# Notchfilters -- Overview

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## OBJECTIVES:

At the end of performing this experiment, learners would be able to:
• Describe the concept of Narrow band filter
• Obtain the Rejection Band and cutoff frequency of the filter designed
• Compare the designed cut-off frequency with the desired cut-off frequency
• Understand the working of µA741 IC (Op Amp)

## EQUIPMENT:

• IC µA741
• Signal generator
• Resistors
• Capacitor
• +/- 15V DC Power Supply
• Digital Storage Oscilloscope & probes
• Connecting wires & Bread Board

## DESIGN:

The rejection frequency, $f_R$, is given by

$$f_R = \frac{1}{2\pi RC}$$

Assuming capacitor, the resistance can be computed. Better accuracy is obtained
by using two resistors and two capacitors of value R and C, instead of single resistor and capacitor of values R/2 and capacitor 2C.

Given frequency 1KHz, Let C = 0.1µF

$$f = 1/2\pi RC$$

$$R = 1.59k\Omega$$

## THEORY:

• The µA741 device is a general-purpose operational amplifier

featuring offset-voltage null capability

• Narrow band reject filters are also known as Notch filters. They are designed to reject a single frequency.

Reference reading:

1) Theory and application of Digital SIgnal Processing, by Lawrence R Rabine and Bernard Gold, Prentice Hall, Easter Economy Edition
2) Integrated Electronics, by Millman and Halkias, Tata McGraw-Hill

Acknowledgement

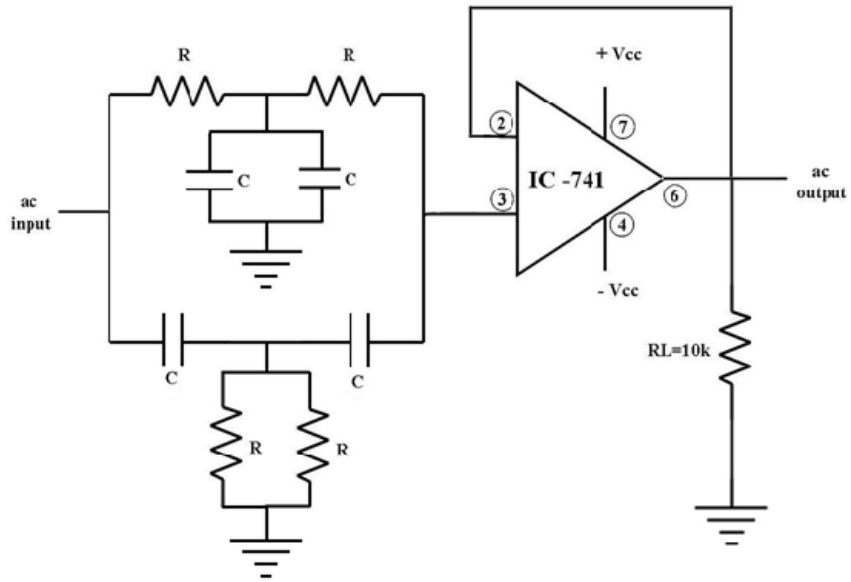
Mr.Shreenivas B for converting laboratory experiment to Tektronix courseware format

# Notchfilters -- Procedures

## Step 1

## Circuit setup:

Build the following circuit with designed values




## Step 2

• Use a signal generator to generate analog input . The analog input will be set to 1 Vpp Sine wave

• Turn on the supply of the circuit and enable signal generator that is feeding signal to the circuit.

## Step 3

• Connect the DSO probe – CH1 at analog input (Sine wave), CH2 at output (pin # 6 of  µA741 IC)

• Perform Autoset on DSO and capture the output signal.

## Step 4

• Configure PEAK-to-PEAK measurement on the input and output signal

• Observe and record the signal – input and output.

## Step 5

Record the input and output peak-to-peak voltage for various input frequencies, and complete the table below.

| Frequency (Hz) | Vin(v) | Vout(v) | Gain (dB) = 20log (Vout/Vin) |
|---|---|---|---|
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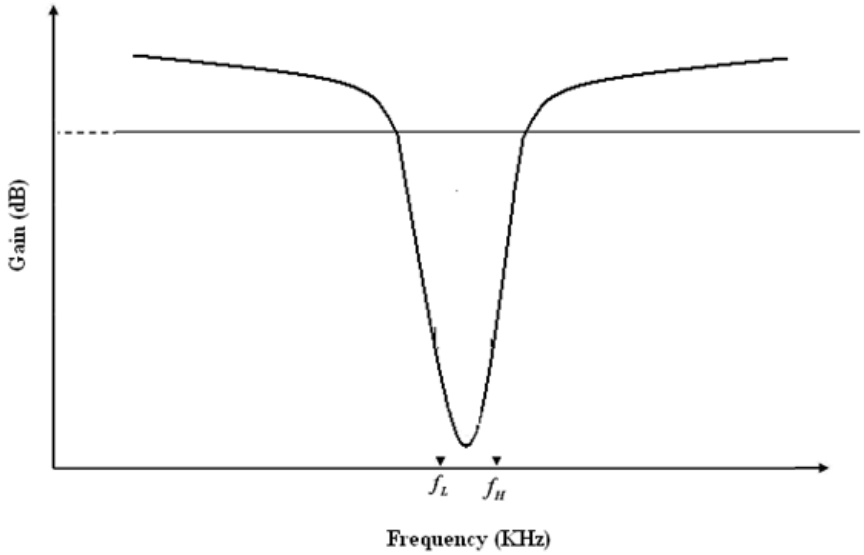
## Step 6

Plot the frequency response of the designed filter (Plot of Frequency Vs. Gain on a semi-log sheet)




## Step 7

## Observation:

1) The lower cut-off frequency Fl and the higher cut-off frequency

Fh .

2) The bandwidth BW = Fh - Fl

## Step 8

### Open-ended Question / Can you answer this?

If the designed parameters are not equal to the desired ones, give reasons.