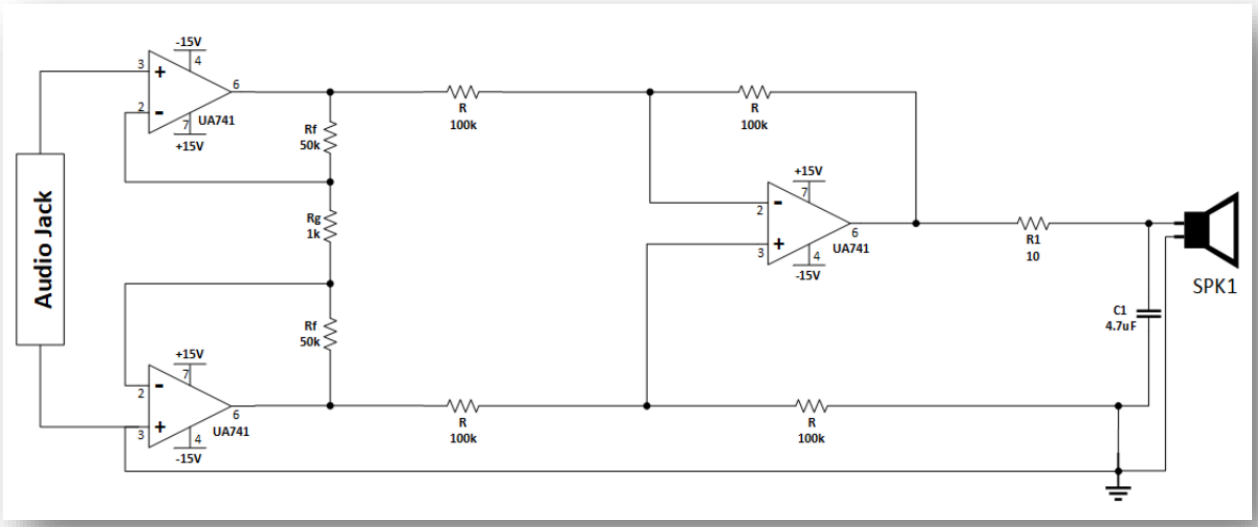
MEHMET ARDA UÇAR 20210602211

Izmir University of Economics
EEE 205 Fundamentals of Electrical Circuits
2023-2024 Fall
Due Date: 05.01.2024 23:59

Project
Audio Amplifier Circuit



Input: A sinusoidal input with V_{pp} = 100mV and a frequency of 100 Hz

Project Report

1. Calculate the gain (Vo/Vin) of this circuit.
2. Explain the working principle of the circuit.
3. Explain the reason why we use the capacitor C1 and resistor R1 at the output.
4. Analyze the circuit on ORCAD/PSPICE using the given input. Provide the schematic and simulation results for V_{in}& V_{out} relationship. Comment on the result. (+Vcc = +15V, -Vcc = -15V & Use the opamp uA741/EVAL).
5. Build the circuit on NI ELVIS using the given input. Provide the images of your circuit and oscilloscope measurements for V_{in}& V_{out} relationship.
6. Provide your PCB layout for this circuit on KiCAD.

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IMPORTANT: Show your NI ELVIS results to the corresponding TA of your section.
In parenthesis, you can find appropriate hours to show your work.

- Monday 10.20- Sude Pehlivan Akbuğday (Monday 15.00-17.00)
- Monday 12.10- Batuhan Özkurt & Zeynep Övgü Yaycı (Monday 14.00-16.00)
- Tuesday 14.55- Burak Akbuğday & Zeynep Övgü Yaycı (Tuesday 14.00-15.00 or 16.30-17.30)
- Friday 12.10- Sude Pehlivan Akbuğday & Batuhan Özkurt (Friday 14.00-16.00)

1. Calculate the gain (Vo/Vin) of this circuit.

You should bring your components.
The project is individual.
Assignment is single attempt.
Cheating is prohibited.
AI is only a tool to enhance our knowledge. Copy/paste from AI is prohibited.

