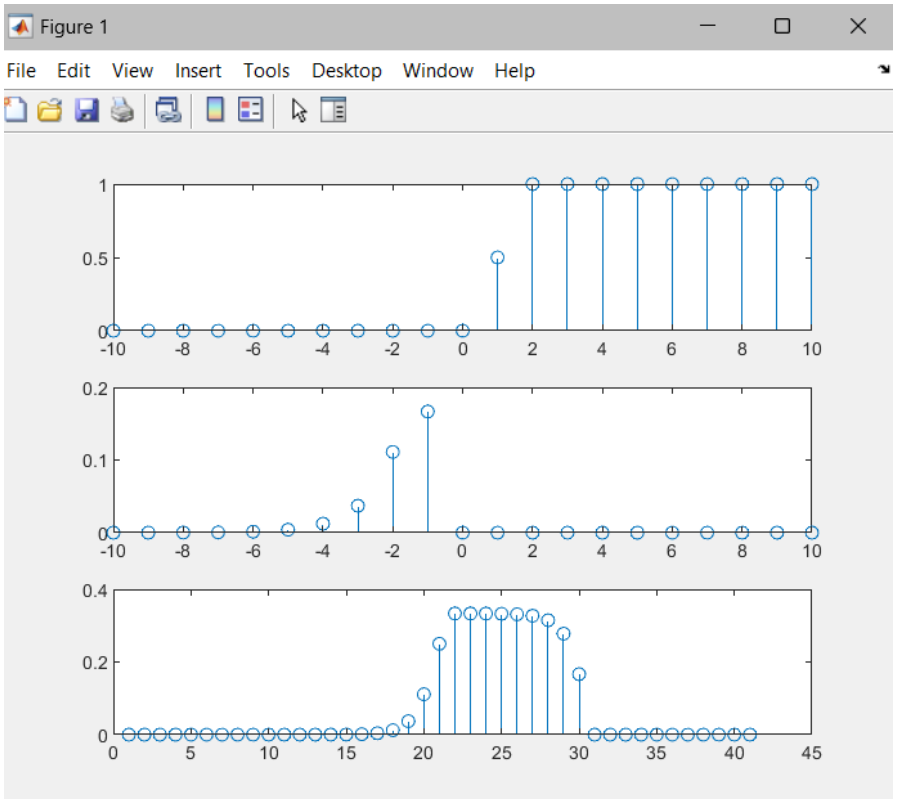
Lab 6: Analysis of Discrete LTI Systems using Convolution Sum

Name	**DANISH ZULFIQAR**
Registration Number	**FA21-BEE-042**
Class/section	**4-A**
Instructor's Name	**DR. BILAL TARIQ**

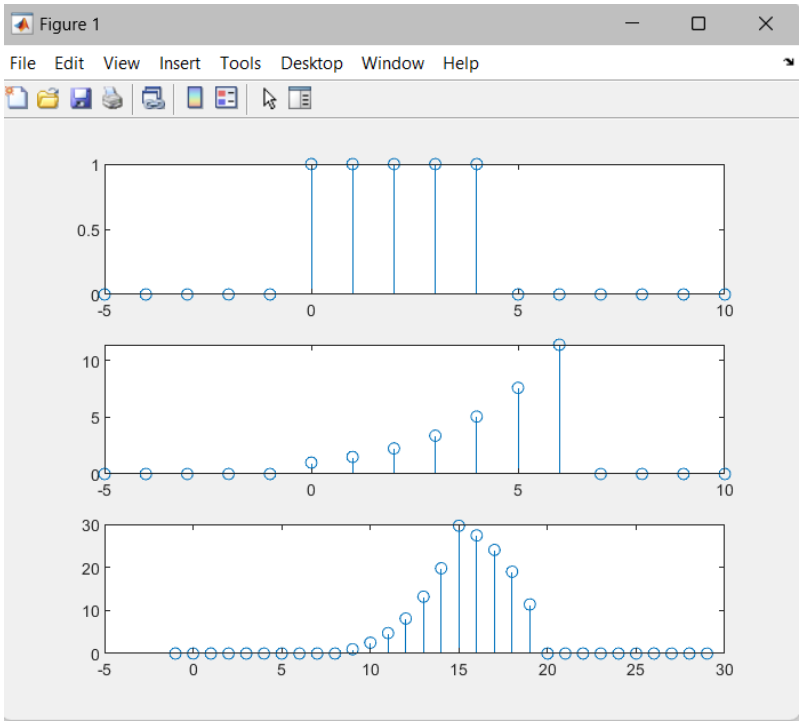
Task 1:

```
>> n=linspace(-10, 10, 21);
h=heaviside(n-1)
x=((1/3).^(-n)).*heaviside(-n-1)
subplot(311)
stem(n,h)
subplot(312)
stem(n, x)
subplot(313)
y=conv(h,x)
stem(y)
```



