Digital Signal Processing
MATLAB HW2 - q3

Table of Contents

Professor: Dr. Sheikhzadeh Author: [SeyedAli] - [SeyedHosseini] E-mail: [alisnake@aut.ac.ir] %which I`m about to change ASAP University: Amirkabir University of Technology

Clear recent data

```
clear; close all; clc;
```

Part D

```
n = 1:21;
```

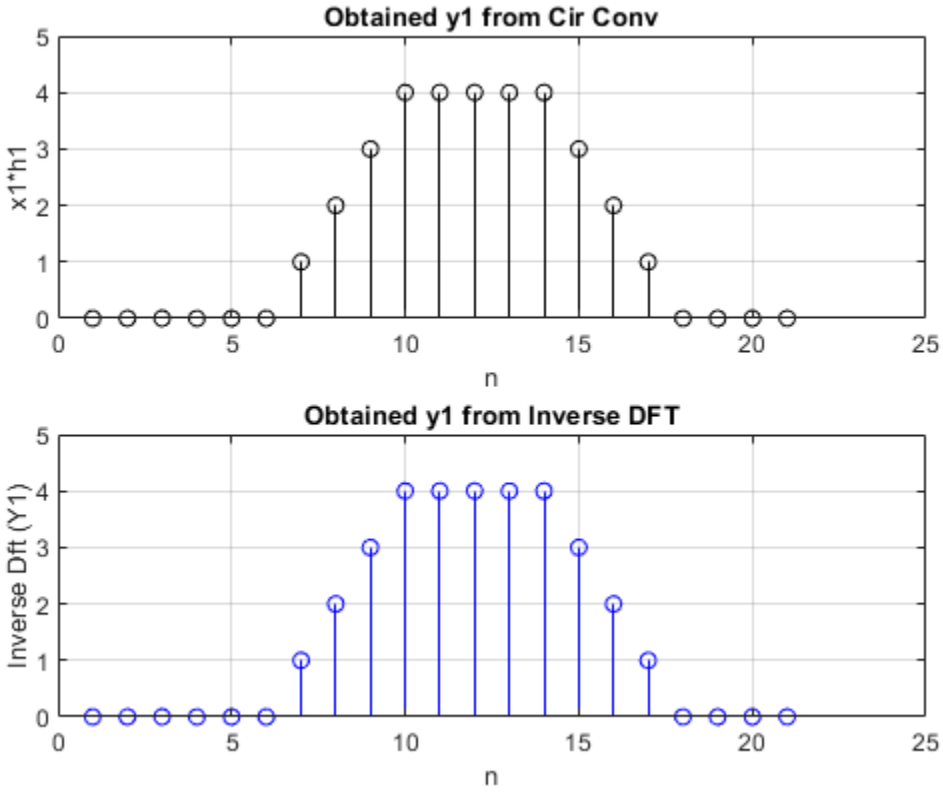
1st signals

```
%time domain
x1 = zeros(1,21);
x1(4:7) = 1; %Rectangular pulse with length 4
h1 = zeros(1,21);
h1(4:11) = 1; %Rectangular pulse with length 8
N1 = 21;
y1 = cir_conv(x1,h1,N1); %Using Part C function

%freq domain
X1 = fft(x1);  %calculation of DFT
H1 = fft(h1); %calculation of DFT
Y1 = X1.*H1;
y_1 = (ifft(Y1));  %Inverse DFT
```

plots

```
figure(1)
subplot(211)
```

```
stem(n,y1,"k");grid on;
title("Obtained y1 from Cir Conv")
xlabel("n")
ylabel("x1*h1")
axis([0 25 0 5])

subplot(212)
stem(n,y_1,"b");grid on;
title("Obtained y1 from Inverse DFT")
xlabel("n")
ylabel("Inverse Dft (Y1)")
axis([0 25 0 5])
```



