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%Program to perform a discrete fourier transform and plot its
    magnitude and
%phase spectra, and then perform the inverse DFT.

close all; %close open figures and windows generated by running MATLAB
code
clear all; %clear the workspace
clc;      %clear the command window

N = 128;      %No. of complex no.s
Fs= 8000;     %Sampling frequency
X = zeros(128); %Initialising variable of DFT
Ts= 1/Fs;     %Sampling time

%Discrete fourier transform
for k = 1:1:128      %No. of samples
    for n = 0:1:N-1  %Time index
        X(k)=X(k)+(cos(2000*pi*n*Ts)+cos(800*pi*n*Ts))*exp(-
j*2*pi*(k-1)*n/N);
    end;
end;
X1 = fftshift(abs(X)); %shift the fft to center of maximum amplitude
f = linspace(-Fs/2,Fs/2,N); %x axis symmetric around central
    frequency

%magnitude plot of DFT
figure(1)      %New figure window
stem(f,X1);    %Discrete plot
xlabel('k');    %Label of x axis
ylabel('X(k)'); %Label of y axis
title('magnitude plot of DFT 14UEC109'); %Title of plot

%phase plot of DFT
figure(2)      %New figure window
stem(f,fftshift(angle(X))); %Discrete plot
xlabel('k');    %Label of x axis
ylabel('\angle X(k)'); %Label of y axis
title('phase plot of DFT 14UEC109'); %Title of plot

%Inverse Discrete Fourier Transform
x1 = zeros(128); %initialising variable of IDFT signal
for n = 1:1:N    %time index
    for k = 1:1:128 %no. of samples
        x1(n)=x1(n)+(X(k)*exp(j*2*pi*(k-1)*(n-1)/N))/N; %IDFT
    end;
end;

k = 1:1:128;      %No. of samples
x0 = cos(2000*pi*k*Ts)+cos(800*pi*k*Ts); %original signal

%IDFT PLOT
figure      %New figure window

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subplot(2,1,1) %Plotted in first section of 2x1 figure
plot(k,x1);    %continuous plot
xlabel('k');    %Label of x axis
ylabel('x1(k)'); %Label of y axis
title('signal obtained from IDFT,14UEC109'); %Title of plot
hold on        %To hold the current plot in the figure window

