**Irish Mehta- 2017AAPS0295G**

Lab 4

```matlab
clc;
fc=50;%frequency of the carrier

fs=1000;
t=0:1/fs:(1-1/fs);%1 seconds duration
x=5*sin(2*pi*fc*t);%time domain signal (real number)

subplot(2,1,1);plot(t,x);hold on
title('5sin(2*pi*50*t)'); xlabel('t=nT_s'); ylabel('x[n]');


N=1000; %FFT size
X = fft(x,N);
df=fs/N; %frequency resolution

sampleIndex = 0:N-1; %raw index for FFT plot
f=sampleIndex*df; %x-axis index converted to frequencies
subplot(2,1,2); stem(f,abs(X)./500); %x-axis represent frequencies
title('X[f]'); xlabel('frequencies (f)'); ylabel('|X(f)|');
xlim([0 500]);
ylim([0 10])
```
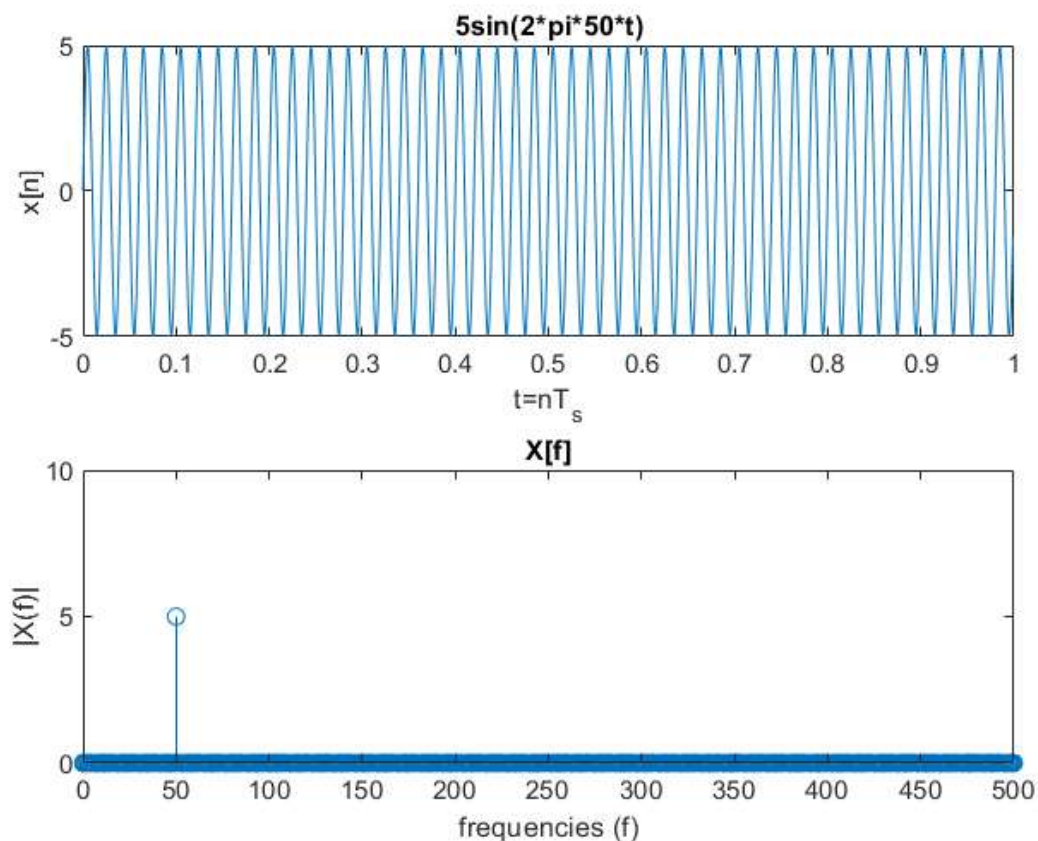


```matlab
noise=6.1*randn(1,length(t));
```

```matlab
signal_noisy = x + noise; % Noise corrupted signal
figure;
subplot(2,1,1);
plot(t,signal_noisy);
title('Noisy signal'); xlabel('t=nT_s'); ylabel('x[n]');

subplot(2,1,2)
N=1000; %FFT size
