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EXPERIMENT 1: Single Sided Amplitude, Phase and Power Spectrum for the specified signal

Initialization

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

Signal Definition Segment

Amplitudes

```
A1=8;  
A2=6;  
A3=7;  
% Frequencies  
fc1=10;  
fc2=40;  
fc3=100;  
% Phase constant  
theta1=pi/2;  
theta2=-2*pi/3;  
theta3=pi/6;  
% Sampling Frequency  
k=32;  
fs=k*max([fc1 fc2 fc3]);  
% Duration  
t=0:1/fs:32767/fs;
```

Signal Generation Segment

```
xn=A1*cos(2*pi*fc1*t+theta1)+A2*cos(2*pi*fc2*t+theta2)+A3*cos(2*pi*fc3*t+theta3);
```

FFT Computation and Specification of Magnitude and Phase of resulting sequence

```
N=6400;
% frequency specification
f=(0:1:(floor(N/2)-1)).*fs/N;
%FFT of signal
Xk=fft(xn,N);
Xkssb=Xk(1:N/2);
Xkssb=Xkssb./(N/2);
%Magnitude specification
Xkssbm=abs(Xkssb);
%Angle Specification
Xkssbp=angle(Xkssb);
Xkssbp=Xkssbp.*(180/pi);
Xkplot=zeros(length(Xkssbp));
c1=find(f==10);
c2=find(f==40);
c3=find(f==100);
Xkplot(c1)=Xkssbp(c1);
Xkplot(c2)=Xkssbp(c2);
Xkplot(c3)=Xkssbp(c3);
%Power Spectral Density
Pssb=(Xkssb.*conj(Xkssb))/2;
```

Plot Generation Segment

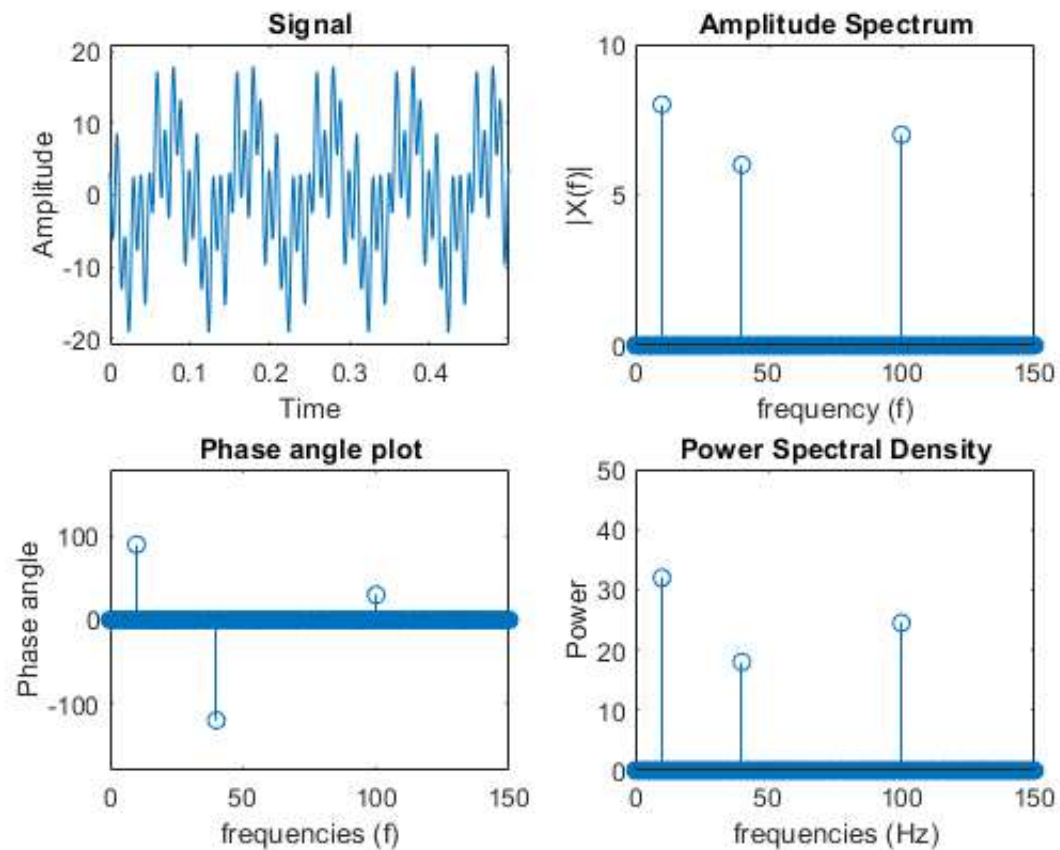
```
figure(1)
subplot(221)
plot(t,xn);
axis([0 0.5 -21 21])
xlabel('Time');
ylabel('Amplitude');
title('Signal');

subplot(222)
stem(f,Xkssbm);
axis([0 150 0 10]);
title('Amplitude Spectrum');
xlabel('frequency (f)');
ylabel('|X(f)|');

subplot(223)
stem(f,Xkplot);
axis([0 150 -180 180]);
title('Phase angle plot');
xlabel('frequencies (f)');
ylabel('Phase angle');

subplot(224)
stem(f,Pssb);
```

```
axis([0 150 0 50]);
title('Power Spectral Density');
xlabel('frequencies (Hz)');
ylabel('Power');
```



EXPERIMENT 2: Time Domain and Single Sided Power Spectral Density Plot of Square Wave of 50% Duty Cycle and 25 Hz Frequency

Initialisation

```
close all
```

Signal Definition Segment

Frequency

```
fc=25;
% Sampling frequency
k2=16;
fs2=k2*fc;
%Duration
t2=0:1/fs2:32767/fs2;
```

Signal Generation Segment

```
xn2=square(2*pi*fc*t2,50);
```

FFT Computation

```
N2=1600;
%frequency
f2=(0:1:(floor(N2/2)-1)).*fs2/N2;
%FFT of signal
Xk2=fft(xn2,N2);
Xkssb2=Xk2(1:N2/2);
Xkssb2=Xkssb2./(N2/2);
%Power Spectral Density
Pssb2=(Xkssb2.*conj(Xkssb2))/2;
```

Plot Generation Segment

```
figure(2)
subplot(121)
plot(t2,xn2);
axis([0 0.1 -2 2])
xlabel('Time');
ylabel('Amplitude');
title('Signal');

subplot(122)
stem(f2,Pssb2);
axis([0 200 0 1]);
title('Power Spectral Density');
xlabel('frequencies (Hz)');
ylabel('Power');
```

