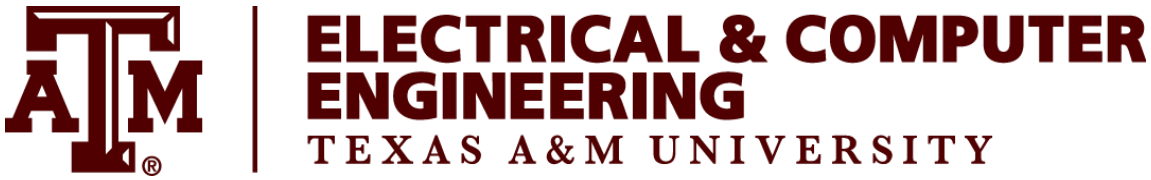

Pre-Lab 4: Operational Amplifiers Part 2

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ECEN 325 -501

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Date: 9/16/2020

Calculations:

1. For the summing amplifier in Fig. 1, find R1 and R2 to have Vo = −(Vi1 + 2Vi2), if R3 = 15kΩ.

$$V_o = -\left(V_{i1} + 2V_{i2} \right) \; if \; R_3 = 15k\Omega$$

$$\frac{R_3}{R_1} = 1, \; R_1 = 15k\Omega$$

$$\frac{R_3}{R_2} = 2, \; R_2 = 7.5k\Omega$$

2. For the differential amplifier in Fig. 2, find R1 to have Vo = Vi2 − Vi1, if R2 = R3 = R4 = 10kΩ.

$$V_o = V_{i_2} - V_{i_1} \; if \; R_2 = R_3 = R_4 = 10k\Omega$$

$$V_o = \frac{R_2}{R_1}\left(V_{i_2} - V_{i_1} \right)$$

$$\frac{R_2}{R_1} = 1 \; , \; R_1 = 10k\Omega$$

3. For the instrumentation amplifier in Fig. 3, find R to have Vo = 3(Vi2 − Vi1), if R_gain = 1kΩ.

$$V_o = \left[1 + \frac{2R}{R_{gain}} \right]\left(V_{i_2} - V_{i_1} \right); \; V_o = 3\left(V_{i_2} - V_{i_1} \right) \; \& \; R_{gain} = 1k\Omega$$

$$\left[1 + \frac{2R}{R_{gain}} \right] = 3$$

$$\frac{2R}{R_{gain}} = 2; \; R = R_{gain} = 1k\Omega$$

4. For each circuit, find Vo if Vi1 = 0.2 sin(2π1000t) and Vi2 = 0.3V.

Circuit 1:

$$V_o = -\left(V_{i_1} + 2\,V_{i_2} \right)$$

$$V_o = -\left(0.2\sin(2\pi \cdot 1000t) + 2(0.3) \right)$$

$$V_o = -0.6 - 0.2\sin(2\pi \cdot 1000t)\ V$$

Circuit 2:

$$V_o = V_{i_2} - V_{i_1}$$

$$V_o = 0.3 - 0.2\sin(2\pi \cdot 1000t)\ V$$

Circuit 3:

