ESE-2014 Lab5

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Determine analytical the convolution y(n)=x(n)*h(n) of the following sequences, and verify your answers using the conv_m function

1. x(n)= {2,-4,5,3,-1,-2,6}, h(n)={1,-1,1,-1,1}

SOLUTION:

Convolution function:

conv_m.m

```
function[y,ny]=conv_m(x,nx,h,nh)
nyb=nx(1)+nh(1);
nye=nx(length(x))+nh(length(h));
ny=[nyb:nye];
y=conv(x,h);
```

Operation on sequence:

Command Window

```
>>  n1 = -3:3; x = [2 -4 5 3 -1 -2 6]; n2 = -1:3; h = [1 -1 1 -1 1];
>> w=conv(x,h)
w =

    2    -6    11    -8     7    -7     9    -4     7    -8     6

>> [y,n] = conv_m(x,n1,h,n2); y, n
y =

    2    -6    11    -8     7    -7     9    -4     7    -8     6

n =

   -4   -3   -2   -1    0    1    2    3    4    5    6

>>
```

2. x(n)= {1,1,0,1,1}, h(n)={1,-2,-3,4}

SOLUTION:

Operation on sequence:

```
Command Window
>> n1 = -3:3; x = [1 1 0 1 1]; n2 = -3:0; h = [1 -2 -3 4];
>> conv(x,h)
ans =

   1   -1   -5    2    3   -5    1    4

>> [y,n] = conv_m(x,n1,h,n2); y, n
y =

   1   -1   -5    2    3   -5    1    4

n =

  -6   -5   -4   -3   -2   -1    0    1

>>
```

3. x(n)=(1/4)^-n[u(n+1)-u(n-4)], h(n)=u(n)-u(n-5)

SOLUTION:

Operation on Sequence:

```
Command Window
>> n1 = -1:4;
>> [x1,nx1] = stepseq(-1,-1,4);
>> [x2,nx2] = stepseq(4,-1,4);
>> [x3,n3] = sigadd(x1,nx1,-x2,nx2);
>> x4 = 0.25 .^ -n1;
>> n4 = n1;
>> x = x4 .* x3;
>> n2 = 0:5;
>> [h1,nh1] = stepseq(0,0,5);
>> [h2,nh2] = stepseq(5,0,5);
>> h=h1-h2;
>> w=conv(x,h)

w =

    0.2500    1.2500    5.2500   21.2500   85.2500   85.0000   84.0000   80.0000   64.0000         0         0
```

```
>> [y,n] = conv_m(x,n1,h,n2); y, n

y =

    0.2500    1.2500    5.2500   21.2500   85.2500   85.0000   84.0000   80.0000   64.0000         0         0


n =

    -1     0     1     2     3     4     5     6     7     8     9
```

4. x(n)= n/4[u(n)-u(n-6)], h(n)=2[u(n+2)-u(n-3)]

SOLUTION:

Operation on Sequence:

Command Window

```
>> n1 = 0:6;
>> [x1,nx1] = stepseq(0,0,6);
>> [x2,nx2] = stepseq(6,0,6);
>> [x3,n3] = sigadd(x1,nx1,-x2,nx2);
>> x4 = n1/4;
>> n4 = n1;
>> x = x4 .* x3;
>> n2 = -2:3;
>> [h1,nh1] = stepseq(-2,-2,3);
>> [h2,nh2] = stepseq(3,-2,3);
>> h = 2 * (h1 - h2);
>> w=conv(x,h)

w =

  Columns 1 through 11

         0    0.5000    1.5000    3.0000    5.0000    7.5000    7.0000    6.0000    4.5000    2.5000         0

  Column 12

         0
```

```
>> [y,n] = conv_m(x,n1,h,n2); y, n

y =

  Columns 1 through 11

         0    0.5000    1.5000    3.0000    5.0000    7.5000    7.0000    6.0000    4.5000    2.5000         0

  Column 12

         0


n =

    -2    -1     0     1     2     3     4     5     6     7     8     9
```