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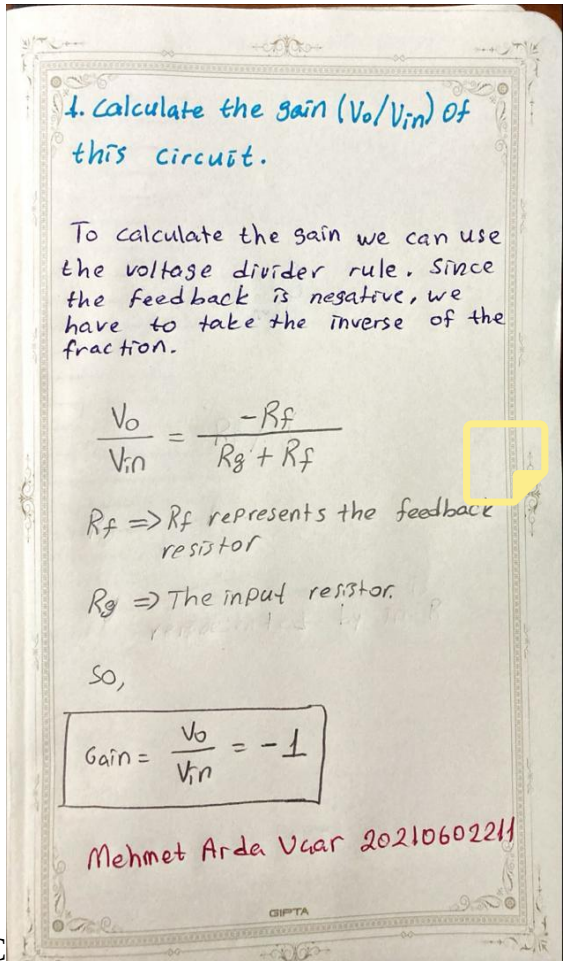
C 

2. Explain the working principle of the circuit.

First of all, Circuit is non-inverting op-amp audio amplifier circuit. In addition to this, It rotates audio signals until it amplifies input audio signals by a factor of -1. What is more, we do it using a non-inverting op-amp configuration with negative feedback. Working principle of op-amp circuit is based on fact that the op-amp circuit tries to keep voltage difference between its input terminals as close to zero as possible. If the input voltage at '+' terminal is higher than '-' terminal, output voltage will be positive. It is same as for opposite version.

3. Explain the reason why we use the capacitor C1 and resistor R1 at the output.

From my point of view, first of all, Capacitor C1 acts as a coupling capacitor. In other words, it prevents the output signal from overloading the circuit. To make it clear, Capacitor C1 acts as a high pass filter, allowing only high frequency signals to pass. What is more, R1 and C1 form an RC high pass filter and the corner frequency is calculated as follows:
$Fc = 1 / (2\pi.R1.C1)$
For certain values of R1 and C1, the corner frequency is approximately 3 Hz. This filter passes

all frequencies above 3 Hz, which effectively eliminates low frequency components of the input signal. In addition to this, resistor R1 acts as a load resistor preventing the op-amp from saturating and also acts as a low pass filter to regulate the output waveform. As a result of these, they improve the stability and accuracy of the op-amp circuit.

4. Analyze the circuit on ORCAD/PSPICE using the given input. Provide the schematic and simulation results for V_in& V_out relationship. Comment on the result. (+Vcc = +15V, -Vcc = -15V & Use the opamp uA741/EVAL).

