

# ***DSAA Computer Assignment – 2***

***Adwait Thattey***  
***S20170010004***  
***Sec – A***

## ***Q1. Function to make convolution:***

```
function y = Convolution(x,h)
    A = max( size(x) );
    B = max( size(h) );
    len = A + B - 1;
    y = zeros( [1,len] );
    Xe = zeros( [1,len] );
    He = zeros( [1,len] );
    Xe(1:A) = x;
    He(1:B) = h;
    for i=1:max( size(y) )
        for j=1:i
            y(i) = y(i) + Xe(j) .* He((i + 1) - j);
        end
    end
    return
```

***a)***

***Code to generate convolution of 2 signals:***

→ ***Function to create x1,y1,h***

```
function [x1, x2, h] = makex1x2h(n)
    %{
        x1 = {1, 2, 3, 8, 9}
        x2 = {1, 0, 1, 0}
        h = {1, 2, 3, 2, 1}
    %}
    x1 = zeros(size(n));
    x2 = zeros(size(n));
```

```
h = zeros(size(n));
```

```
x1(n==0) = 1;
```

```
x1(n==1) = 2;
```

```
x1(n==2) = 3;
```

```
x1(n==3) = 8;
```

```
x1(n==4) = 9;
```

```
x2(n==0) = 1;
```

```
x2(n==1) = 0;
```

```
x2(n==2) = 1;
```

```
x2(n==3) = 0;
```

```
h(n==0) = 1;
```

```
h(n==1) = 2;
```

```
h(n==2) = 3;
```

```
h(n==3) = 2;
```

```
h(n==4) = 1;
```

```
return
```

→ *getting y1 and y2:*

```
clc
```

```
clear
```

```
t = -10:1:10;
```

```
[x1,x2,h] = makex1x2h(t);
```

```
y1 = convolution(convolution(x1,x2), h);
```

```
y2 = convolution(convolution(x1,h), x2);
```

→ Verifying using inbuilt conv function

```
y1_inbulit = conv(conv(x1,x2), h);
```

```
y2_inbulit = conv(conv(x1,h), x2);
```

```
isequal(y1,y1_inbuilt) && isequal(y2,y2_inbuilt)
```

→output  
logical 1

**Thus Verified**

b)      

```
isequal(y1,y1_inbuilt)
```

  
→output  
logical 1

**Thus Verified**

c) *Code used for plotting :*

```
subplot(5,1,1)  
stem(t,x1)  
title("x1")  
xticks(-10:2:10)  
yticks(0:2:10)
```

```
subplot(5,1,2)  
stem(t,x2)  
title("x2")  
xticks(-10:2:10)  
yticks(0:2:10)
```