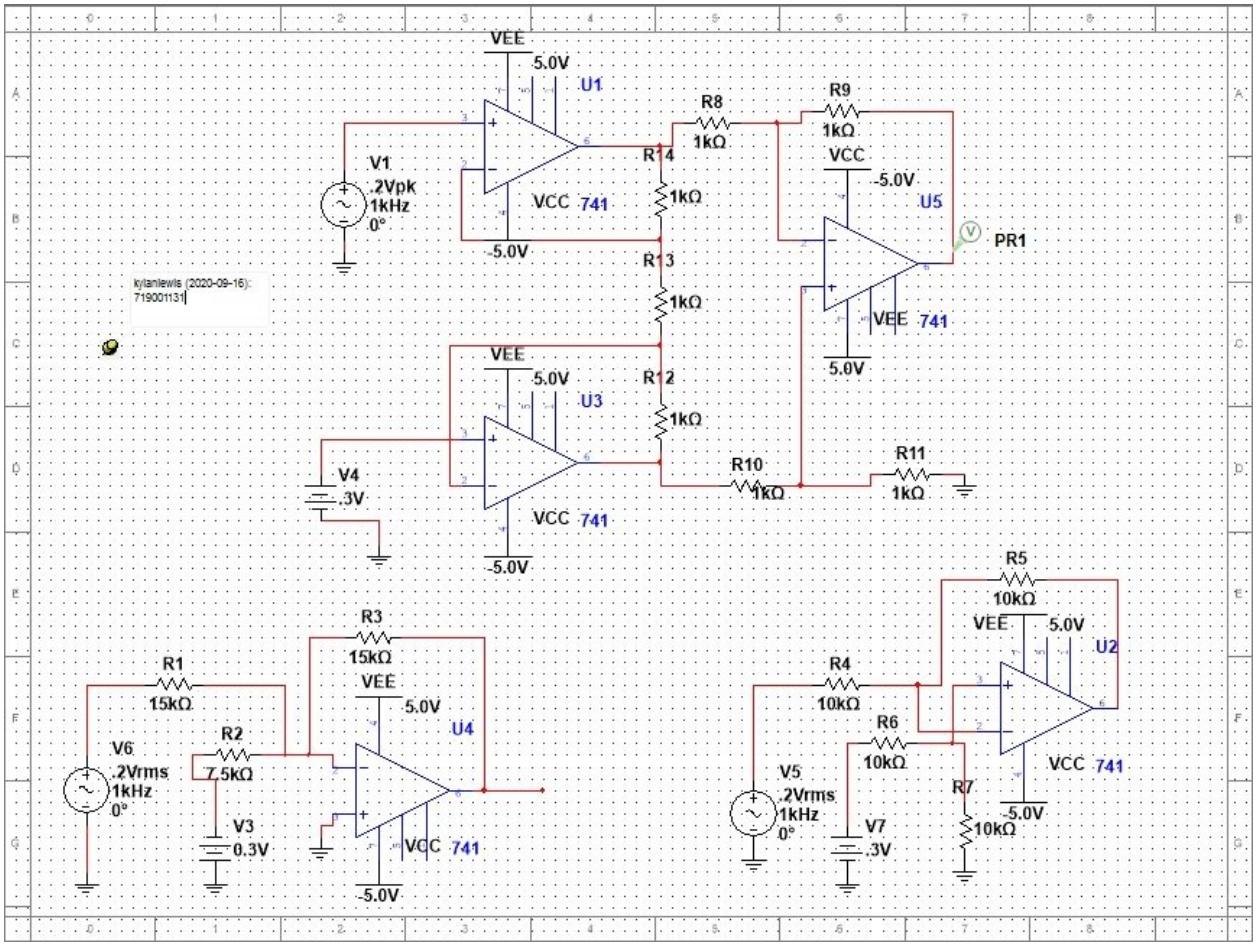
$$V_o = 3\left(V_{i_2} - V_{i_1} \right)$$

$$V_o = 3(0.3 - 0.2\sin(2\pi \cdot 1000t)\ V)$$

$$V_o = 0.9 - 0.6\sin(2\pi \cdot 1000t)\ V$$

Breadboard Wiring:

