A PROJECT REPORT

ON

WIDE BAND REJECT FILTER

SUBMITTED TO YESHWANTRAO CHAVAN COLLEGE OF ENGINEERING, NAGPUR

THIRD YEAR OF ENGINEERING (SEM-5)

IN

ELECTRONICS AND TELECOMMUNICATION

BY

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UNDER THE GUIDANCE OF

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2022 – 2023

CERTIFICATE

This is to certify that the project report entitled

"WIDE BAND REJECT FILTER"

Submitted by

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is a bonafide work carried out by them under the supervision of **K.P KAMBLE** and it is approved for the partial fulfillment of the requirement of university for the award of the third year of B.Tech of Engineering (Electronics and Telecommunication)

K.P KAMBLE	**Dr.Milind Narlawar**
Guide	**Head**
Department of E&T/C	**Department of E&T/C**

Place: Nagpur

Date: /10/2022

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BHARGAV SABLE
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WIDE BAND REJECT FILTER

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

The bandpass filter passes one set of frequencies while rejecting all others. The band-stop filter does just the opposite. It rejects a band of frequencies, while passing all others. This is also called a band-reject or band-elimination filter.

A wide band-stop filter using a low-pass filter, a high-pass filter and a summing amplifier is shown in figure. For a proper band reject response, the low cut-off frequency f_L of high-pass filter must be larger than the high cut-off frequency f_H of the low-pass filter. In addition, the passband gain of both the high-pass and low-pass sections must be equal.

The use of operational amplifiers within the band stop filter design also allows us to introduce voltage gain into the basic filter circuit. The two non-inverting voltage followers can easily be converted into a basic non-inverting amplifier with a gain of $Av = 1 + Rf/Rin$ by the addition of input and feedback resistors, as seen in our non-inverting op-amp tutorial.

Also, if we require a band stop filter to have its -3dB cut-off points at say, 1kHz and 10kHz and a stop band gain of -10dB in between, we can easily design a low-pass filter and a high-pass filter with these requirements and simply cascade them together to form our wide-band band-pass filter design.

Now we understand the principle behind a Band Stop Filter**,** let us design one using the previous cut-off frequency values.

1.2 SUMMARY

Thus, this chapter contains introduction regarding the project description.

CHAPTER 2

DRAWING AND TESTING

2.1 INTRODUCTION

This chapter explains on how this project will be implemented and components used in the project, brief description of each component. It included each process from the beginning until the end of this project. This chapter includes the project as well as the hardware module wise discussion as the input module and the output module.

2.2 HARDWARE DESIGN

2.2.1 741 OP-AMP

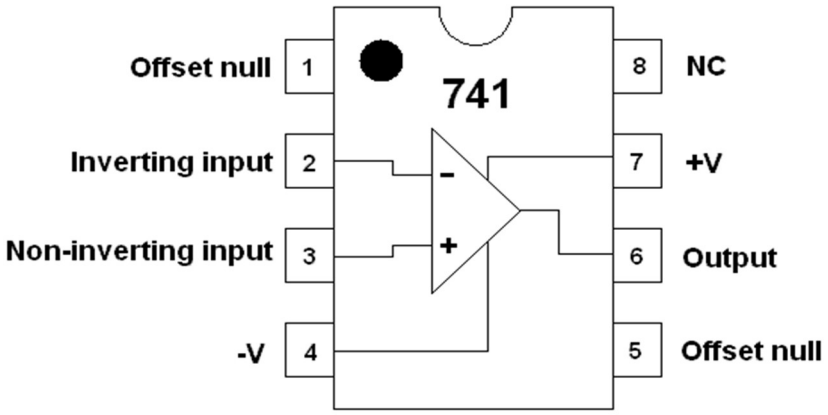


Figure 2.3.1 741 OP-AMP Pin Diagram

2.2.2 FEATURES OF 741 OP-AMP

1. Power Supply: A minimum supply of 5V and can handle up to 18V.
2. Input Impedance: About 2 MΩ.
3. Output Impedance: About 75 Ω.
4. Voltage Gain: 2,00,000 for a minimal range of frequency.
5. Slew Rate (Rate at which op-amp can detect voltage change) : 0.5V/μs.
6. Input offset: In a range of 2mV-6mV.
7. Output Load: Recommended greater than 2KΩ.
8. Maximum Output Current: 20 mA.

2.3 SUMMARY

Thus, this chapter describes about the components selection for implementing our system. It briefly described about the specifications of the components selected.