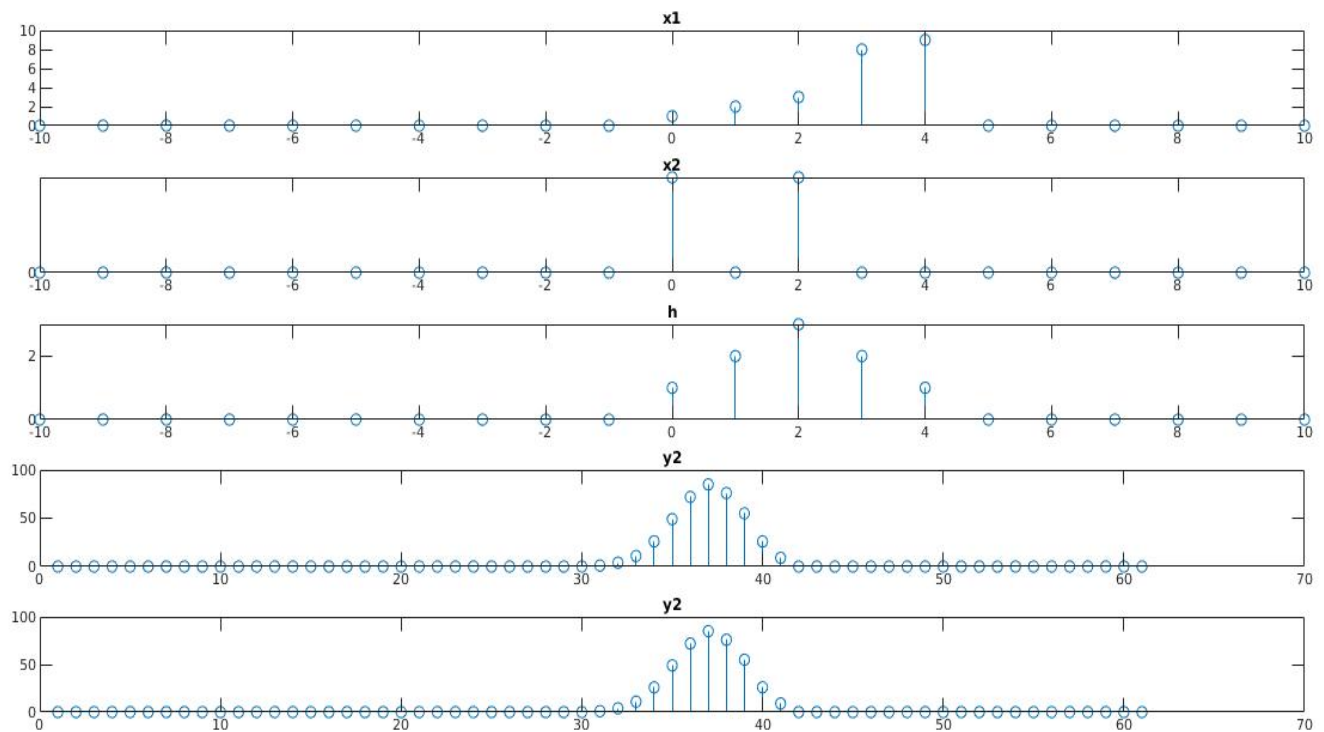
```
subplot(5,1,3)  
stem(t,h)  
title("h")  
xticks(-10:2:10)  
yticks(0:2:10)
```

```
subplot(5,1,4)  
stem(y1)  
title("y2")
```

```
subplot(5,1,5)
```

```
stem(y2)
title("y2")
```

(This image is not very clear. Image is attached in the zip folder. See that instead)



**Q2)**

→ *Function to generate x and h :*

```
function [x,h] = q2Func(n)
    x = zeros(size(n));
    h = zeros(size(n));

    %{
        x = {2, 3, 1, 2, 3} -> on 1
        h = {1, 2, 3, 2, 1} -> on 3
    %}
```

```
x(n== -2) = 2;  
x(n== -1) = 3;  
x(n== 0) = 1;  
x(n== 1) = 2;  
x(n== 2) = 3;  
h(n== -2) = 1;  
h(n== -1) = 2;  
h(n== 0) = 3;  
h(n== 1) = 2;  
h(n== 2) = 1;  
return
```

→ *Forming y and verifying using inbuilt function*

```
clear;  
clc;  
  
n = -10:1:10;  
[x,h] = q2Func(n);  
  
y = convolution(x, h);  
y_inbuilt = conv(x, h);  
  
isequal(y, y_inbuilt)
```

→ Output  
logical 1

**Thus Verified**

**b) Plotting x,h,y**

→ *Code for plotting* →

```
subplot(3,1,1)  
stem(n,x)  
title("x")  
xticks(-10:2:10)
```

