# Computer Assignment - 05 - Spring 2019

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## DFT and Circular Convolution -

Compute and compare the eight point circular convolution for the following sequences x1[n] and x2[n] using
(a) the circular convolution definition and
(b) the DFT method.

$x1[n] = (¼)^n$ 0<=n<=7
x2[n] = cos(3pi*n/8) 0<=n<=7

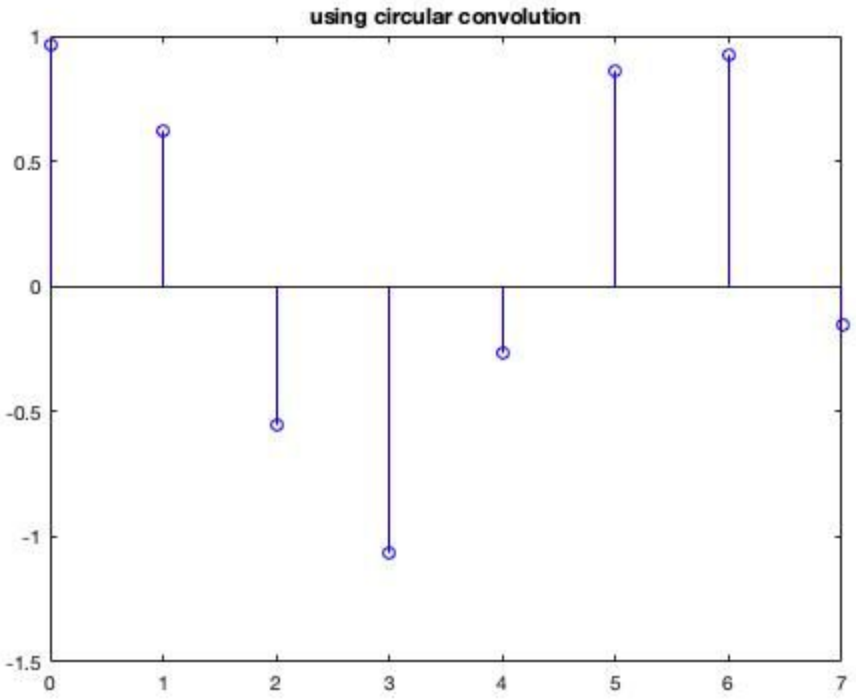
Solution -

```
function y = Rotate(x2,shift_amount)
   l = length(x2);
   y = zeros(1,l);
   y(shift_amount+1:end) = x2(1:l-shift_amount);
   y(1:shift_amount)= x2 (1+l-shift_amount:end);
end

n = 0:7;
x1 = ((1/4).^n);
x2 = cos(3*pi*n/8);
shift_amount = 0;
cirular_conv = zeros(size(n));
for i = 1:length(n)
   rotated = Rotate(x2, shift_amount);
   cirular_conv = cirular_conv + x1(i).*rotated;
   shift_amount = shift_amount + 1;
end
```

```
stem(n,cirular_conv,'blue');
title('using circular convolution')
cirular_conv

X1 = zeros(size(n));
N=8;
for i = 0:N-1
   X1(i+1)=0;
   for j = 0:N-1
      X1(i+1) = X1(i+1) + x1(j+1)*exp(-1i*2*pi*i*j/8);
   end
end

X2 = zeros(size(n));
for i = 0:N-1
   X2(i+1)=0;
   for j = 0:N-1
      X2(i+1) = X2(i+1) + x2(j+1)*exp(-1i*2*pi*i*j/8);
   end
end

Dft_signal = X1.*X2;
Ifft_signal = zeros(size(n));
for i = 0:N-1
   Ifft_signal(i+1)=0;
   for j = 0:N-1
      Ifft_signal(i+1) = Ifft_signal(i+1) +
Dft_signal(j+1)*exp(1i*2*pi*i*j/8);
   end
   Ifft_signal(i+1) = Ifft_signal(i+1)/8;
end

stem(n,real(Ifft_signal),'blue')
```

```
title('using DFT method')
real(Ifft_signal)
```

Output:

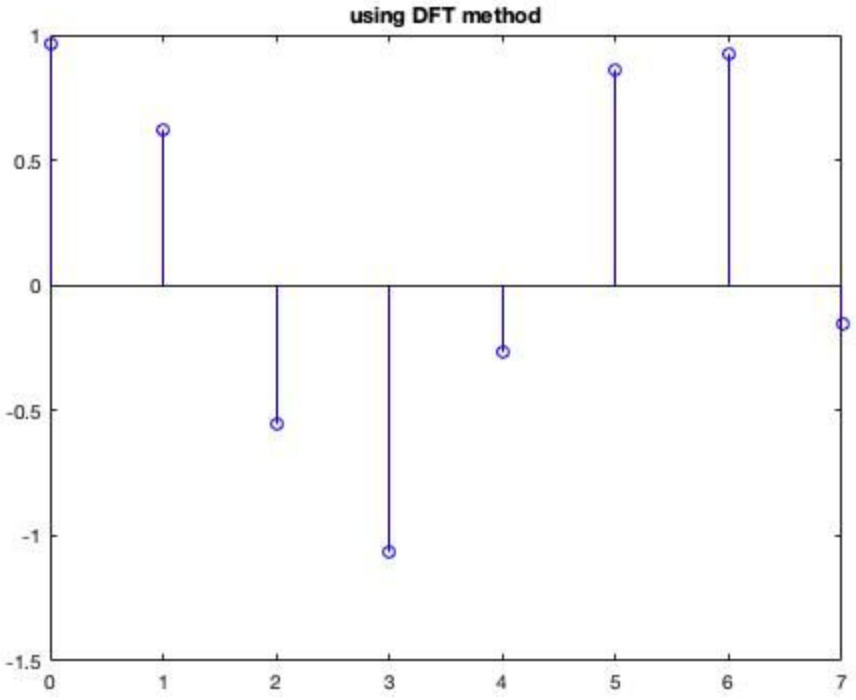



Cirular_conv =

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.9619 | 0.6232 | -0.5513 | -1.0617 | -0.2654 | 0.8575 | 0.9215 | -0.1523 |

Ifft_signal =

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.9619 | 0.6232 | -0.5513 | -1.0617 | -0.2654 | 0.8575 | 0.9215 | -0.1523 |


using DFT method
1
0.5
0
-0.5
-1
-1.5
0
1
2
3
4
5
6
7