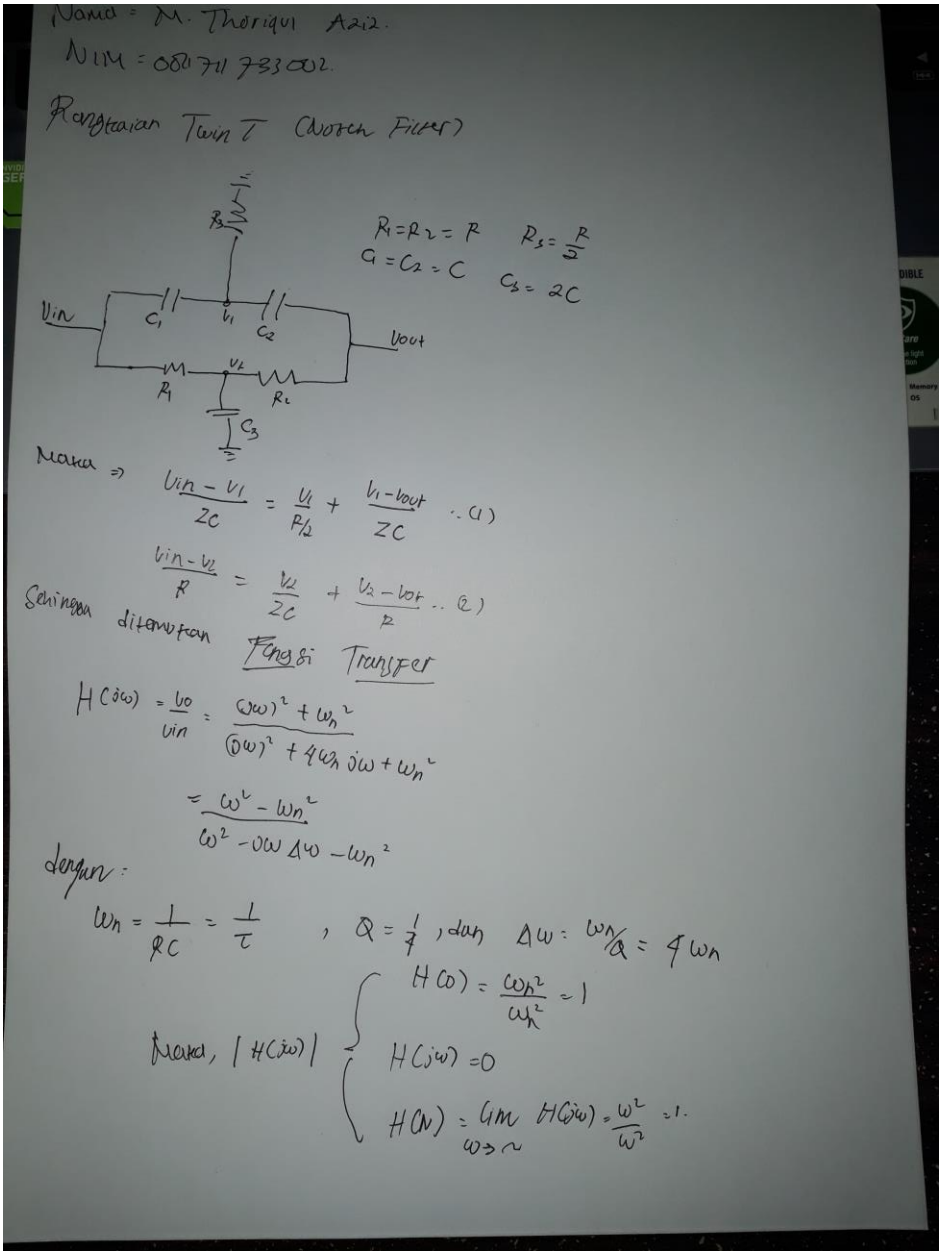
**Tugas Pengolahan Sinyal**

**Notch Filter**

1. Buat Fungsi Transfer Notch Filter

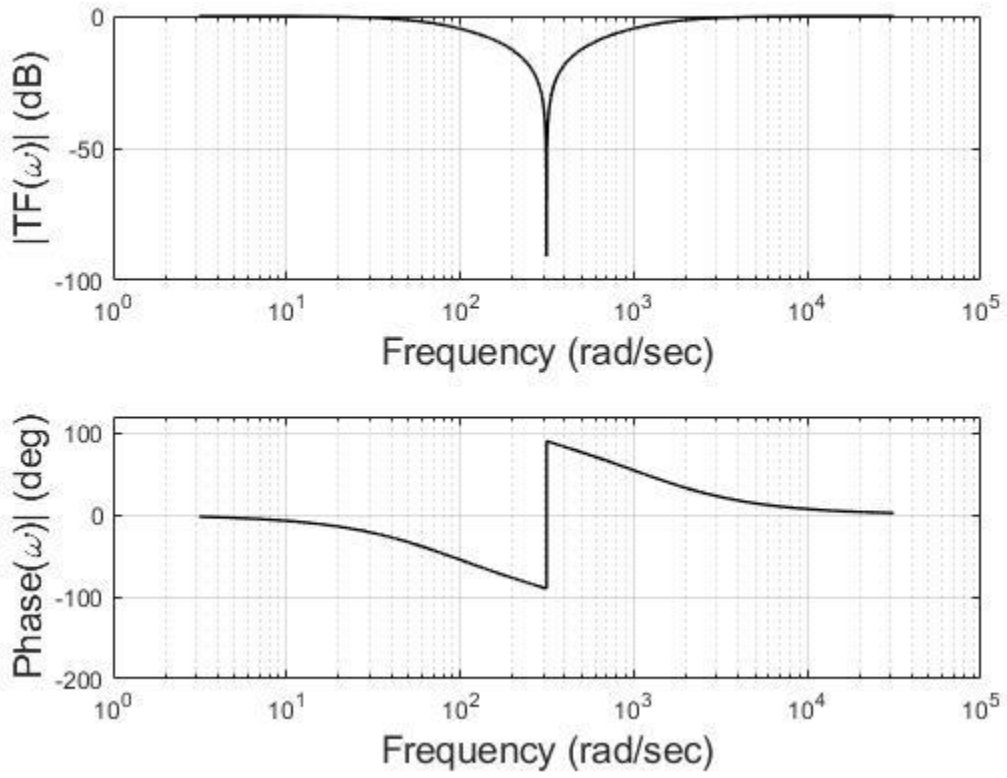



2. Buat Bode Plot dari Notch Filter pada frekuensi 50 Hz
   Code matlab :

```
Editor - D:\Tugas\Pengolahan Sinyal\tugas\BodePlotNotchFilter.m
tugasNo19.m | BodePlotNotchFilter.m | Ex6_10.m | buatPLI.m | Ex6_14.m

1 -       clear all; close all;
2 -    w = 3.141593:.1:31415.93;          % Define frequency vector
3 -    wn = 314.1593;                     % Define wn
4 -    delta = 4*wn;              % Define delta
5 -    TF = (w.^(2)-wn.^(2))./(w.^(2)-j*w*delta-wn.^(2));  % Transfer function
6 -    Mag = 20*log10(abs(TF));        % Magnitude in dB
7 -    Phase = angle(TF)*360/(2*pi);   % Phase in deg.
8 -    subplot(2,1,1);
9 -      semilogx(w,Mag,'k','LineWidth',1);            % Plot as log frequency
10 -       xlabel('Frequency (rad/sec)','FontSize',14);
11 -       ylabel('|TF({\it\omega})| (dB)','FontSize',14);
12 -       grid on;
13 -   subplot(2,1,2);
14 -     semilogx(w,Phase,'k','LineWidth',1);
15 -       xlabel('Frequency (rad/sec)','FontSize',14);
16 -       ylabel('Phase({\it\omega})| (deg)','FontSize',14);
17 -       ylim([-200 120]); grid on;
```

Hasilnya :




