VE216
Introduction to Signals and Systems

PRELAB 2 ATTACHED PAGES

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3.1 (b)

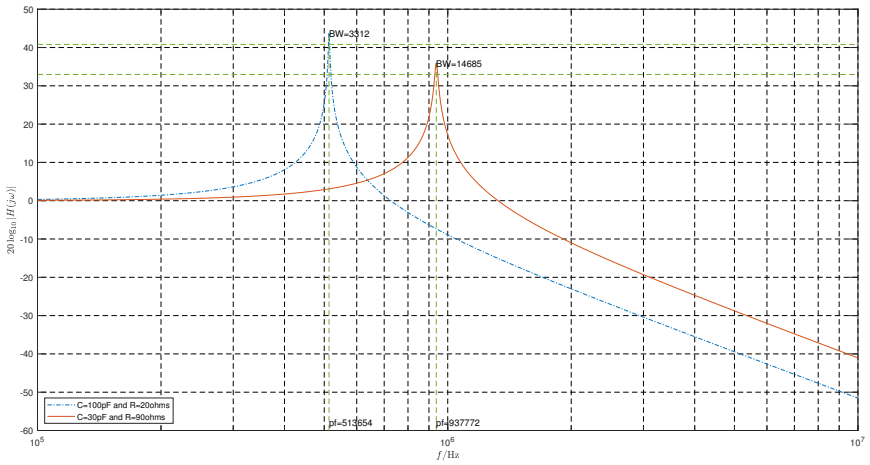

Figure 1. 3.1(b).

MATLAB Code:

```
R=20;L=960e-6;C=100e-12;
freq=logspace(5,7,10000);
H1=20*log10(abs(1./(-L*C.*(2*pi.*freq).^2+R*C*1i*2*pi.*freq+1)));
p=semilogx(freq,H1);
p.LineStyle='-.';
grid on;
hold on;
R=90;C=30e-12;
H2=20*log10(abs(1./(-L*C.*(2*pi.*freq).^2+R*C*1i*2*pi.*freq+1)));
semilogx(freq,H2);
[m1,index1]=max(H1);
pf1=freq(index1);
l1=line([pf1,pf1],[-60,m1],'linestyle','--');
l1.Color='#77AC30';
text(pf1,-58,strcat('pf=',num2str(pf1,6)));
[m2,index2]=max(H2);
pf2=freq(index2);
```

```
l2=line([pf2,pf2],[-60,m2],'linestyle','--');
l2.Color='#77AC30';
text(pf2,-58,strcat('pf=',num2str(pf2,6)));
db1=m1-3;
l3=line([1e5,1e7],[db1,db1],'linestyle','--');
l3.Color='#77AC30';
H11=H1(1:index1-1);
[~,index11]=min(abs(H11-db1));
H12=H1(index1+1:length(H1));
[~,index12]=min(abs(H12-db1));
bw1=-freq(index11)+freq(index12+index1);
text(freq(index1),m1,strcat('BW=',num2str(bw1,5)));
db2=m2-3;
l4=line([1e5,1e7],[db2,db2],'linestyle','--');
l4.Color='#77AC30';
H21=H2(1:index2-1);
[~,index21]=min(abs(H21-db2));
H22=H2(index2+1:length(H2));
[~,index22]=min(abs(H22-db2));
bw2=-freq(index21)+freq(index22+index2);
text(freq(index2),m2,strcat('BW=',num2str(bw2,5)));
qf1=pf1/bw1;
qf2=pf2/bw2;
hold off;
ax=gca;
ax.GridLineStyle='--';
ax.GridColor='k';
ax.GridAlpha=1;
ax.MinorGridLineStyle='--';
ax.MinorGridColor='k';
ax.MinorGridAlpha=1;
axis([1e5 1e7 -60 50]);
legend('C=100pF and R=20ohms','C=30pF and R=90ohms','Location','
    southwest');
xlabel('$$f/\mathrm{Hz}$$','Interpreter','latex');
ylabel('$$20\log_{10}|H(j\omega)|$$','Interpreter','latex');
```

3.2 (c)

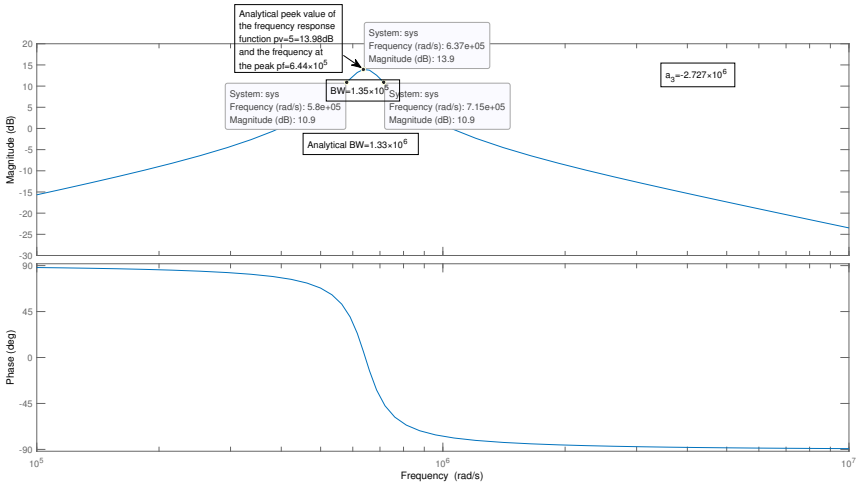

Figure 2. 3.2(c)

From the figure we can see that the analytical value of the peak value of the frequency response function and the frequency at the peak are very closed to the "exact" values read off my plot, however, the analytical value of BW_{3dB} is not very closed to the "exact" value read off my plot.

MATLAB Code:

```
R1=1e3;
R3=1e4;
R2=120;
C=1.5e-9;
sys=tf([R2*R3*C/(R1+R2)  0],[R1*R2*R3*C^2/(R1+R2)  2*R1*R2*C/(R1+R2)
    1]);
fb=bandwidth(sys);
[mag,phase,wout]=bode(sys);
[gpeak,fpeak]=getPeakGain(sys);
```