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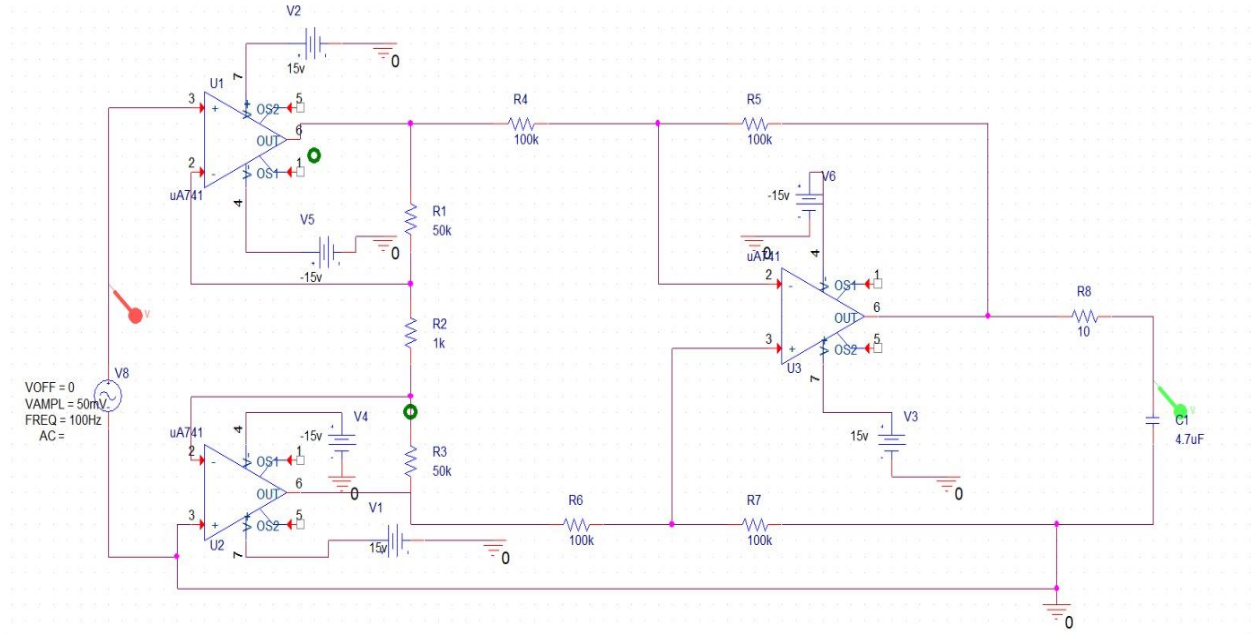