3. Cobalah untuk memfilter sinyal biopotensial yang diberi noise PLI ( 50Hz) kemudian gunakan fungsi transfer notch filter untuk memfilter noise tersebut
   Code Matlab:

Editor - D:\Tugas\Pengolahan Sinyal\tugas\buatPLI.m

tugasNo19.m | BodePlotNotchFilter.m | Ex6_10.m | buatPLI.m | Ex6_14.m

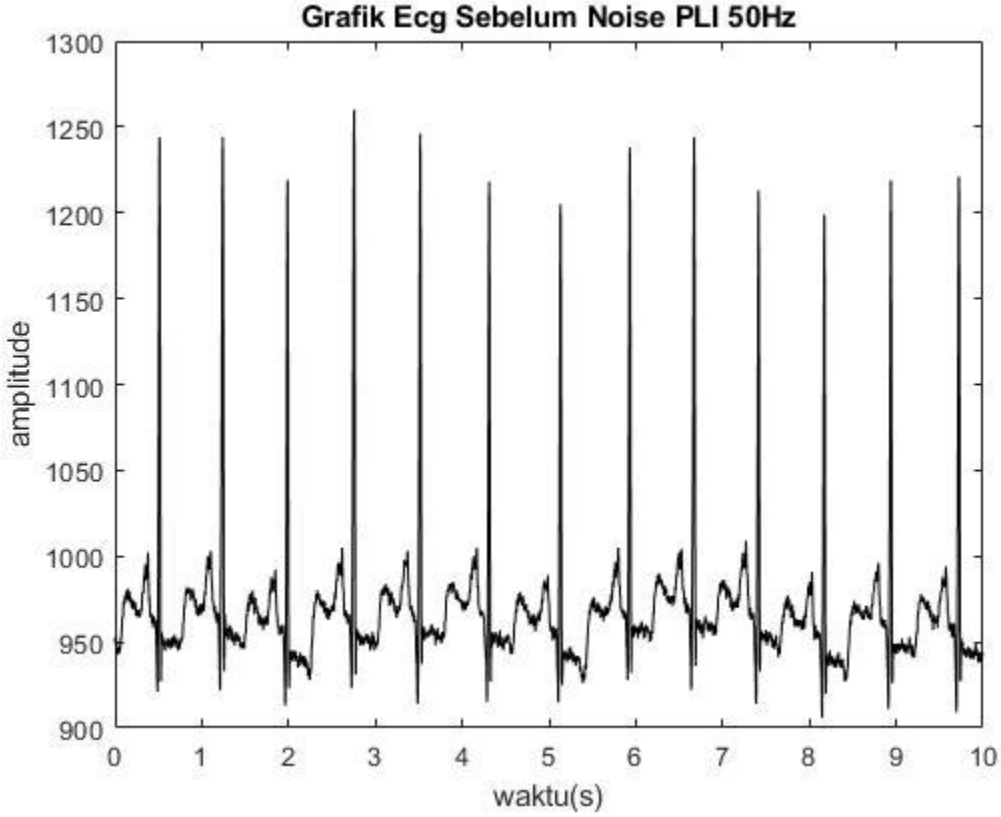
```
clc
clear
load('100m (0).mat')
N =length(val);
fs=360;
t=0:1/fs:(N-1)/fs;
figure(1)
plot(t,val,'k')
title('Grafik Ecg Sebelum Noise PLI 50Hz')
xlabel('waktu(s)')
ylabel('amplitude')
%%%%
S=sin(2*pi*50*t);
noise= val+sin(2*pi*50*t);
B=abs(fft(noise));
mag=B.^2;
frek=0:fs/N:(fs/2)-fs/N;
figure(2)
subplot(2,1,1)
plot(t,noise,'k')
title('Grafik Ecg Sebelum Noise PLI 50Hz')
xlabel('waktu(s)')
ylabel('amplitude')
subplot(2,1,2)
plot(frek,mag(1:N/2),'k')
title('Grafik Ecg Sebelum Noise PLI 50Hz')
xlabel('frekuensi(hz)')
ylabel('magnitude')
xlim([49 51])
ylim([0 5e5]);
%%%%%%%%%
frekl=(0:N-1)*fs/N;
```