(Next Page)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U1
V1
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1kHz
0°
VCC
741
-5.0V
R8
1kΩ
R9
1kΩ
R14
1kΩ
VCC
-5.0V
U5
PR1
R13
1kΩ
VEE
741
5.0V
kylanlewis (2020-09-16):
719001131
VEE
5.0V
U3
R12
1kΩ
V4
.3V
R10
1kΩ
R11
1kΩ
VCC
741
-5.0V
R5
10kΩ
VEE
5.0V
U2
R3
15kΩ
R1
15kΩ
R4
10kΩ
R6
10kΩ
VCC
741
R2
7.5kΩ
V6
.2Vrms
1kHz
0°
V3
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U4
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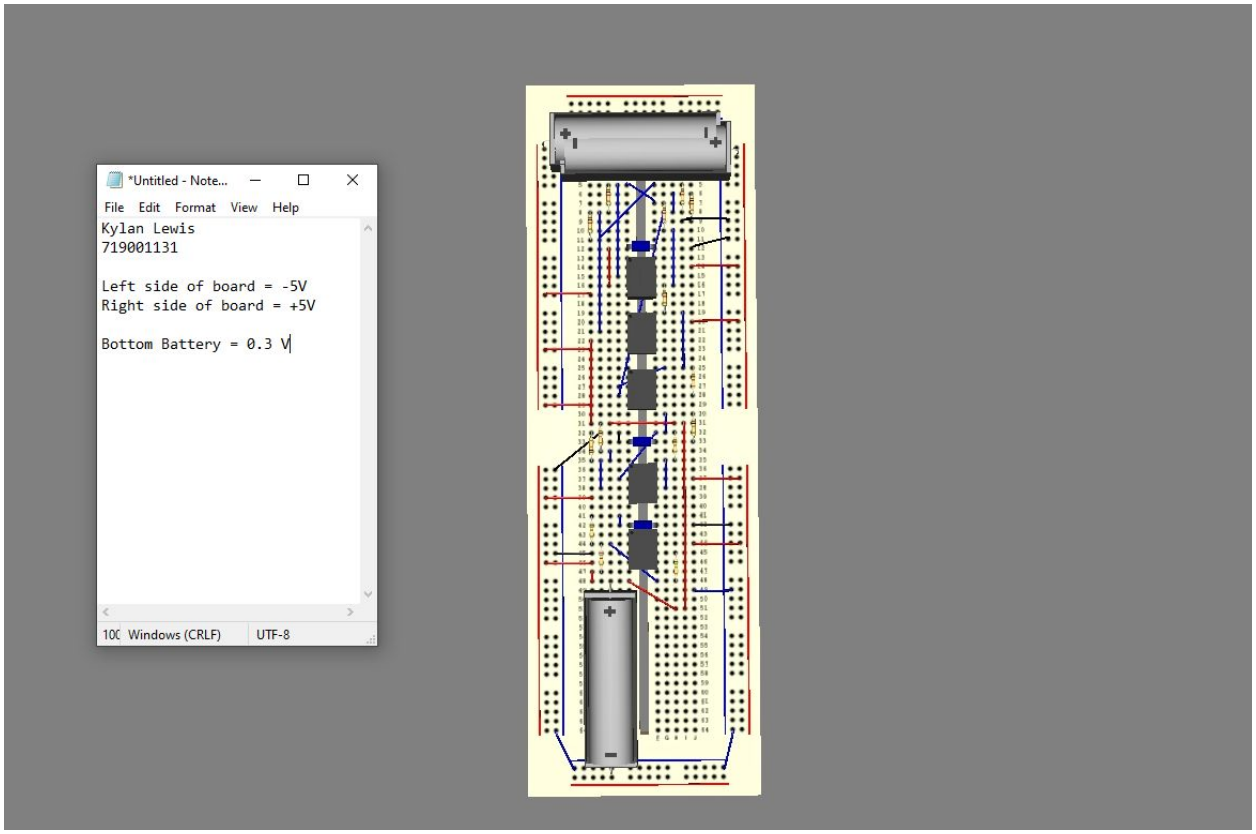
1kHz
0°
V7
.3V
R7
10kΩ
-5.0V


*Untitled - Note...
File Edit Format View Help
Kylan Lewis
719001131
Left side of board = -5V
Right side of board = +5V
Bottom Battery = 0.3 V
Windows (CRLF)
UTF-8