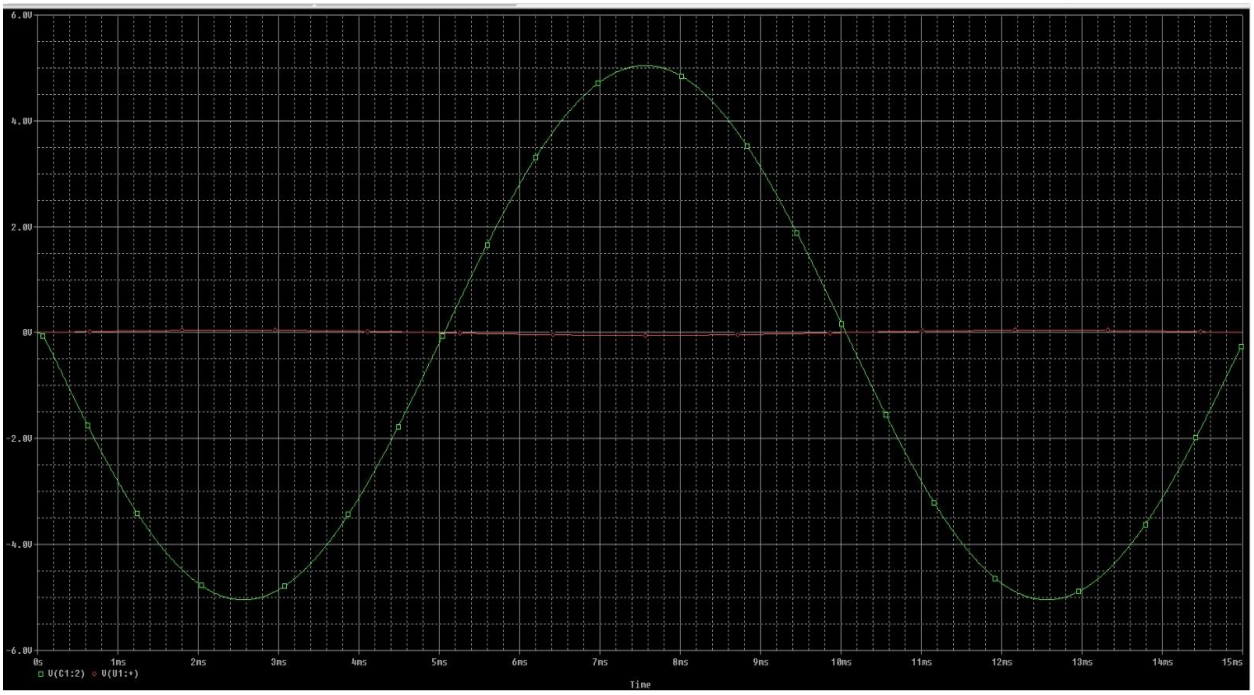

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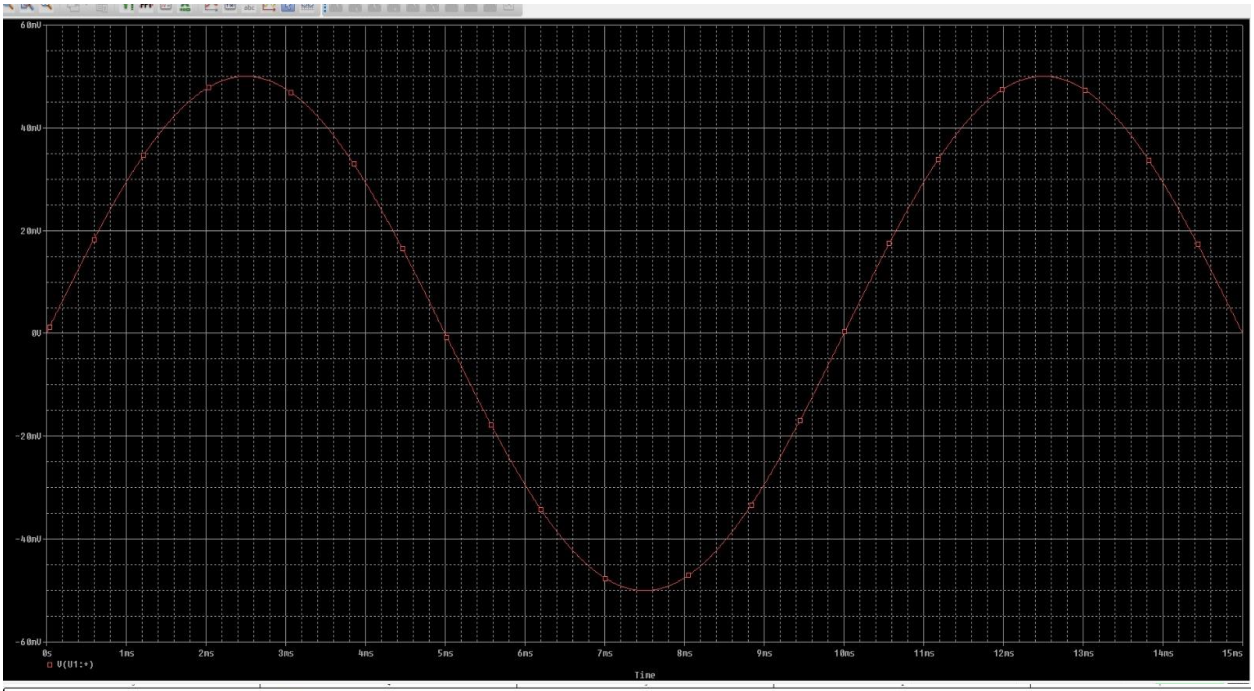