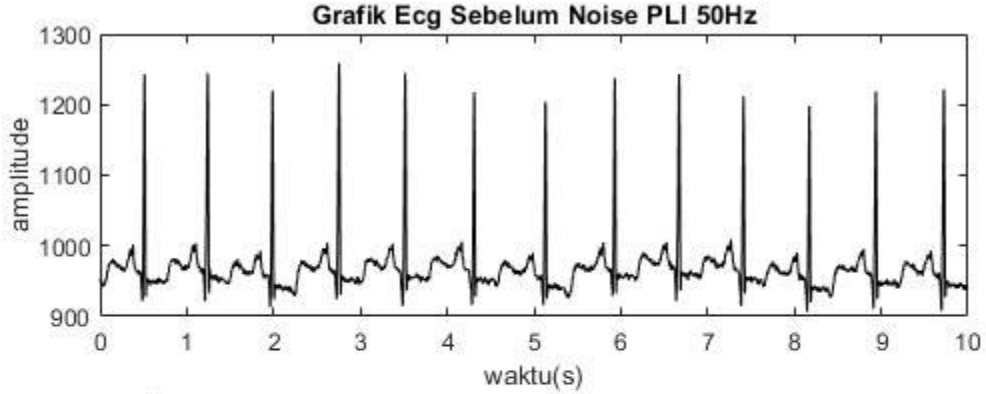
Editor - D:\Tugas\Pengolahan Sinyal\tugas\buatPLI.m

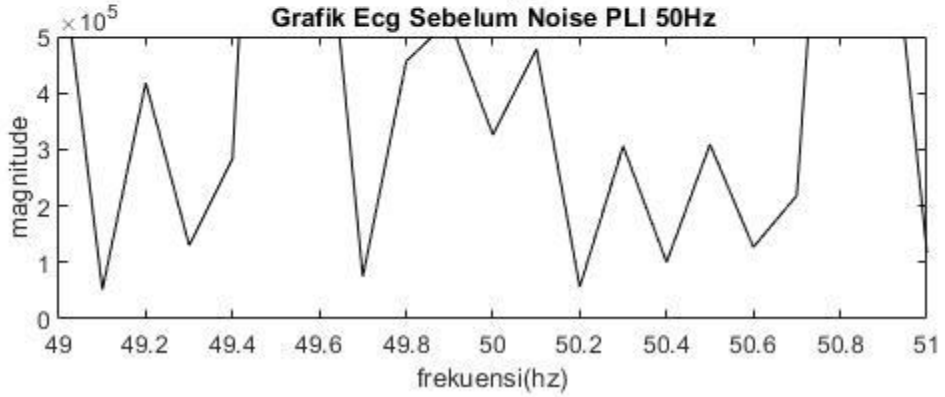
tugasNo19.m | BodePlotNotchFilter.m | Ex6_10.m | buatPLI.m | Ex6_14.m

