EE2301: Electronic Devices and Circuits Lab
Assignment 1

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Aim-

To construct Low Pass filter, High Pass filter and Band Pass filter.

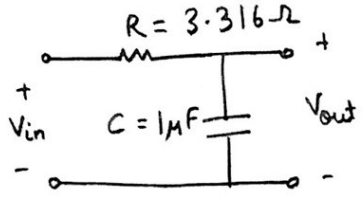
Procedure-

This experiment was simulated using NGSPICE. First the components required were identified and then the appropriate values were assigned to each component. In this experiment capacitors and resistors were required. The cutoff frequency of the Low Pass filter was 48000Hz, the cutoff frequency of the High Pass filter was 58Hz and the cutoff frequency of the Band Pass filter was 58Hz and 48000Hz.

→ Theory -

• Low Pass Filter -

It is a circuit which allows low frequency signals to pass through to the output and damps / stops the input signal having a frequency higher than the cutoff frequency. Here we need a component whose impedance changes with frequency. In this case a capacitor is used because its impedance reduces with increase in frequency and increases with reduce in frequency. Also a resistor is connected in series.



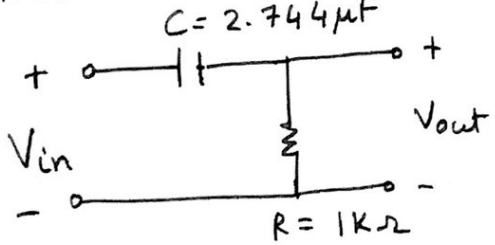
Cutoff Frequency $f = \frac{1}{2\pi RC}$

$= \frac{1}{2 \cdot \pi \cdot (3.316) \times 10^{-6}}$

$= 47996 \text{ Hz}$ //

• High Pass Filter -

It is a circuit which allows high frequency signals to pass through to the output and damps / stops the input signal having a frequency lower than the cutoff frequency. Using the same argument as above we can use a capacitor and resistor and take the output across the resistor as for low freq. the capacitor consumes a lot of voltage and vice-versa for high freq.



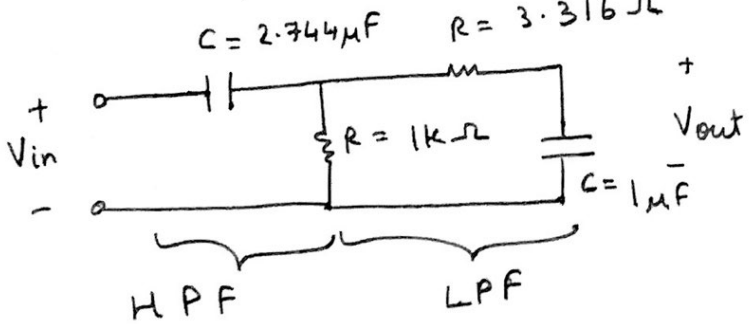
Cutoff Frequency $f = \frac{1}{2\pi RC}$

$= \frac{10^6}{2 \cdot \pi \cdot 10^3 \cdot 2.744}$

$= 58 \text{ Hz}$ //

· **Band Pass Filter -**

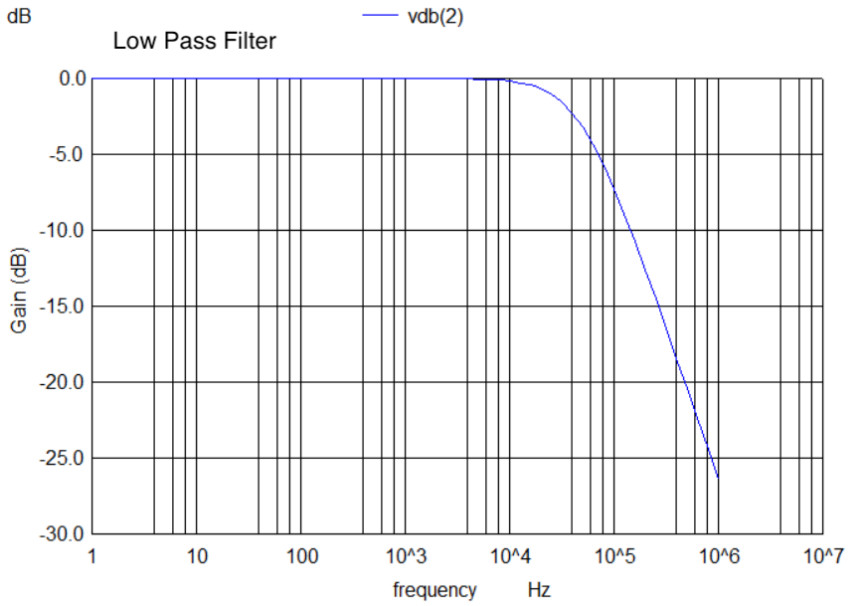
It is a circuit which allows a certain range of frequency input signal and damps / stops the input signal having frequencies not in the range. We can use the previous designed circuits for our benifit. In the low pass filter the circuit rejected the signals above a certain frequency and in high pass filter the circuit rejected the signals below a certain frequency. So we can use both LPF and HPF in series so that the cutoff freq. of LPF is the highest freq. for the band pass filter and the cutoff freq. of HPF is the lowest freq. for the band pass filter.

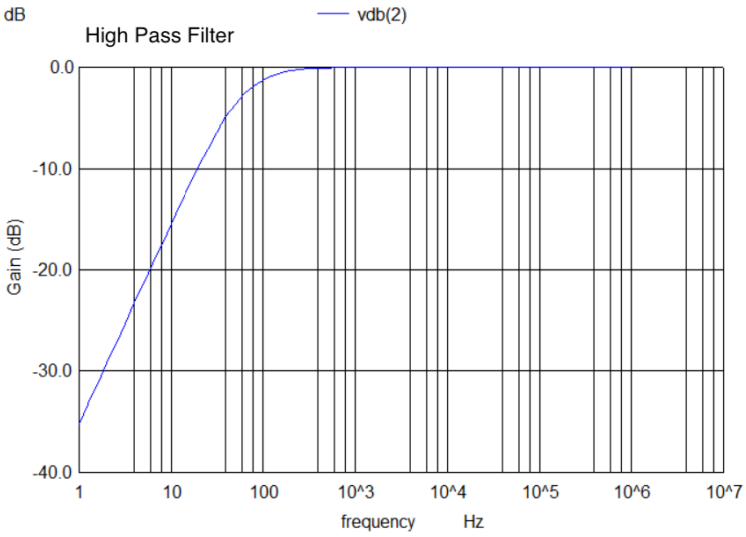


Using the exact components from before, the frequency range of the band pass filter is - 58 Hz to 48000 Hz

Outputs-

Low Pass filter with
$f_{cH} = 48000$ Hz





High Pass filter with
$f_{cL} = 58$ Hz

Band Pass filter with $f_{cL} = 58$ Hz and $f_{cH} = 48000$ Hz