ECE 207 **Lab Work 8** **Due October 7th**

Names ____

Objectives:

1) Design an active low-pass filter with desired LF gain and break frequency.
2) Predict magnitude response with hand-drawn Bode plot.
3) Compare predictions to MATLAB simulation and laboratory measurements
4) Compare predictions to laboratory measurements.

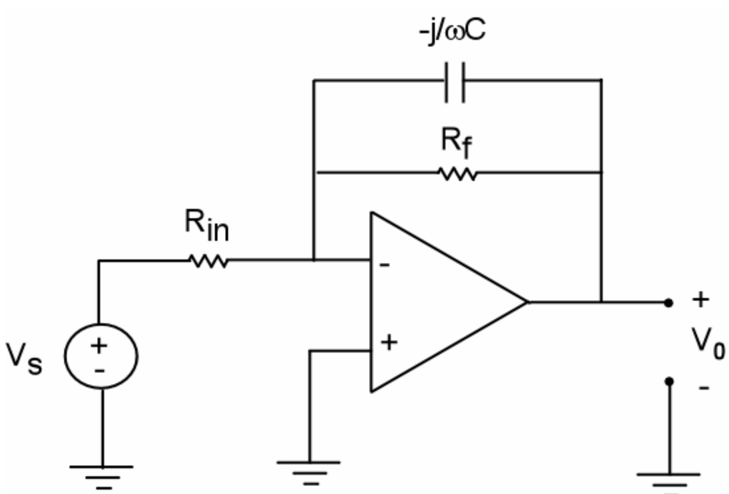
Deliverables

1) Page with detailed design calculations
2) Hand-drawn straight-line Bode magnitude plot response predicted from model.
3) MATLAB-generated Bode magnitude plot.
4) Laboratory measurements of V_o/V_s.
5) Comparison of experimental data to calculated values ***AND*** to simulation (plot laboratory data on ***both*** on hand-drawn plot ***AND*** on MATLAB-generated plot).

Procedure

1. Using resistors and capacitors in your lab kit, design an active low-pass filter with the |LF gain| ≅ 7.5 and f_b ≅ 1060 Hz.

   Note for op-amp circuits, R must be 1 KΩ or above.



2. Measure R_{in} = _________, R_f = _________, and C = _________. Use these measured values when calculating model predictions and in producing MATLAB-generated plots.

3. Measure the ***amplitude*** of V_0 for the frequencies indicated below. Adjust amplitude of V_s = 1V (2V peak-to-peak).

f (Hz)	**106**	**530**	**1060**	**2120**	**10600**
V_o					

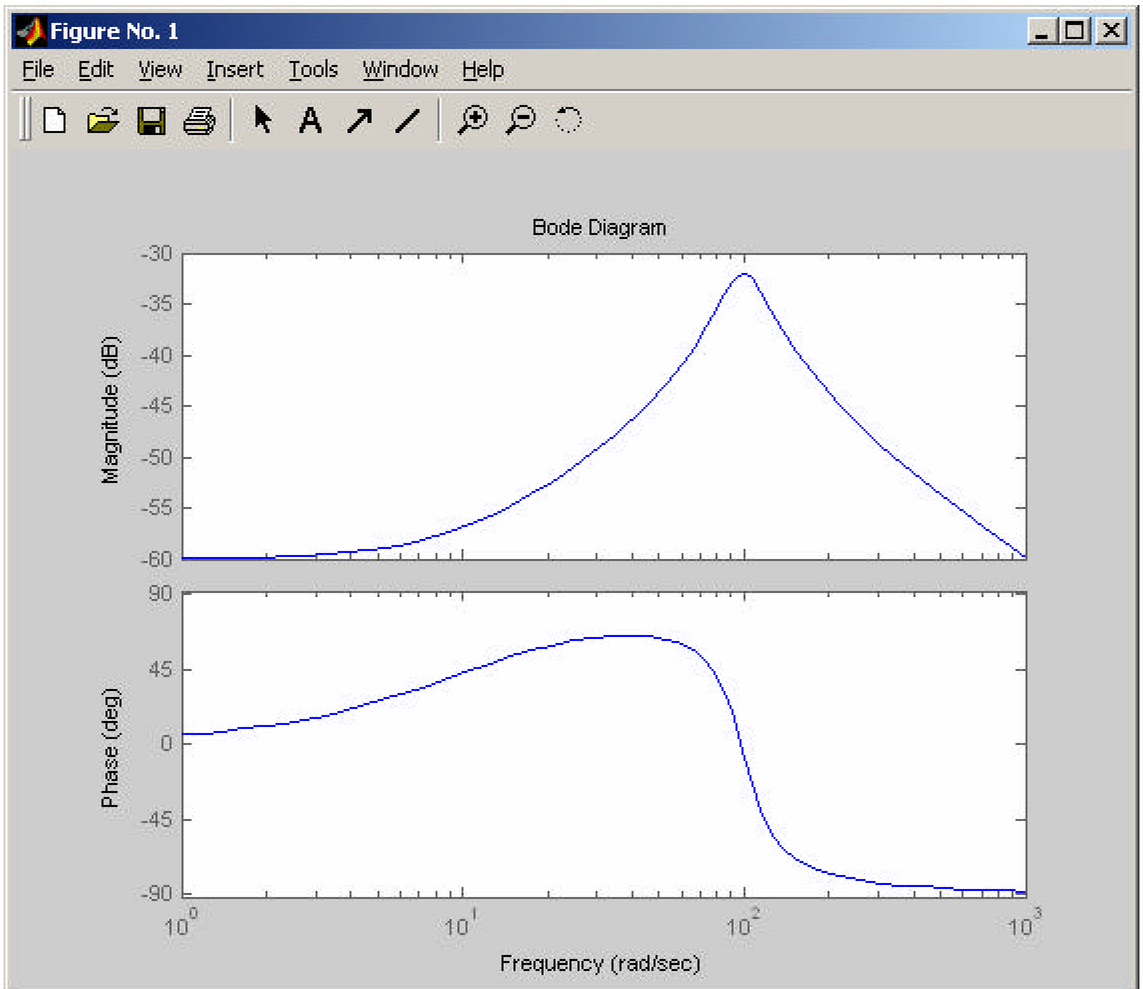
MATLAB Example 1

$$H(s) = \frac{s + 10}{s^2 + 40s + 10000}$$

The MATLAB code for the above transfer function is

```
>> n=[1 10];
>> d=[1 40 10000];
>> h=tf(n,d);
>> bode(h)
```

The resulting plot is shown below



MATLAB Example 1

MATLAB m-file for a low-pass filter with a transfer function (LP gain=10, ω_b=100 r/s.)

$$TF = \frac{10}{\frac{s}{100} + 1}$$