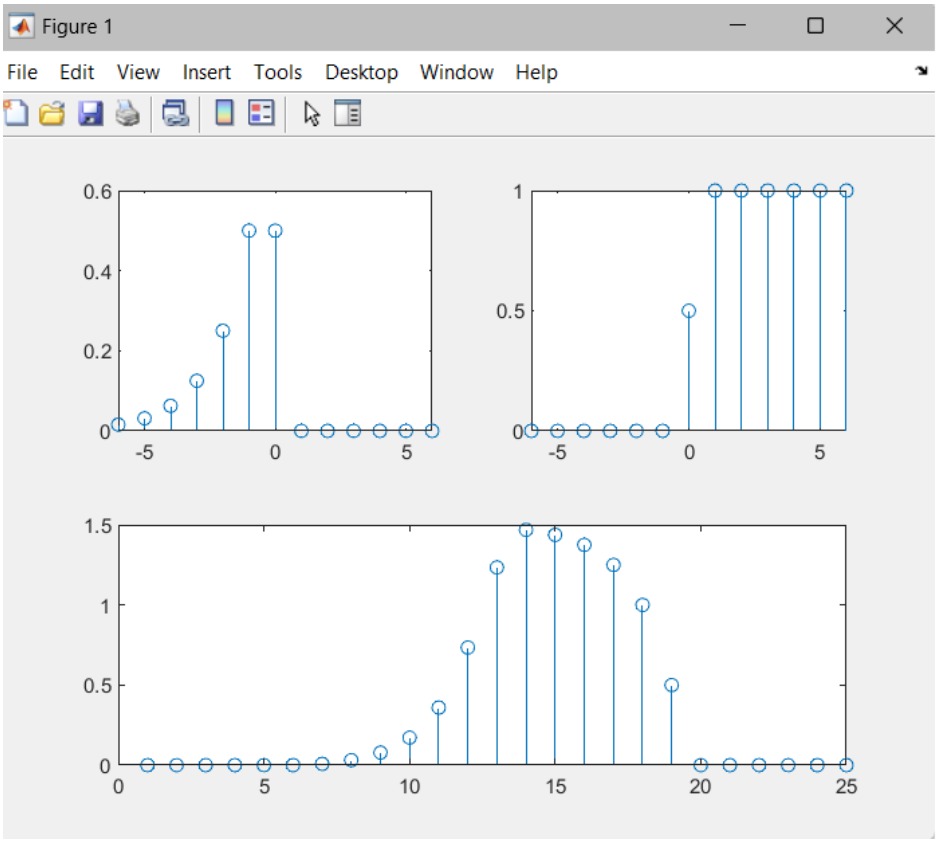
Task 2:

```
>> n = -5:10;
x = [0 0 0 0 0 1 1 1 1 1 0 0 0 0 0 0];
subplot (3,1,1);
stem (n,x)
subplot (3,1,2)
a1 = (n>=0) & (n<=6);
a2 = 1.5.^n;
h = a1.*a2;
stem (n,h)
y=conv (x, h);
subplot (3, 1,3)
stem (-1:29, y)
```



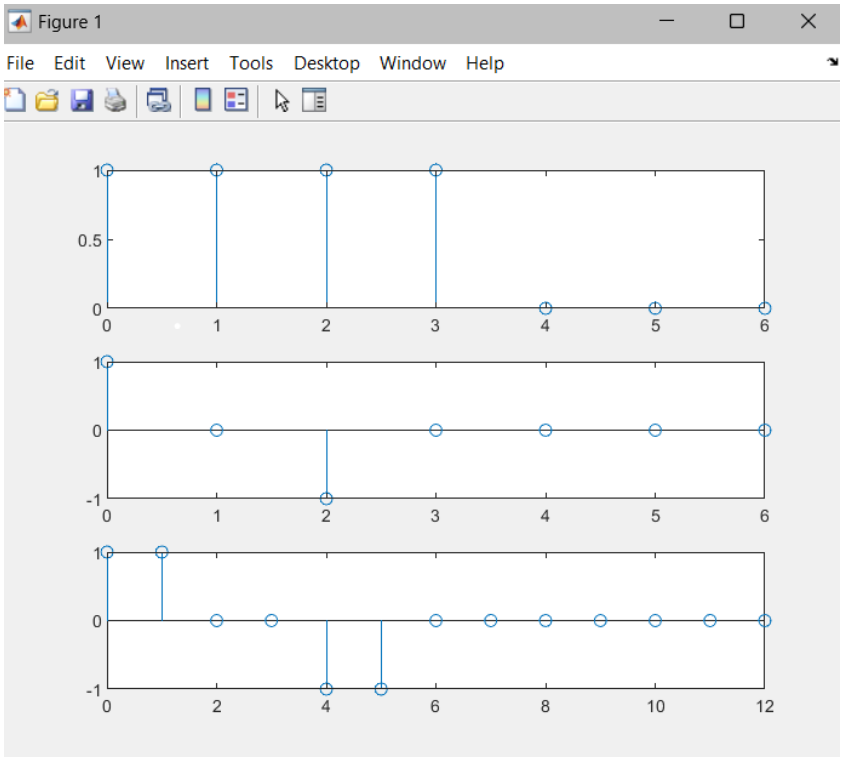
Task 3:

```
>> n = -6 : 6;
xn = (2.^n).*heaviside(-n);
hn = heaviside(n);
yn = conv( xn , hn );
subplot(2,2,1)
stem( n , xn )
subplot(2,2,2)
stem( n , hn )
subplot(2,2,[3,4])
stem( yn )
```



