Christian Garcia

ELEN 50L

Wednesday 2:15 PM

2 December 2020

Project 2 Report

1.
$$A = \frac{R_2}{R_1} \frac{1}{\sqrt{(R_2 wC)^2 + 1}}$$

1. $A = 1$
   $w = 0$
   $$1 = \frac{R_2}{R_1} \frac{1}{\sqrt{(0)^2 + 1}}$$
   $$\frac{R_2}{R_1} = 1$$

   $R_1 = 1 k\Omega$
   $R_2 = R_1$
   $R_2 = 1 k\Omega$

2. $A = 0.7$
   $w = 1000$
   $$0.7 = 1 \frac{1}{\sqrt{(1000^2 C)^2 + 1}}$$
   $R_1 = 1 k\Omega$ $0.49((1000^2 C)^2 + 1) = 1$
   $R_2 = 1 k\Omega$ $C = 1 NF$

3. $R_1 = 1 k\Omega$ $C = 1 NF$
   $R_2 = 1 k\Omega$

3.
$$A = \frac{R_2}{R_1} \frac{\sqrt{(R_1 wC_1)^2 + 1}}{\sqrt{(R_2 wC_2)^2 + 1}}$$
   $A = 10$ $$10 = \frac{10}{1} \frac{\sqrt{(1000(1)(1))^2 + 1}}{\sqrt{(10000(1)(C_2))^2 + 1}}$$
   $w = 1$
   $R_1 = 1 k\Omega$

$A = 10$ $$10 = \frac{R_2}{R_1} \frac{\sqrt{1}}{\sqrt{1}}$$ $R_2 = 10 k\Omega$ $(10000 C_2)^2 = (1000 (1 \times 10^{-6}))^2$
$w = 0$ $C_1 = 1 NF$ $1 \times 10^{10} C_2 = 0.000001$
$R_1 = 1 k\Omega$ $R_2 = 10 k\Omega$ $C_2 = 0.1 NF$

4.
$$A = \frac{R_2}{R_1} \frac{\sqrt{(R_1 wC_1)^2 + 1}}{\sqrt{(R_2 wC_2)^2 + 1}}$$

1. $A = 0.01$ $$0.01 = \frac{R_2}{100 k\Omega}$$
   $w = 0$
   $R_1 = 100 k\Omega$ $R_2 = 1 k\Omega$
   $C_1 = 1 NF$

2. $A = 0.9$ $$0.9 = 100 \frac{\sqrt{(1000(10000)(0.00000 1))^2 + 1}}{\sqrt{((1000)(10000) C_2)^2 + 1}}$$
   $w = 10000$
   $R_1 = 100 k\Omega$ $(1 + 10^{14}) C_2^2 = 111.11 (10^6 + 1)$
   $C_1 = 1 NF$ $C_2 = 1.1 NF$
   $R_2 = 1 k\Omega$

```
>> ELEN50Project21

A0 =

     1

A1000 =

     0.7071

A0 =

     10

A10000 =

     10

A0 =

     0.0100

A10000 =

     0.9054
```


Figure 1

Figure 2

Figure 2
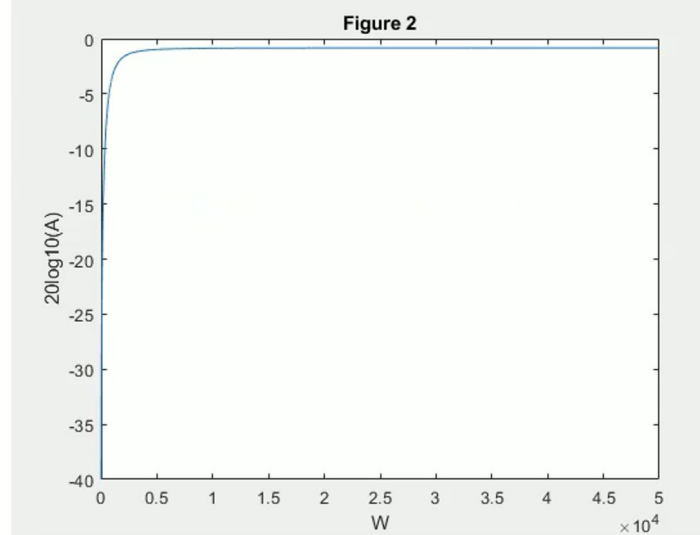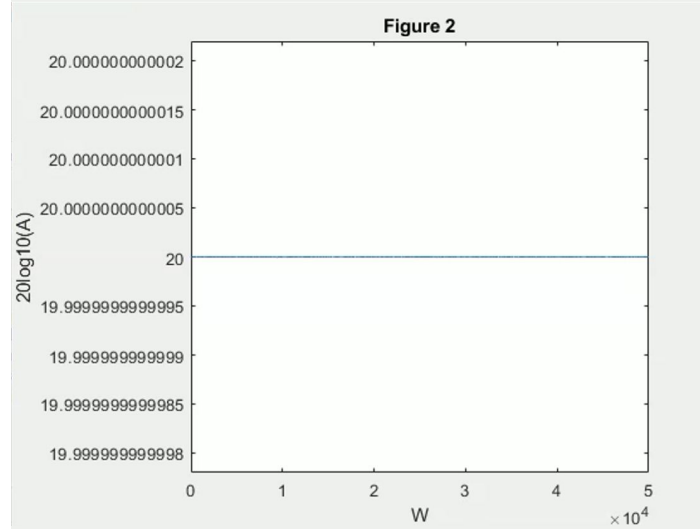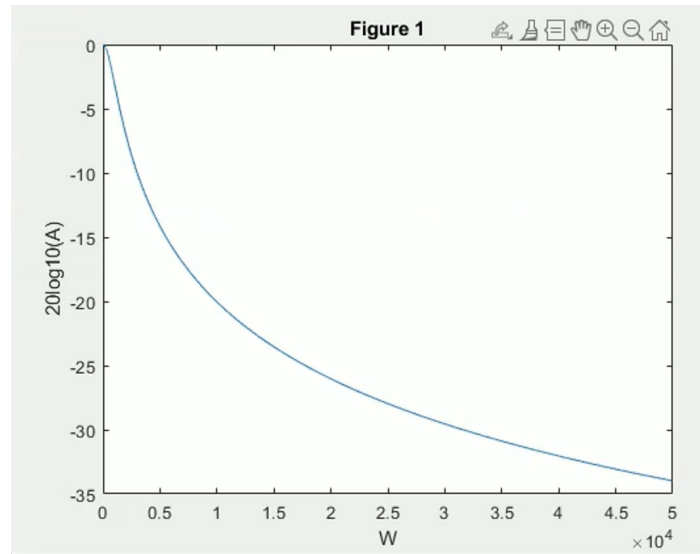
freq_meas	Vin	Vout	F(rad/s)	A(w)	20logA(w)
1	1	0.926629	6.28	0.926629	-0.661882243
20	1	0.926379	125.6	0.926379	-0.66422597
40	1	0.921643	251.2	0.921643	-0.708745422
60	1	0.911019	376.8	0.911019	-0.809451308
80	1	0.885252	502.4	0.885252	-1.058661668
100	1	0.84537	628	0.84537	-1.459063364
200	1	0.620915	1256	0.620915	-4.139356968
300	1	0.448672	1884	0.448672	-6.961420647
400	1	0.337074	2512	0.337074	-9.445494905
500	1	0.261785	3140	0.261785	-11.64110483
600	1	0.208002	3768	0.208002	-13.63864978
700	1	0.168945	4396	0.168945	-15.44509314
800	1	0.140017	5024	0.140017	-17.07638464
900	1	0.117714	5652	0.117714	-18.58343765
1000	1	0.10066	6280	0.10066	-19.94286148
2000	1	0.063713	12560	0.063713	-23.9154389
3000	1	0.035957	18840	0.035957	-28.884331
4000	1	0.023482	25120	0.023482	-32.58529833
5000	1	0.0172	31400	0.0172	-35.28943106