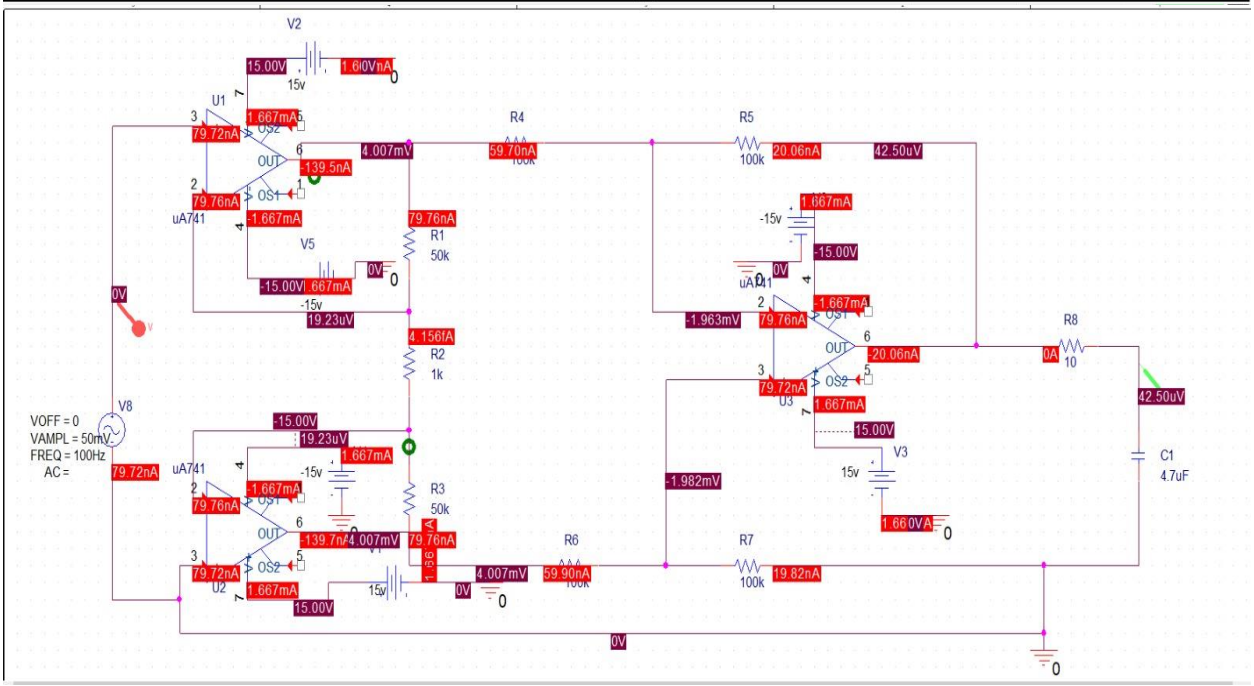

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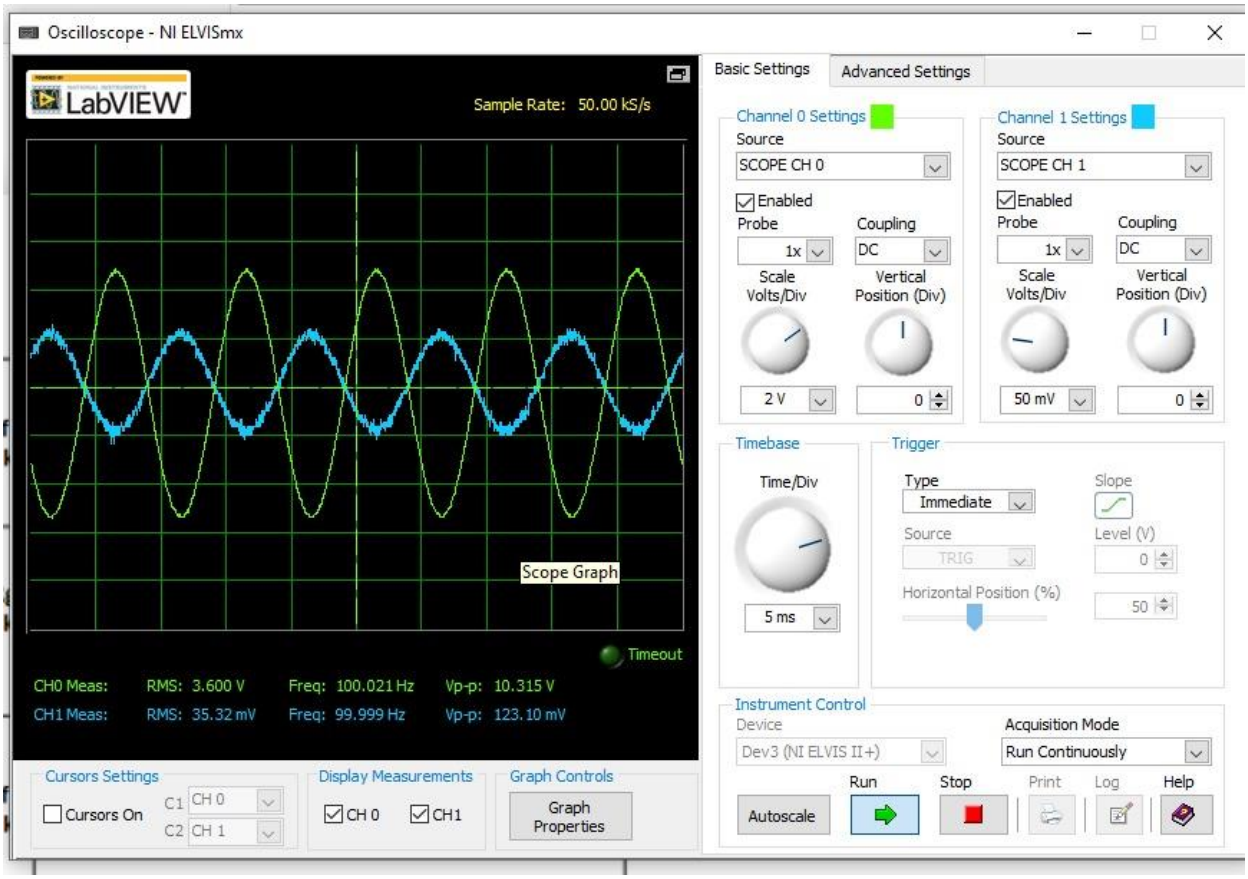