Task 4:

```
>> n = 0:6;
n = 0:6;
h = [1 0 -1 0 0 0 0];
x = [1 1 1 1 0 0 0];
subplot(3,1,1)
stem(n,x)
subplot(3,1,2)
stem(n,h)
y = conv(x,h);
subplot(3,1,3)
stem(0:12,y)
```

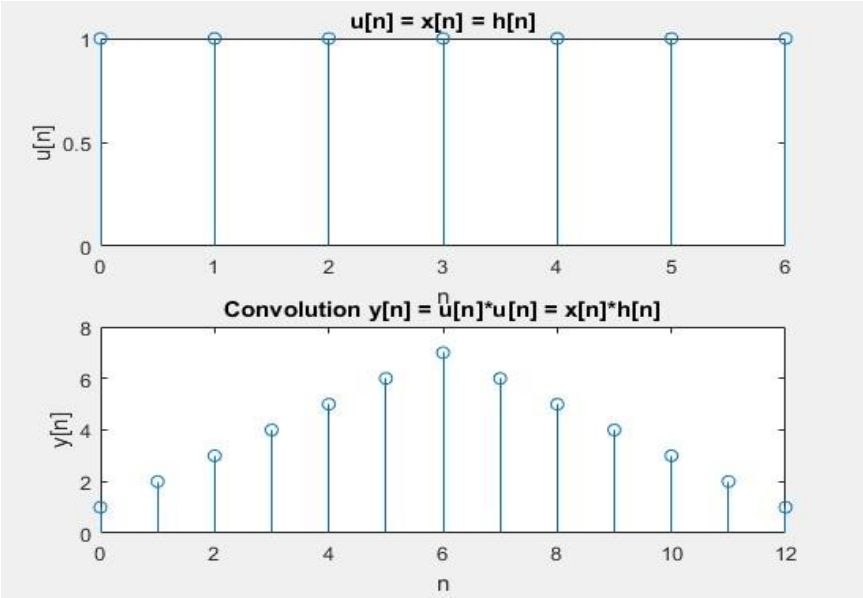


Task 5:

(a) $y[n] = u[n] * u[n], 0 \le n \le 6$

Command:

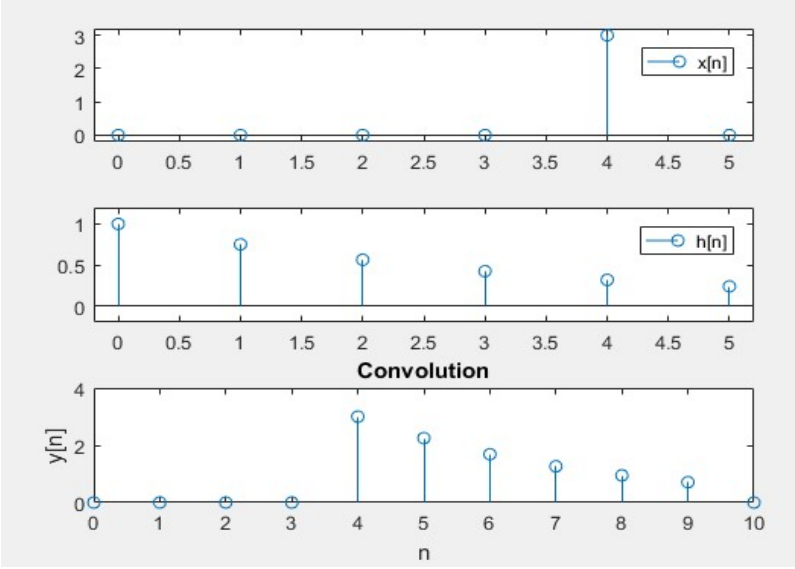
```
n = 0:6; u =
ones(size(n
));
subplot(2,1,
1)
stem(n,u)
title('u[n] = x[n]
= h[n]')
xlabel('n'
)
ylabel('u[
n]') y =
conv(u,u
);
subplot(2
,1,2)
stem(0:1
2,y)
title('Convolution y[n] = u[n]*u[n] =
x[n]*h[n]') xlabel('n') ylabel('y[n]')
```



(b) $y[n] = 3\delta[n-4] * (3/4)^n u[n], 0 \le n \le 5$

Command:

```
n = 0:5; h =
(3./4).^n.*(n>=
0); x = [0 0 0 0
3 0];
subplot(3,1,1)
stem(n,x)
legend('x[n]')
axis([-0.2 5.2 -
0.2 3.2])
subplot(3,1,2)
stem(n,h)
legend('h[n]')
axis([-0.2 5.2 -
0.2 1.2]) y =
conv(x,h);
subplot(3,1,3)
stem(0:10,y)
title('Convoluti
on')
ylabel('y[n]')
xlabel('n')
```



Critical Analysis/Conclusion:

In this lab, I learnt how to use convolution sum to analyze discrete LTI systems. I used the built in function conv and also the other method to visualize convolution.