Title: Low Pass Filter using OP-AMP

Student Details :

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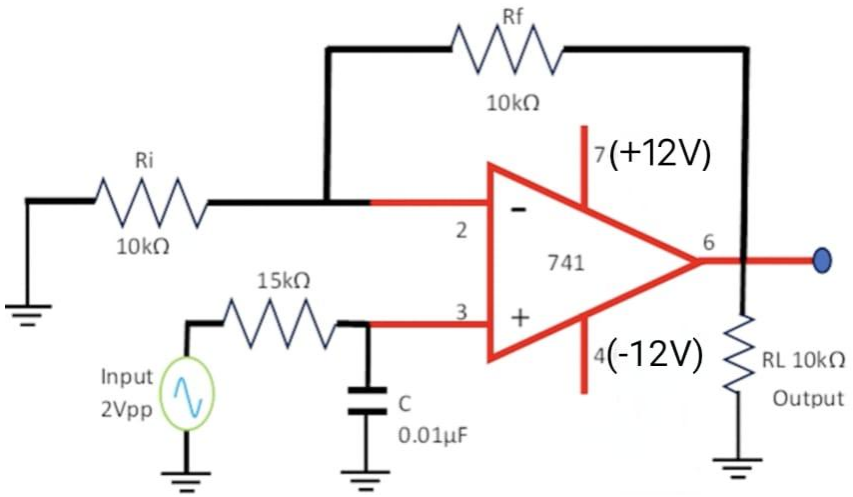
Introduction :

- A low pass filter is an electronic circuit that allows low-frequency signals to pass while blocking high-frequency signals.
- The LM741 operational amplifier is commonly used to design active low pass filters due to its simplicity and stability.
- This filter uses a combination of resistors, capacitors, and an op-amp to achieve the desired frequency response.
- It provides better gain and performance compared to passive low pass filters.
- Low pass filters are widely used in audio processing, communication systems, and noise reduction circuits.

Objective:

- To design and analyze a low pass filter using the LM741 operational amplifier.
- To allow low-frequency signals to pass while attenuating high-frequency noise.
- To determine and study the cutoff frequency of the low pass filter.
- To understand the practical application of op-amp–based active filters in electronic circuits.

Circuit Diagram :



Working Principle :

A low pass filter using the LM741 op-amp allows low-frequency signals to pass while attenuating high-frequency signals. The circuit uses a resistor and capacitor (RC network) at the input, where the capacitor offers high reactance to low frequencies and low reactance to high frequencies.

At low frequencies, the signal passes through the resistor to the op-amp and is amplified normally. As frequency increases beyond the cutoff frequency, the capacitor diverts the signal to ground, reducing the output. The LM741 provides stable gain and buffering, ensuring accurate filtering. This type of filter is widely used to remove noise and smooth signals

Components Required (for eSim) :

Op-amp comparator : LM741

Resistors: R1=15k, Ri1=10k, Rf1=10k, RL1=10k

Capacitor : 0.01uf

DC supply: +12V , -12V and ground

AC supply: 2Vpp

Expected Output:

Input: AC sine wave (e.g., 0–5 V or ±2.5 V depending on the circuit configuration).

Output: Filtered sine wave with high-frequency components attenuated.

Operation / Observation:

- At low frequencies, the output follows the input with minimal attenuation.
- As the input frequency increases beyond the cutoff frequency, the output amplitude decreases.
- High-frequency noise is effectively removed, resulting in a smooth output waveform.
- This confirms the proper operation of the low pass filter.

Reference :

Title : Design and Performance Analysis of Enhanced Op-Amp for Low Pass Filter in

Subwoofer

Author : S. Sasikala and S. Mythily

Link : https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=10560931

Note for eSim Submission:

The circuit shown above will be reproduced in eSim using standard components. The simulation results (input and output waveforms) will be captured and attached in the final report. No special characters are used in the title or anywhere in the proposal.