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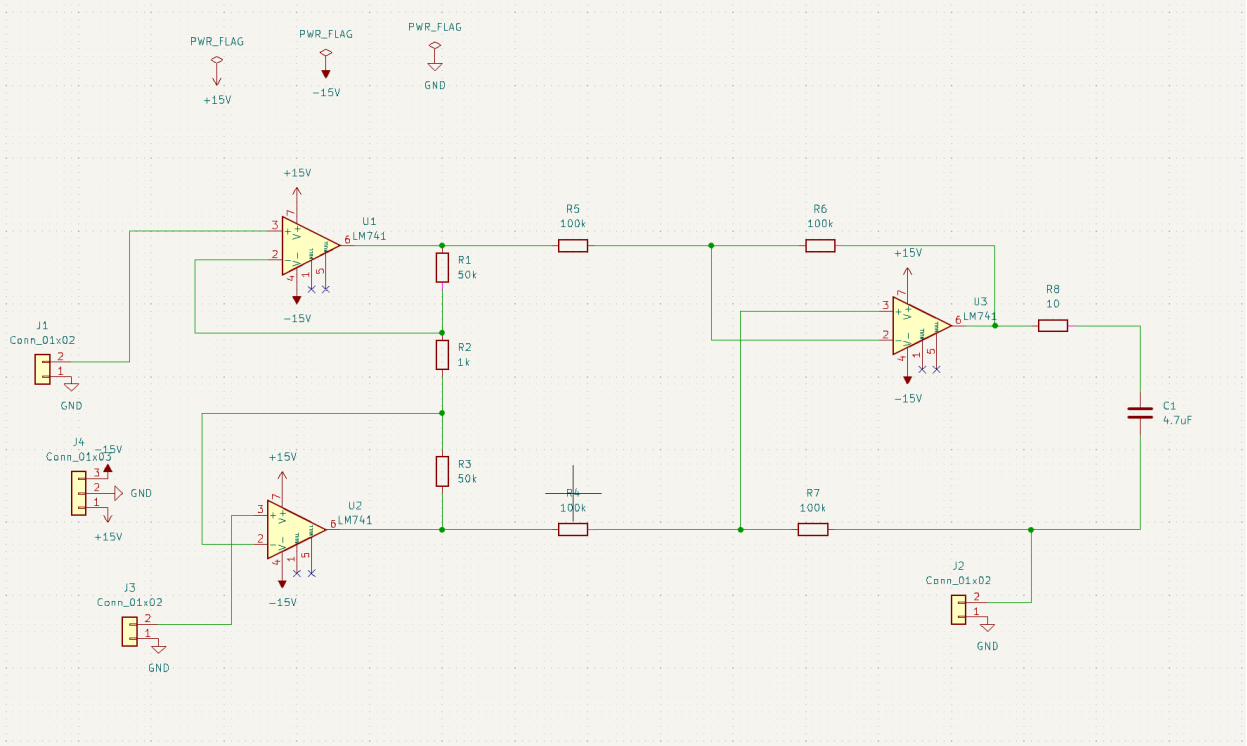
Provide your PCB layout for this circuit on KiCAD.