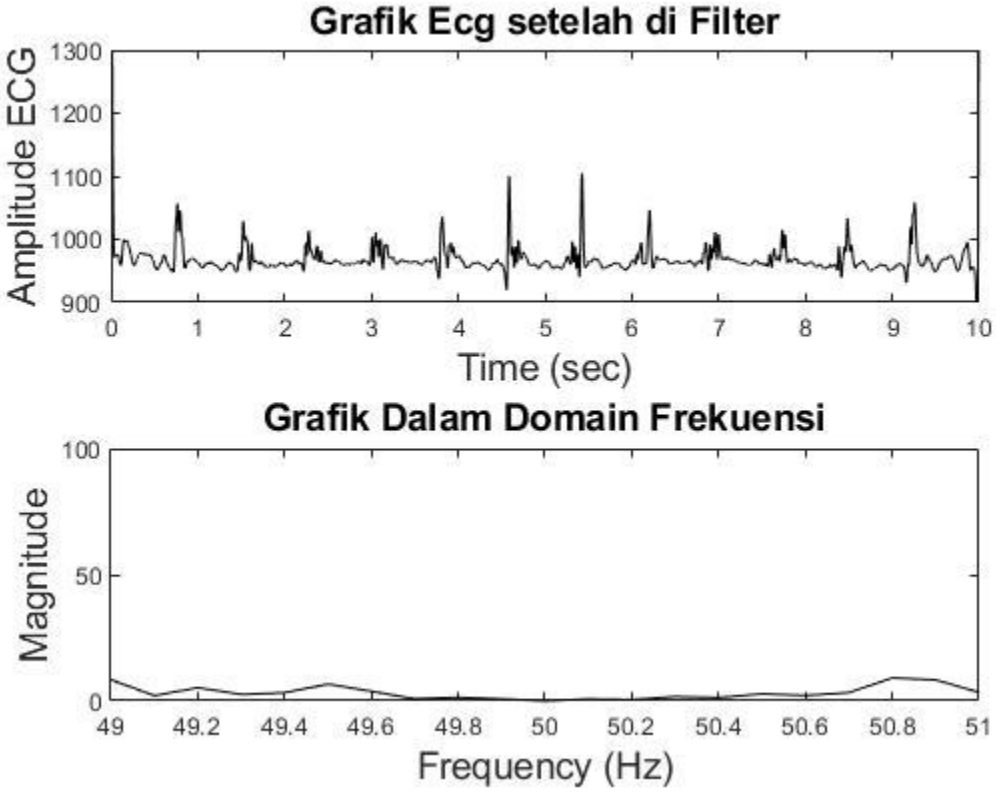
```
ylabel('amplitude')
subplot(2,1,2)
plot(frek,mag(1:N/2),'k')
title('Grafik Ecg Sebelum Noise PLI 50Hz')
xlabel('frekuensi(hz)')
ylabel('magnitude')
xlim([49 51])
ylim([0 5e5]);
%%%%%%%%%
frekl=(0:N-1)*fs/N;
w=2*pi*frekl;
wn=2*pi*50;
delta = 4*wn;
TF = (w.^(2)-wn.^(2))./(w.^(2)-j*w*delta-wn.^(2));
Vout=B.*TF;
vout = real(ifft(Vout));
nf = fix(length(Vout)/2);
figure(3)
    subplot(2,1,1)
    plot(t,vout,'k');
    xlabel('Time (sec)','FontSize',14');
    ylabel ('Amplitude ECG','FontSize',14');
    title('Grafik Ecg setelah di Filter','FontSize',14);
    xlim([0 10])
    ylim([900 1300]);
   subplot(2,1,2);
    plot(frekl(1:nf),abs(Vout(1:nf)),'k');
    xlabel('Frequency (Hz)','FontSize',14');         % Label plot axes
    ylabel ('Magnitude','FontSize',14');
    title('Grafik Dalam Domain Frekuensi','FontSize',14);
    xlim([49 51])
    ylim([0 100])
```

Hasil Gambar:


Grafik Ecg Sebelum Noise PLI 50Hz
amplitude
waktu(s)
1300
1250
1200
1150
1100
1050
1000
950
900
0
1
2
3
4
5
6
7
8
9
10


Grafik Ecg Sebelum Noise PLI 50Hz
amplitude
waktu(s)
1300
1200
1100
1000
900
0
1
2
3
4
5
6
7
8
9
10


Grafik Ecg Sebelum Noise PLI 50Hz
×10^5
magnitude
frekuensi(hz)
5
4
3
2
1
0
49
49.2
49.4
49.6
49.8
50
50.2
50.4
50.6
50.8
51


Grafik Ecg setelah di Filter
Amplitude ECG
1300
1200
1100
1000
900
0
1
2
3
4
5
6
7
8
9
10
Time (sec)
Grafik Dalam Domain Frekuensi
Magnitude
100
50
0
49
49.2
49.4
49.6
49.8
50
50.2
50.4
50.6
50.8
51
Frequency (Hz)