CHAPTER 3

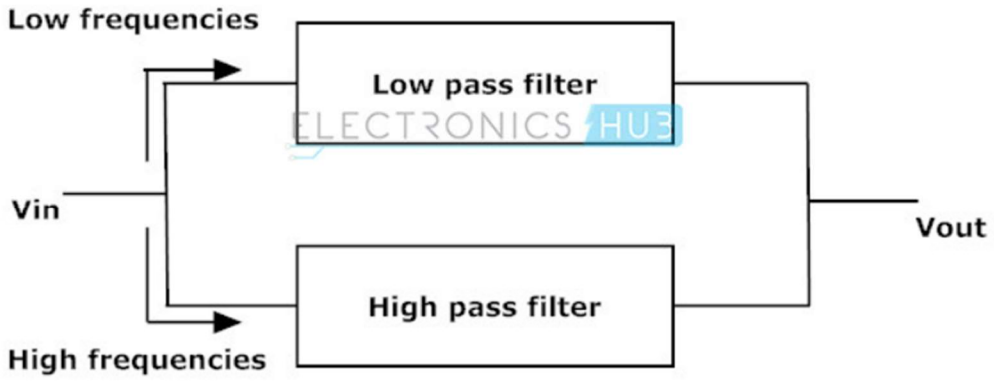
COMPONENTS

SR. NO.	COMPONENTS	QUANTITY
1.	Resistors-3.30 K Ohms	1
	Resistors-10 K Ohms	6
	Resistors-16 K Ohms	2
2.	IC 741	3
3.	PCB	1
4.	Connecting Wires	
5.	Capacitor - 100 nf	2

CHAPTER 4

BLOCK DIAGRAM

4.1 BLOCK DIAGRAM



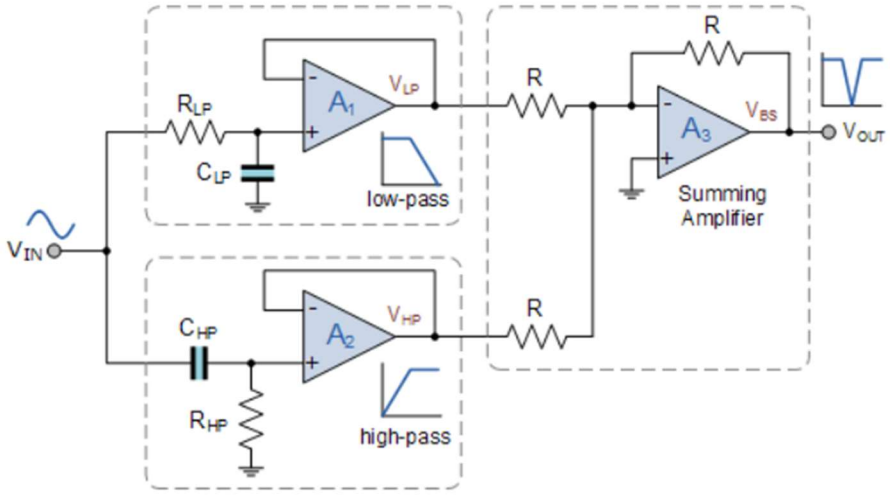
Block Diagram of Wide Band Reject Filter

We know that unlike high pass and low pass filters, band pass and band stop filters have two cut-off frequencies. It will pass above and below a particular range of frequencies whose cut off frequencies are predetermined depending upon the value of the components used in the circuit design.
Any frequencies in between these two cut-off frequencies are attenuated. It has two pass bands and one stop band.