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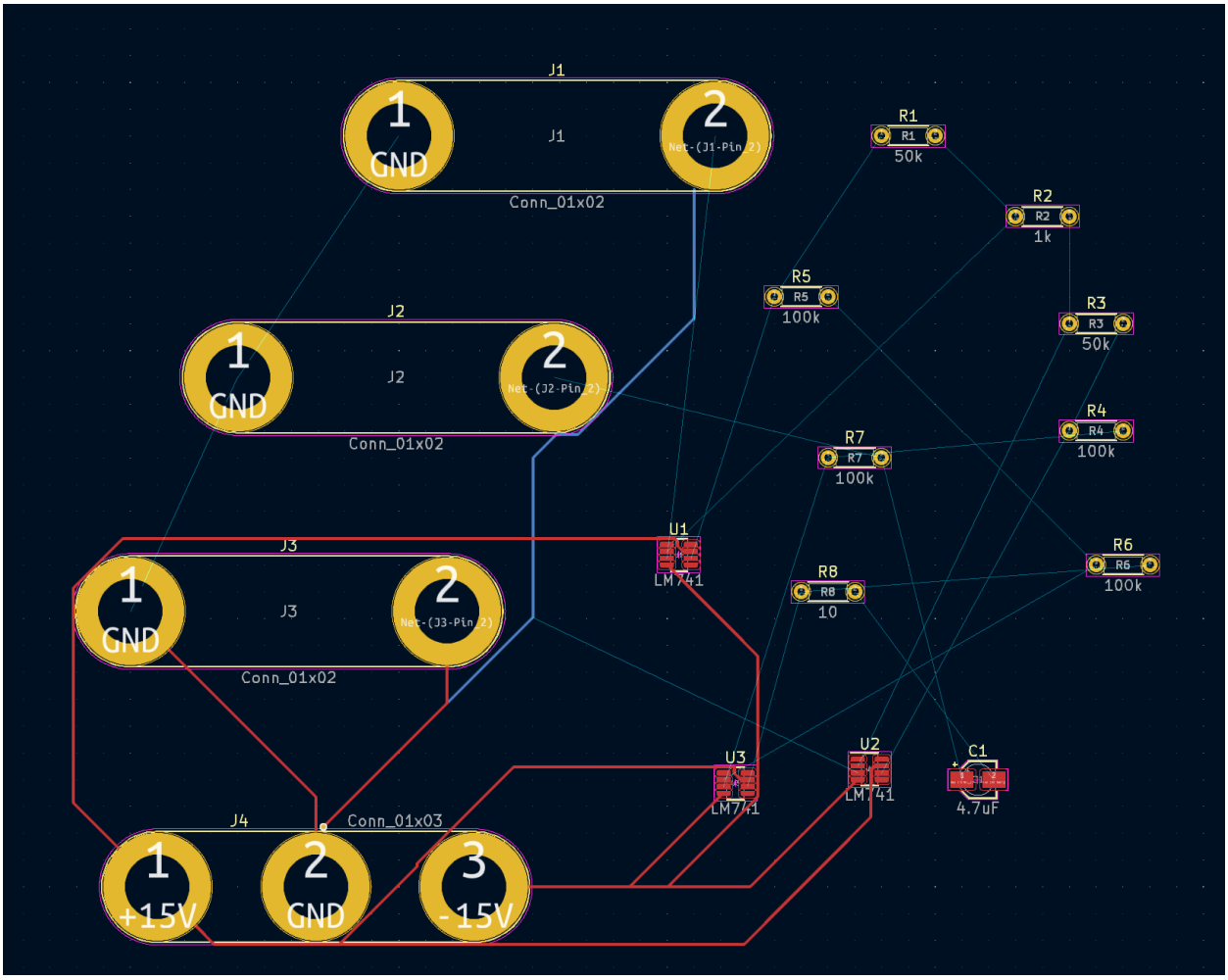

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