Name: Swagat Panda
ID: 2017B5A30983P

Lab VI

Study and design of active filters using LM741

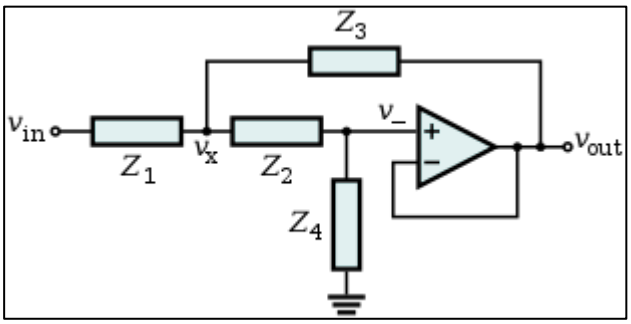
Objective

a) Design a Band Pass Filter using OPAMP (IC-741).
b) Show the frequency response with 3dB frequency and compare your simulated value with theoretical value.

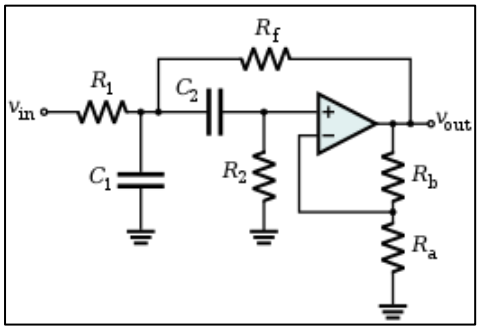
Apparatus Required

- LM 741
- Voltage Supply of 15 V each
- A 100mV voltage source for the input
- Resistors of the following values (in kilo Ohms) – 2.2, 3.9, 5.6, 10
- Capacitors of the following values (in uF) – 0.1

Theory - Sallen-Key Bandpass Filter



The Sallen-Key Topology



Sallen-Key Band Pass Filter

A VCVS filter uses a voltage amplifier with practically infinite input impedance and zero output impedance, and can be used to implement a 2-pole bandpass filter.

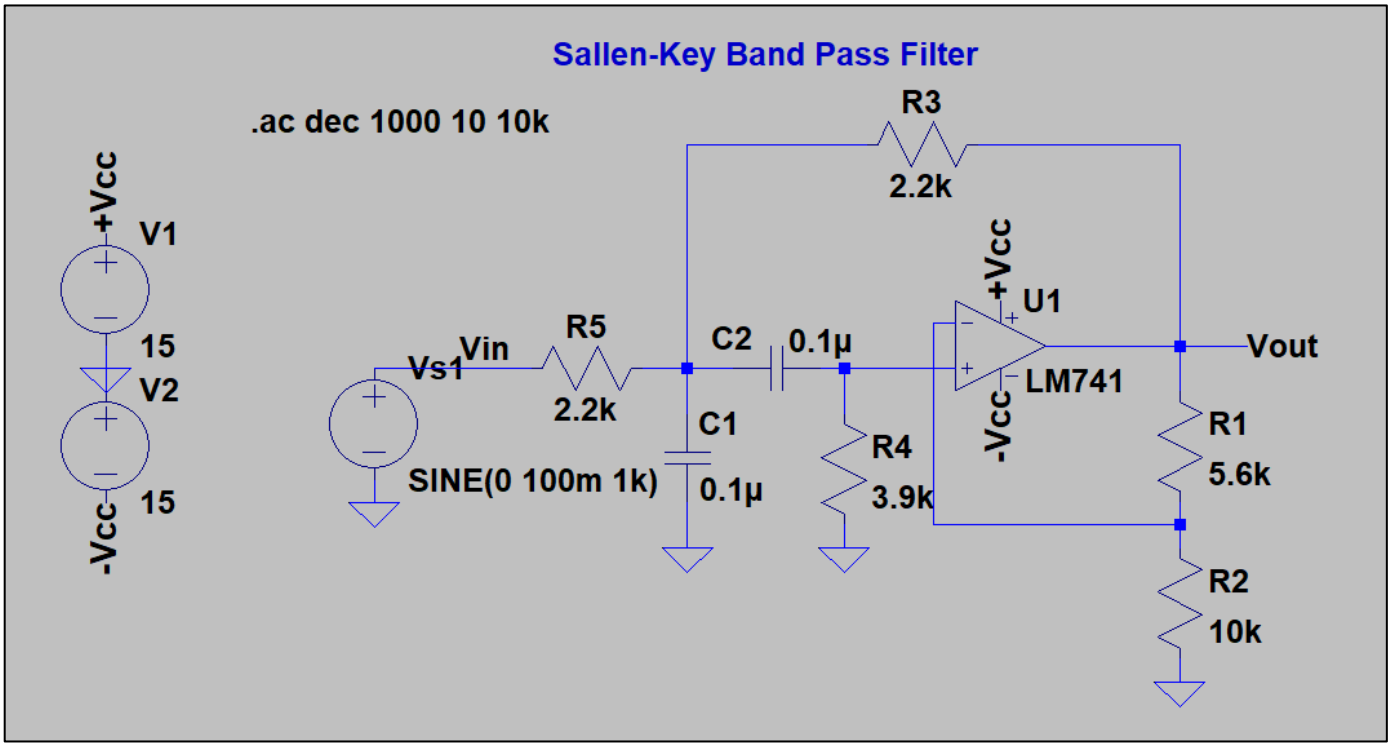
The VCVS filter allows high Q factor and passband gain without the use of inductors. It also has the advantage of independence, i.e., VCVS filters can be cascaded without the stages affecting each other's tuning. A Sallen–Key filter is a variation on a VCVS filter that uses a unity-voltage-gain amplifier (i.e., a pure buffer amplifier).