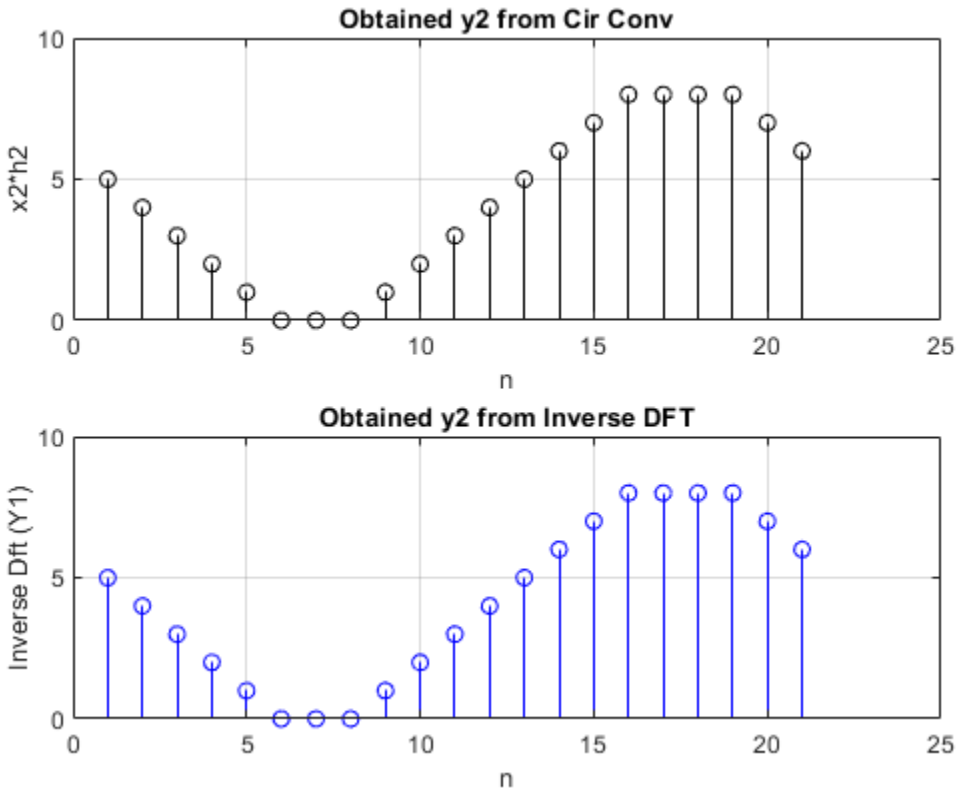
2nd signals

```
%time domain
x2 = zeros(1,21);
x2(5:12) = 1;
h2 = zeros(1,21);
h2(5:15) = 1; %Rectangular pulse with length 8
N2 = 21;
y2 = cir_conv(x2,h2,N2); %Using Part C function

%freq domain
X2 = fft(x2);  %calculation of DFT
H2 = fft(h2); %calculation of DFT
```

```
Y2 = X2.*H2;
y_2 = (ifft(Y2));  %Inverse DFT
```

plots

```
figure(2)
subplot(211)
stem(n,y2,"k");grid on;
title("Obtained y2 from Cir Conv")
xlabel("n")
ylabel("x2*h2")
axis([0 25 0 10])

subplot(212)
stem(n,y_2,"b");grid on;
title("Obtained y2 from Inverse DFT")
xlabel("n")
ylabel("Inverse Dft (Y1)")
axis([0 25 0 10])
```