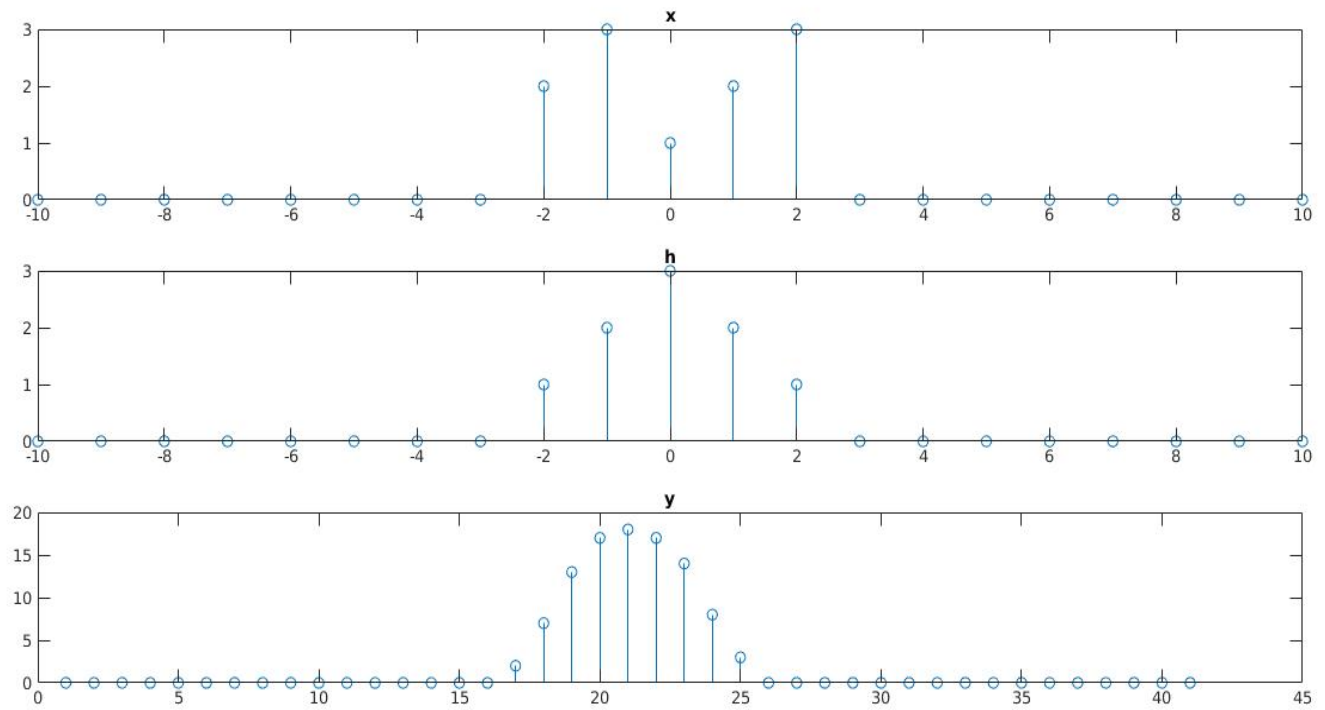
```
yticks(0:1:5)
```

```
subplot(3,1,2)  
stem(n,h)  
title("h")  
xticks(-10:2:10)  
yticks(0:1:5)
```

```
subplot(3,1,3)  
stem(y)  
title("y")
```

→ ***Plot***

*This image is not very clear. Please also see attached image in zip folder*



→ ***P.T.O.***

**Q3)**

***Function to make x and h***

```
function [x1,h] = q3Func(n,shift1,scale1,shift2,scale2)
    x1 = zeros(size(n));
    h = zeros(size(n));

    n1 = ( n + ( shift1/scale1 )) * scale1;
    n2 = ( n + ( shift2/scale2 )) * scale2;

    x1(n1==0) = 1;
    x1(n1==1) = -2;
    x1(n1==2) = 3;
    x1(n1==3) = -8;
    x1(n1==4) = 9;
    h(n2==0) = 1;
    h(n2==1) = 2;
    h(n2==2) = 3;
    h(n2==3) = 2;
    h(n2==4) = 1;

    return
```

***a) Create y1,y2 and verify:***

```
clc;
clear;

n = -10:1:10;
[x , h] = q3Func(n,0,1,0,-1);
[x1, h1] = q3Func(n,2,-1,0,1);

y1 = convolution(x, h);
y2 = convolution(x1, h1);

y1_inbuilt = conv(x, h);
y2_inbuilt = conv(x1, h1);

isequal(y1, y1_inbuilt) && isequal(y2, y2_inbuilt)
```

→ **Output:**  
**logical 1**

**hence Verified**

**b) → Code for plotting**

```
subplot(4,1,1)
stem(n,x)
title("x")
xticks(-10:2:10)
yticks(-15:5:15)
```

```
subplot(4,1,2)
stem(n,h)
title("h")
xticks(-10:2:10)
yticks(-5:1:5)
```

```
subplot(4,1,3)
stem(y1)
title("y1")
```

```
subplot(4,1,4)
stem(y2)
title("y2")
```



*The image is not very clear. A image is attached in a zip file. Please refer that too*

