**Laboratory Report Cover Sheet   
DeVry University  
College of Engineering and Information Sciences**

**Course Number:** ECET350

**Professor:**

**Laboratory Number:** 1

**Laboratory Title:** Sallen-Key Active Filter Design

**Submittal Date:** Click here to enter a date.

**Objectives:**

* Design and simulate a Butterworth, low-pass Sallen-Key active filter.
* Construct and test the designed Butterworth, low-pass Sallen-Key active filter.

**Results: Summarize your results in the context of your objectives.**

**Conclusions: What can you conclude about this lab based on your results?**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***Student:*** |  |  |  |  |  |
|  | Name |  | Program |  | Signature |

**Observations, Measurements, and Calculations**

**Step 1**

1.

radians/sec radians/sec

2.

3.

Roll-off rate:

4. Record your measured response values from the multisim simulation in Table 1.

|  |  |  |
| --- | --- | --- |
| Meas. | (dB)  Meas. | Meas. |
|  |  |  |

Table 1:

Paste your multisim filter schematic in the space provide.

Paste the steady state frequency response from the bode-plotter here in the space provided.

**Step 2**

Record the measured output of your filter voltage in Table 4, and then calculate and record the dB gain in the adjacent column. You may also copy your Excel data table of filter response measurements instead of completing this table.

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency  (Hz) | Vin  (peak to peak) | Measured Filter Vout  (peak to peak) | Calculated Filter Gain 20 log 10(Vout/Vin)  (dB) |
| 300 |  |  |  |
| 600 |  |  |  |
| 900 |  |  |  |
| 1200 |  |  |  |
| 1500 |  |  |  |
| 1800 |  |  |  |
| 2100 |  |  |  |
| 2400 |  |  |  |
| 2700 |  |  |  |
| 3000 |  |  |  |
| 3300 |  |  |  |
| 3600 |  |  |  |
| 3900 |  |  |  |
| 4200 |  |  |  |
| 4500 |  |  |  |
| 4800 |  |  |  |
| 5100 |  |  |  |
| 5400 |  |  |  |
| 5700 |  |  |  |
| 6000 |  |  |  |
| 6300 |  |  |  |
| 6600 |  |  |  |
| 6900 |  |  |  |
| 7200 |  |  |  |
| 7500 |  |  |  |
| 7800 |  |  |  |
| 8100 |  |  |  |
| 8400 |  |  |  |
| 8700 |  |  |  |
| 9000 |  |  |  |
| 9300 |  |  |  |
| 9600 |  |  |  |
| 9900 |  |  |  |

Table 4: Filter Output Measurements and Calculations

5. Paste your Excel graph of the Butterworth, low-pass filter response in the space provided.

**Sallen-Key Low-Pass Filter Analysis Questions**

Using the measured filter output voltage and calculated dB answers in Table 4, answer the questions below, and record your answers in the Week 1 iLab Cover Report.

Note: A second order, low-pass filter theoretically has a roll-off rate of 40 dB per decade, which translates to a roll-off rate of 12 dB per octave. A decade is a frequency 10 times higher than a lower frequency. An octave is a frequency two times higher than a lower frequency.

1. What was the average dB per octave attenuation of your filter?
2. What was the average dB per decade attenuation of your filter? This answer will need to be calculated since a full decade of frequency response measurements was not taken.
3. Compare the dB per octave attenuation measurement to the design specifications. Is it close to the expected value?
4. Compare the dB per decade attenuation calculation to the design specifications. Is it close to the expected value?
5. What is the measured cutoff frequency of your filter?
6. How does it compare to the design specifications?
7. How closely does the overall performance of the constructed, second-order, low-pass Butterworth filter compare with the simulated version?
8. List and explain any possible reasons for differences between the simulated and constructed filter.

***Grade:***

|  |  |  |
| --- | --- | --- |
| **Deliverable** | **Points Available** | **Points Achieved** |
| **Data Measurements** | 10 |  |
| **Graphs (labels, accuracy)** | 10 |  |
| **Answers to Questions** | 10 |  |
| **Organization (format of results and style)** | 10 |  |
| **Total Points** | 40 |  |
|  | | |
| Comments: | | |

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