X = fft(signal_noisy,N);
df=fs/N; %frequency resolution
sampleIndex = 0:N-1; %raw index for FFT plot
f=sampleIndex*df; %x-axis index converted to frequencies
subplot(2,1,2); stem(f,abs(X)); %x-axis represent frequencies
title('X[f]'); xlabel('frequencies (f)'); ylabel('|X(f)|');
xlim([0 500]);
```
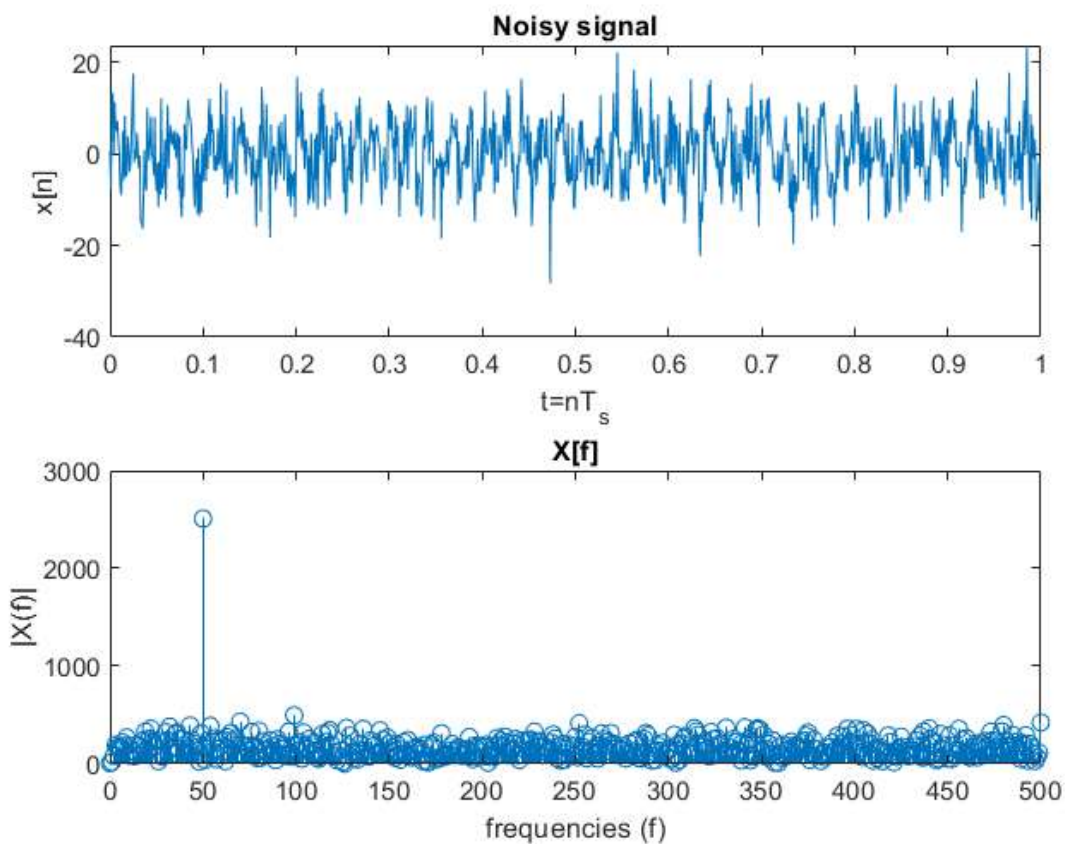


```matlab
% using a moving-average filter
M1 =8;

b = ones(M1,1)/M1;
y = filter(b,1,signal_noisy);
figure;
subplot(2,1,1);
plot(t,y);
title('Filtered signal'); xlabel('t=nT_s'); ylabel('x[n]');

subplot(2,1,2);
N=1000; %FFT size;
X = fft(y,N);
```

```matlab
df=fs/N; %frequency resolution
sampleIndex = 0:N-1; %raw index for FFT plot
f=sampleIndex*df; %x-axis index converted to frequencies
subplot(2,1,2); stem(f,abs(X)./500); %x-axis represent frequencies
title('X[f]'); xlabel('frequencies (f)'); ylabel('|X(f)|');
xlim([0 500]);
ylim([0 10]);
```