Figure 1
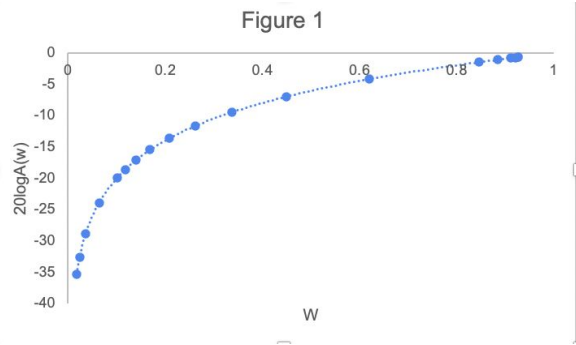
freq_meas	Vin	Vout	F(rad/s)	A(w)	20logA(w)
1	1	1	6.28	1	0
20	1	1	125.6	1	0
40	1	1	251.2	1	0
60	1	1	376.8	1	0
80	1	1	502.4	1	0
100	1	1	628	1	0
200	1	1	1256	1	0
300	1	1	1884	1	0
400	1	1	2512	1	0
500	1	1	3140	1	0
600	1	1	3768	1	0
700	1	1	4396	1	0
800	1	1	5024	1	0
900	1	1	5652	1	0
1000	1	1	6280	1	0
2000	1	1	12560	1	0
3000	1	1	18840	1	0
4000	1	1	25120	1	0
5000	1	1	31400	1	0

freq_meas	Vin	Vout	F(rad/s)	A(w)	20logA(w)
1	1	0.0129	6.28	0.0129	-37.78820579
20	1	0.126207	125.6	0.126207	-17.97833113
40	1	0.241691	251.2	0.241691	-12.33479043
60	1	0.348283	376.8	0.348283	-9.161354466
80	1	0.440904	502.4	0.440904	-7.113119222
100	1	0.520132	628	0.520132	-5.677728527
200	1	0.737313	1256	0.737313	-2.646962175
300	1	0.862024	1884	0.862024	-1.289612852
400	1	0.898187	2512	0.898187	-0.932664701
500	1	0.912271	3140	0.912271	-0.797522612
600	1	0.920111	3768	0.920111	-0.723195545
700	1	0.922273	4396	0.922273	-0.702810107
800	1	0.924688	5024	0.924688	-0.680095567
900	1	0.924779	5652	0.924779	-0.679240817
1000	1	0.926803	6280	0.926803	-0.660251382
2000	1	0.907834	12560	0.907834	-0.839871124
3000	1	0.901421	18840	0.901421	-0.901446572
4000	1	0.877561	25120	0.877561	-1.134453713
5000	1	0.852373	31400	0.852373	-1.387406311

Figure 2 - 2

Circuit 1

C1
1µF

R1
1kΩ

V4
2V

XSC1

V1 R2 1kΩ
0.707Vrms
5000Hz
0°

LM741CH

V3
2V

Circuit 2

C3
0.1µF

R4
V6 10kΩ
2V

XSC3

C2
1µF
R3
1kΩ

V2
0.707Vrms
1Hz
0°

LM741CH

V5
2V

Circuit 3

C5
1.1µF

R6
V9 1kΩ
2V

XSC2

C4
1µF
R5
100kΩ

V7
0.707Vrms
5000Hz
0°

LM741CH

V8
2V