CHAPTER 5

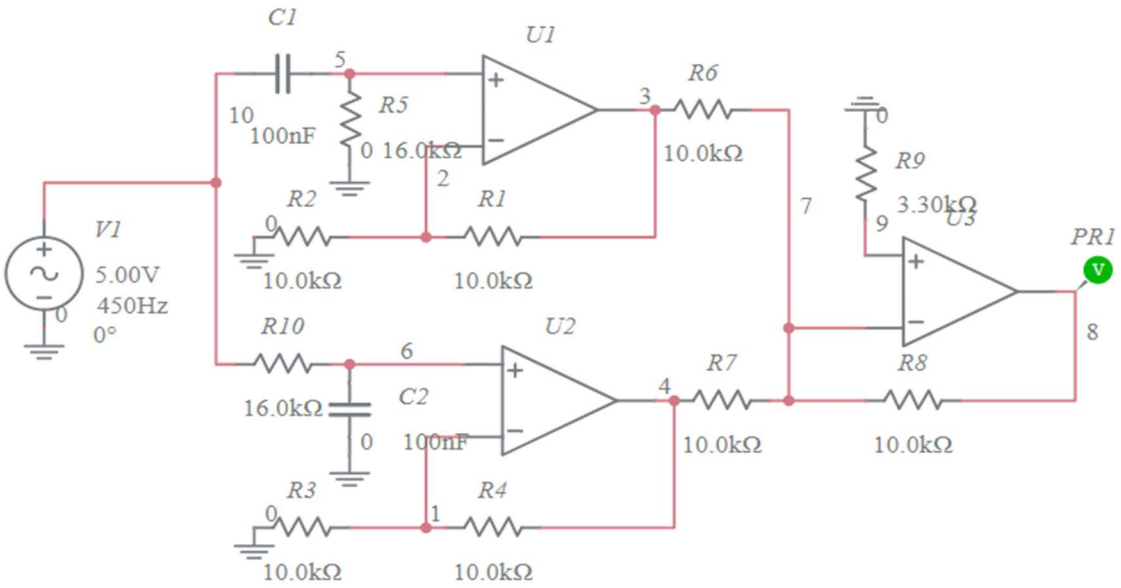
CIRCUIT DIAGRAM

5.1 CIRCUIT DIAGRAM



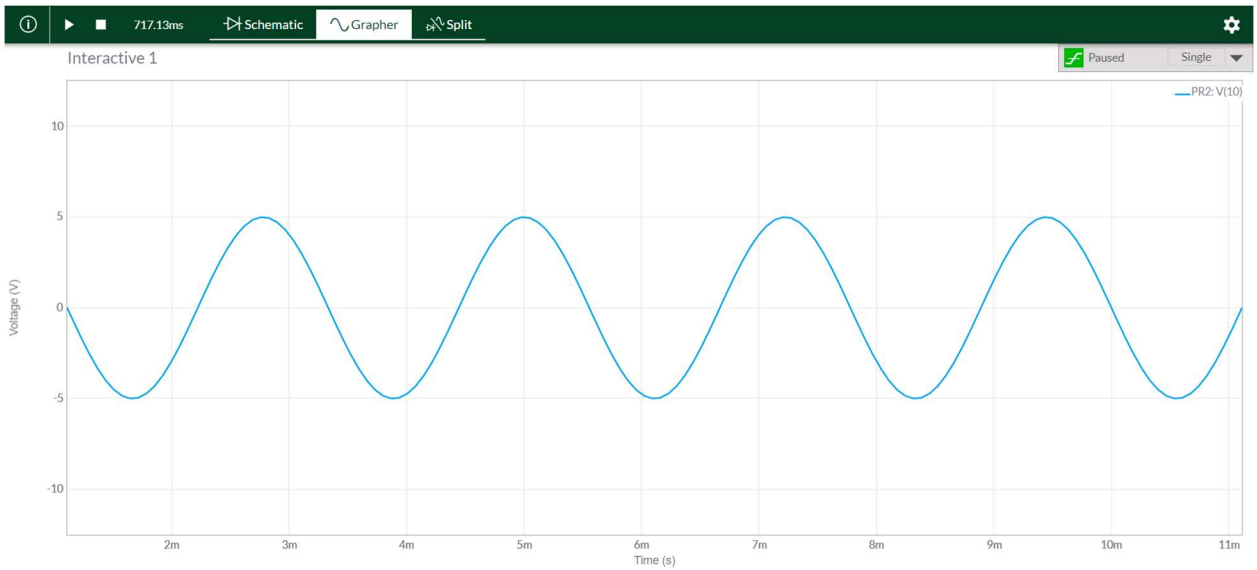
WIDE BAND PASS FILTER CIRCUIT DIAGRAM

5.2 MULTISIM STIMULATION CIRCUIT

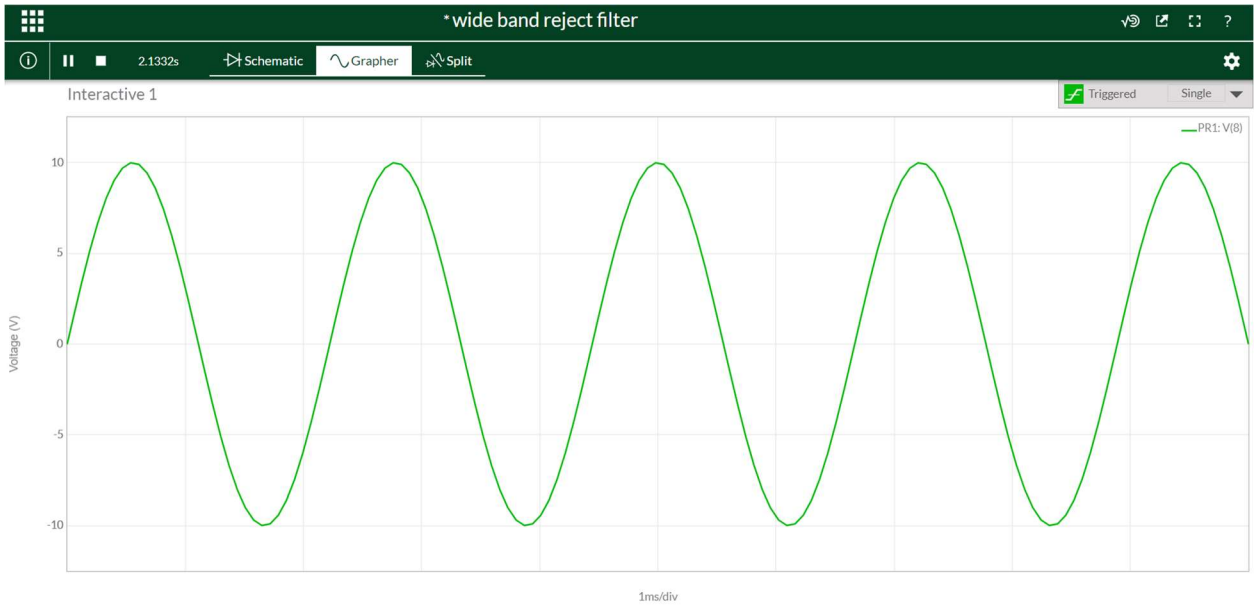


5.3 MULTISIM GRAPHER

5.3.1 INPUT GRAPH



5.3.2 OUTPUT GRAPH



CHAPTER 6

APPLICATIONS

6.1 CIRCUIT APPLICATIONS

1. In different technologies, these filters are used at different varieties.

2. These are widely used in the electric guitar amplifiers. This electric guitar produces a 'hum' at 60 Hz frequency. This filter is used to reduce that hum in order to amplify the signal produced by the guitar amplifier and makes the best equipment. These are also used in some of the acoustic applications like mandolin, base instrument amplifiers.

3. In communication electronics the signal is distorted due to some noise (harmonics) which makes the original signal to interfere with other signals which lead to errors in the output. Thus, these filters are used to eliminate these unwanted harmonics.

4. These are used to reduce the static on radio, which are commonly used in our daily life.

5. These are also used in Optical communication technologies, at the end of the optical fibre there may be some interfering (spurious) frequencies of light which makes the distortions in the light beam. These distortions are eliminated by band stop filters. The best example is in Raman spectroscopy.

6. In image and signal processing these filters are highly preferred to reject noise.

7. These are used in high quality audio applications like PA systems (Public address systems).

8. These are also used in medical field applications., in biomedical instruments like EGC for removing line noise.

CHAPTER 7

SUMMARY

7.1 SUMMARY

Band Stop filter has two pass bands and one stop band. The characteristics of this filter are exactly opposite to the Band Pass Filter. It is also called as a Band rejection filter or Band elimination filter. It uses a high pass filter and a low pass filter connected in parallel. The low frequencies are given to the low pass, whereas the high frequencies are given to the high pass filter.

Simple RLC circuit by connecting capacitor and inductor in series forms the band stop filter. At very high and very low frequencies the band stop filter circuit acts like an open circuit, whereas at mid frequencies the circuit acts as a short circuit.

Hence, the circuit attenuates only mid frequencies and allows all other frequencies. The lower and higher cut-off frequencies of the filter depend on the filter design.

The Band Stop filter with narrow band stop features is called as a notch filter. It is used to eliminate single frequency value. It is formed by two resistors and two capacitors connected in two ‘T’ shaped networks.

So, it is referred as Twin ‘T’ filter. The bandwidth of the filter is nothing but the stop band of the filter. If the quality factor Q is high the narrow the width of the notch response. These are widely preferred in communication circuits.

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