Procedure

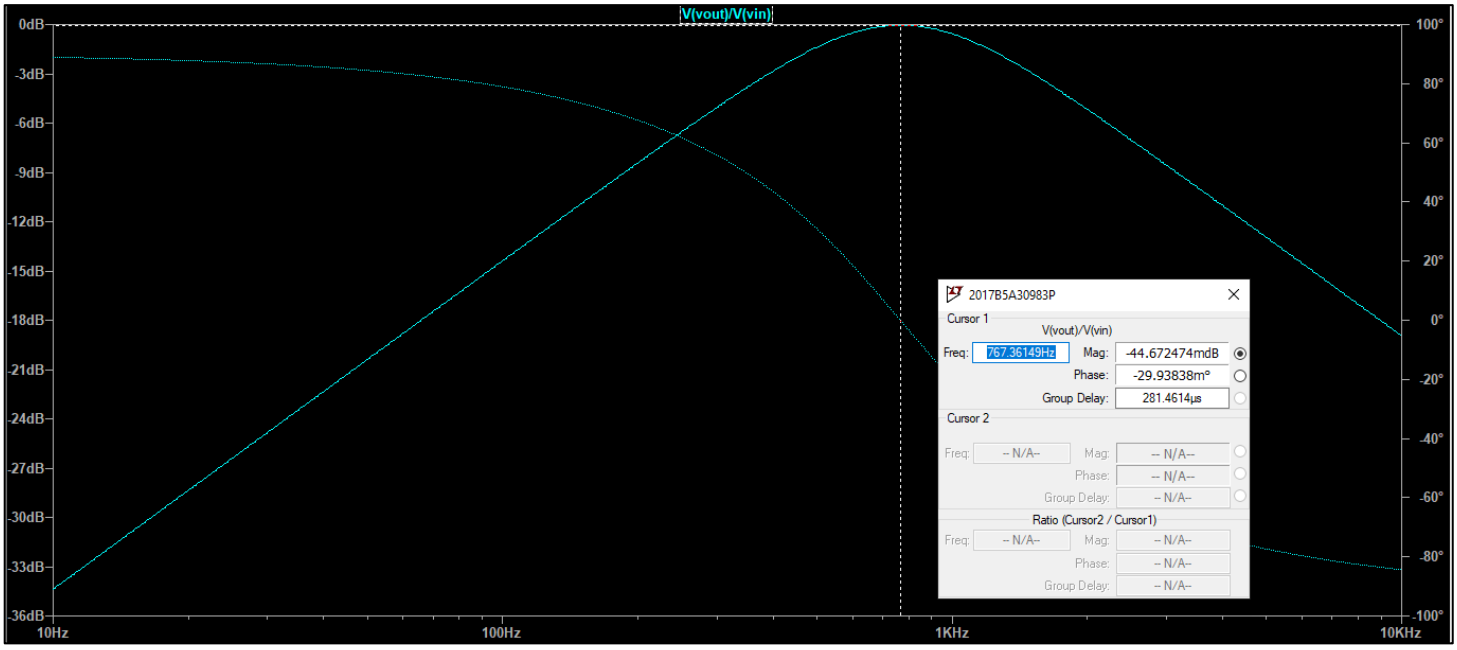
- Connect the circuit as per the given values
- Simulate