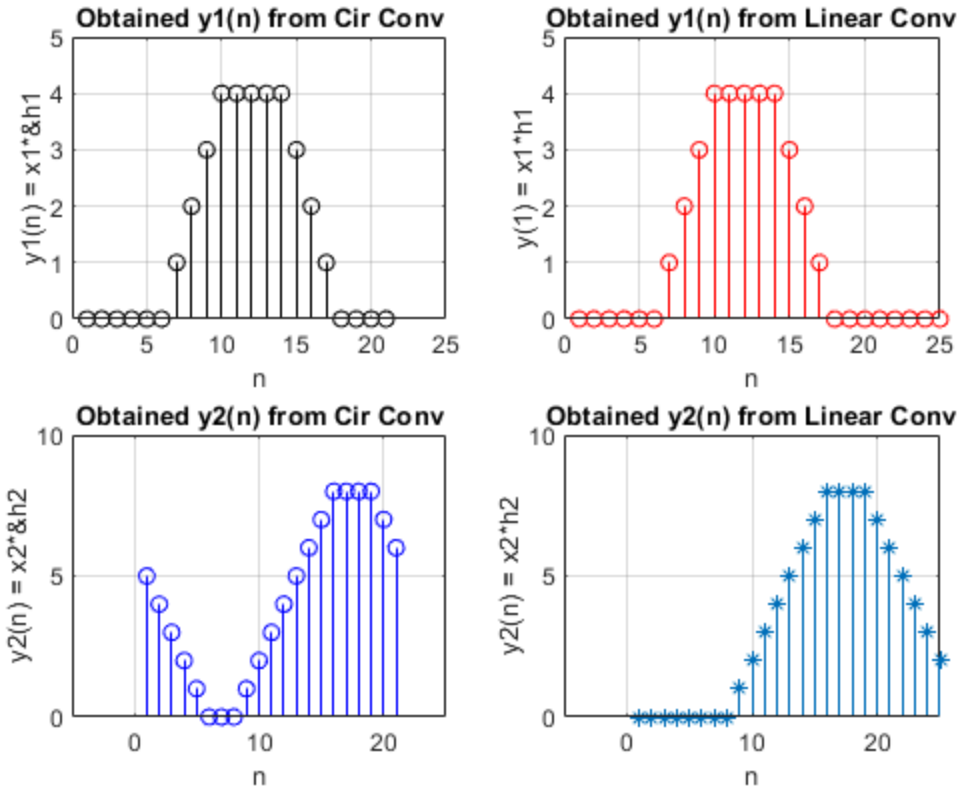
Part E

```
y_l1 = conv(x1,h1);% Linear Convolution Of x1*h1
l1 = 1 :  length(y_l1);
```

```
y_l2 = conv(x2,h2);% Linear Convolution Of x1*h1
l2 = 1 : length(y_l2);
```

plots for part E

```
figure(3)
subplot(221)
stem(n,y1,"k");grid on;
title("Obtained y1(n) from Cir Conv")
xlabel("n")
ylabel("y1(n) = x1*&h1")
axis([0 25 0 5])

subplot(222)
stem(l1,y_l1,"r");grid on;
title("Obtained y1(n) from Linear Conv")
xlabel("n")
ylabel("y(1) = x1*h1")
axis([0 25 0 5])

subplot(223)
stem(n,y2,"b");grid on;
title("Obtained y2(n) from Cir Conv")
xlabel("n")
ylabel("y2(n) = x2*&h2")
axis([-5 25 0 10])

subplot(224)
stem(l2,y_l2,"*");grid on;
title("Obtained y2(n) from Linear Conv")
xlabel("n")
ylabel("y2(n) = x2*h2")
axis([-5 25 0 10])
```



Part A

```
function cflipped_sig = cflip(sig,N)
    cflipped_sig = zeros(1,N) ; %allocation
    cflipped_sig(1) = sig(1) ;
    for n = 1 : N -1
        cflipped_sig(n + 1) = sig(N - n + 1);
    end
end
```

Part B

```
function cshifted_sig = cshift(sig,m)
   N = length(sig);%Length of Signal
   cshifted_sig = zeros(1,N); %allocation first
   for n = 1 : floor(N/2)
      cshifted_sig(n) = sig(N - m + n ); %x(n) = x(N - m + n)
   end
    for n = floor(N/2) + 1 : N
      cshifted_sig(n) = sig(-m + n ); %x(n) = x(-m + n)
   end
end
```

Part C

```
function y = cir_conv(sig1, sig2, N)
     l1 = length(sig1);
     l2 = length(sig2);
     sig1 = [ sig1 zeros(1,N - l1)];%zero padding
     sig2 = [ sig2 zeros(1,N - l2)];%zero padding
     y = zeros(1,N);
     for n = 1 : N
         for m = 1 : N
             j = mod(n-m,N);
             j = j + 1;
             y(n) = y(n) + sig1(m)*sig2(j) ;
         end
     end
end
```

Published with MATLAB® R2020b