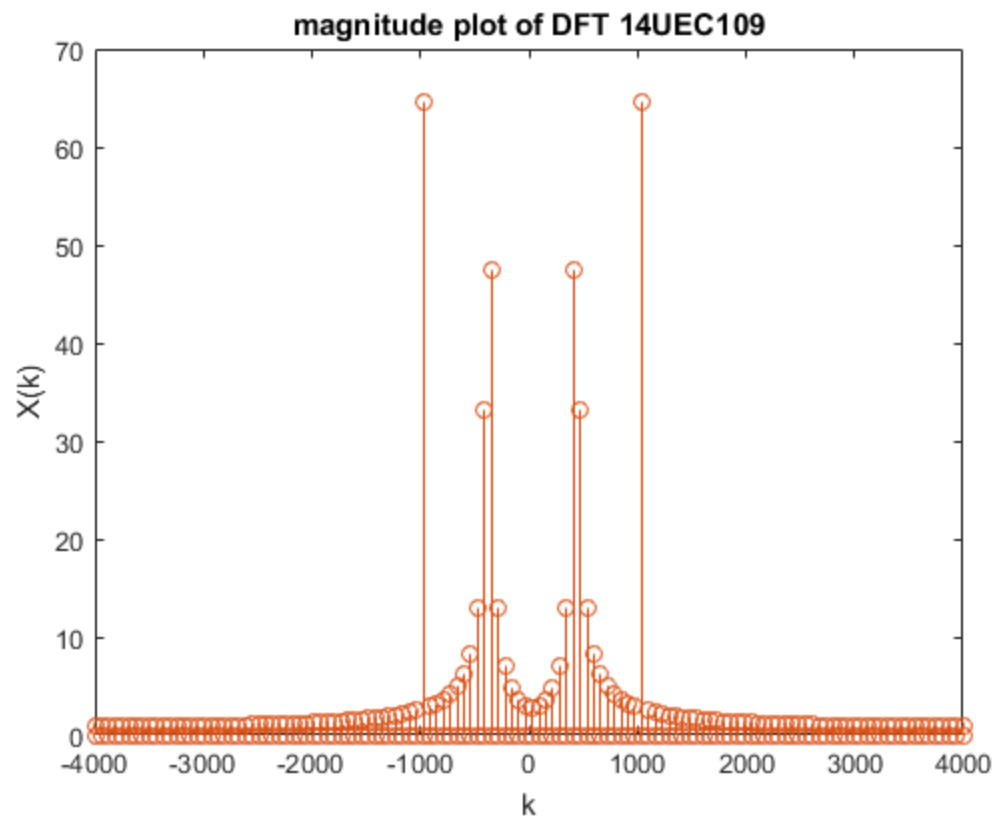
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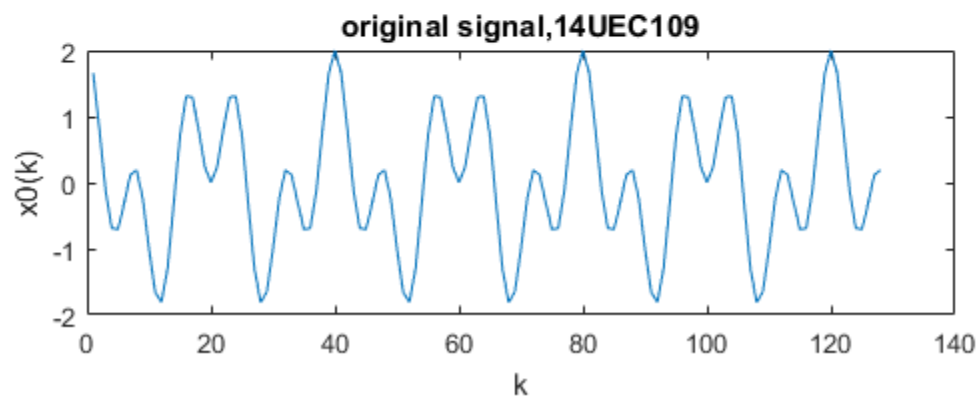
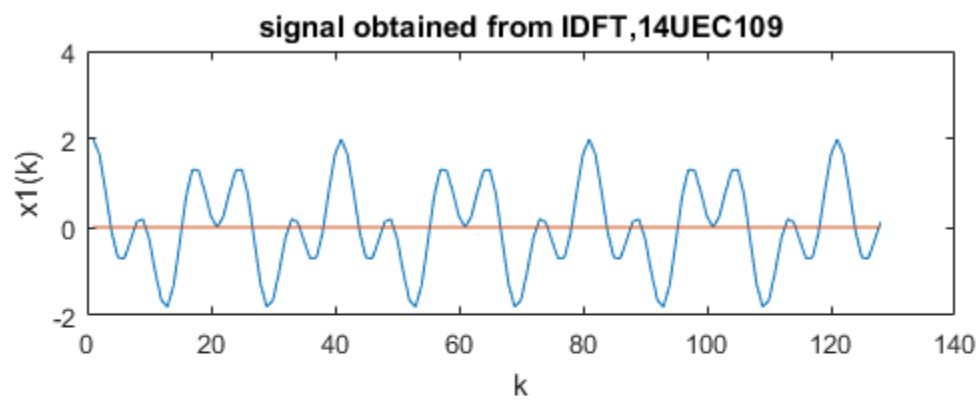
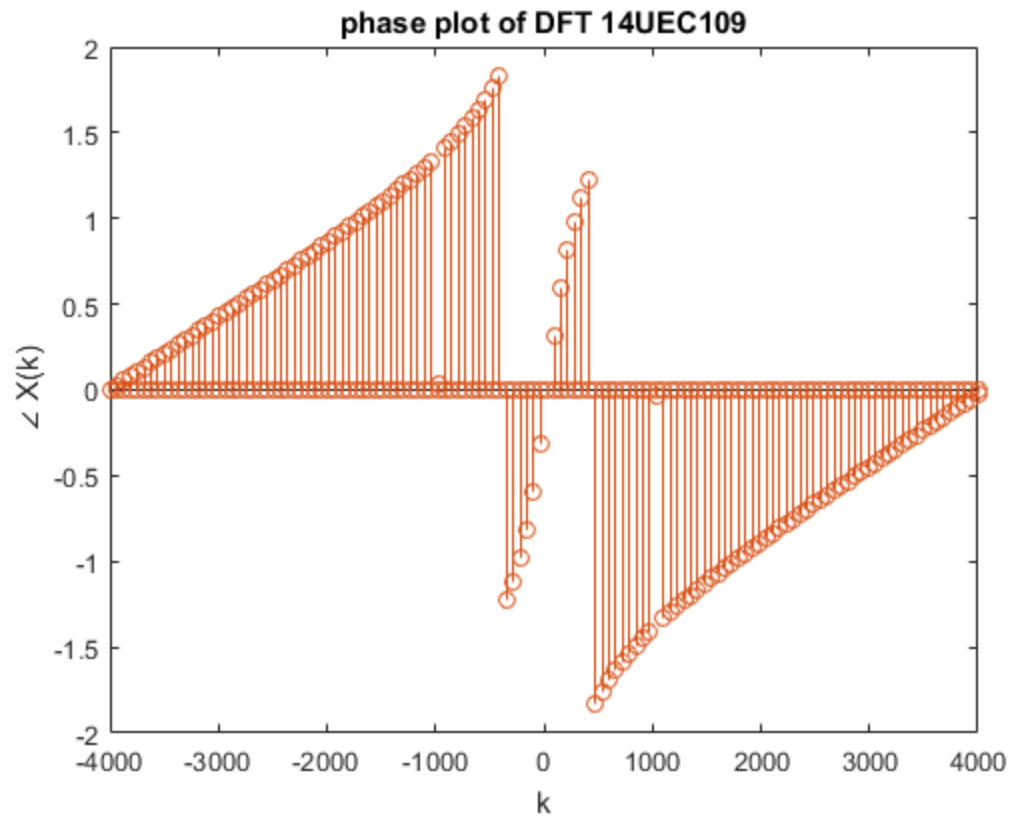
```

%Plot of original signal
subplot(2,1,2) %Plotted in second section of 2x1 figure
plot(k,x0);    %continuous plot
xlabel('k');    %Label of x axis
ylabel('x0(k)'); %Label of y axis
title('original signal,14UEC109'); %Title of plot

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Warning: Imaginary parts of complex X and/or Y arguments ignored





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