1. Band Pass Filter

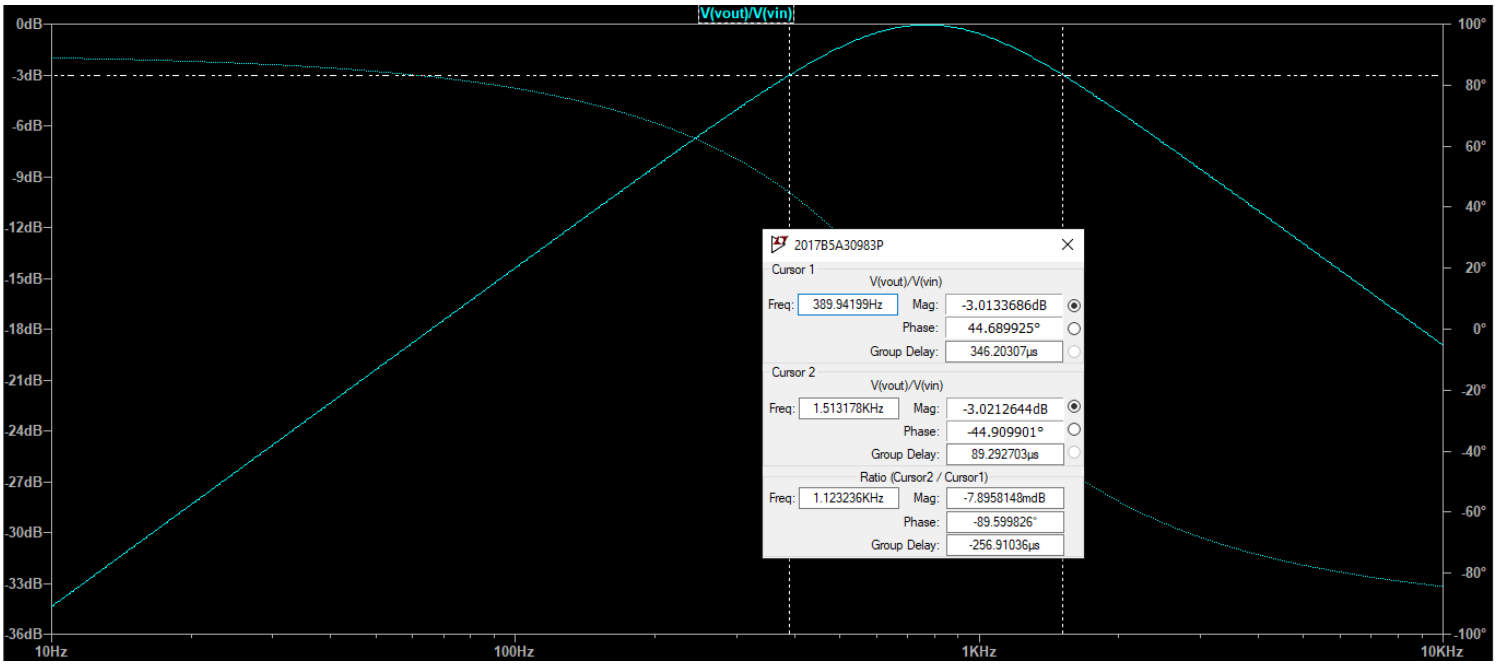
Schematic



Frequency Response Plot – Bandpass Frequency



Frequency Response Plot – f_l and f_h



Results

Type of filter	Theoretical value of 3dB/cutoff frequency	Simulated value of 3dB/corner frequency
Band-pass filter	$f_0 = \frac{1}{2\pi\sqrt{\frac{R_3R_4R_5C_1C_2}{R_3+R_5}}} = \frac{1}{2\pi \times 2071.23 \times 0.1\mu}$ $= 768.407$ Hz	767.361 Hz
	$Q = 0.677315$	Q = 0.68327

F_l = 389.94199Hz

F_h = 1.513178KHz

Conclusions

- The simulated values are in agreement with the theoretical values as expected.