BAND PASS FILTER DESIGN USING OP-AMP

THEORY:

A Band Pass Filter is a circuit which allows only particular band of frequencies to pass through it. This Pass band is mainly between the cut-off frequencies and they are f_L and f_H. Where f_L is the lower cut-off frequency and f_H is higher cut-off frequency. The center frequency is denoted by 'f_C' and it is also called as resonant frequency or peak frequency. The f_L value must always be less than the value of f_H. The pass band of the filter is nothing but the bandwidth. The gain of the filter is maximum at resonant or center frequency and this is referred as total pass band gain.

First the signal will pass through the high pass filter, the output signal of this high pass filter will tends to infinity and thus the signal which tends to infinity is given to the low pass filter at the end. This low pass filter will low pass the high frequency signal.When the High Pass Filter is cascaded with Low pass filter the simple Band Pass Filter is obtained. In order to realize this filter the order of the low pass and high pass circuits must be same. By cascading one first order low pass and high pass gives us the second order band pass filter and by cascading two first order low pass filters with two high pass filters forms a fourth order band pass filter. Due to this cascading the circuit produces a low value quality factor. The capacitor in the first order high pass filter will block any DC biasing from the input signal.

SCHEMATIC DIAGRAM:

The circuit schematic of Band pass filter using op-amp in eSim is show in the figure below:

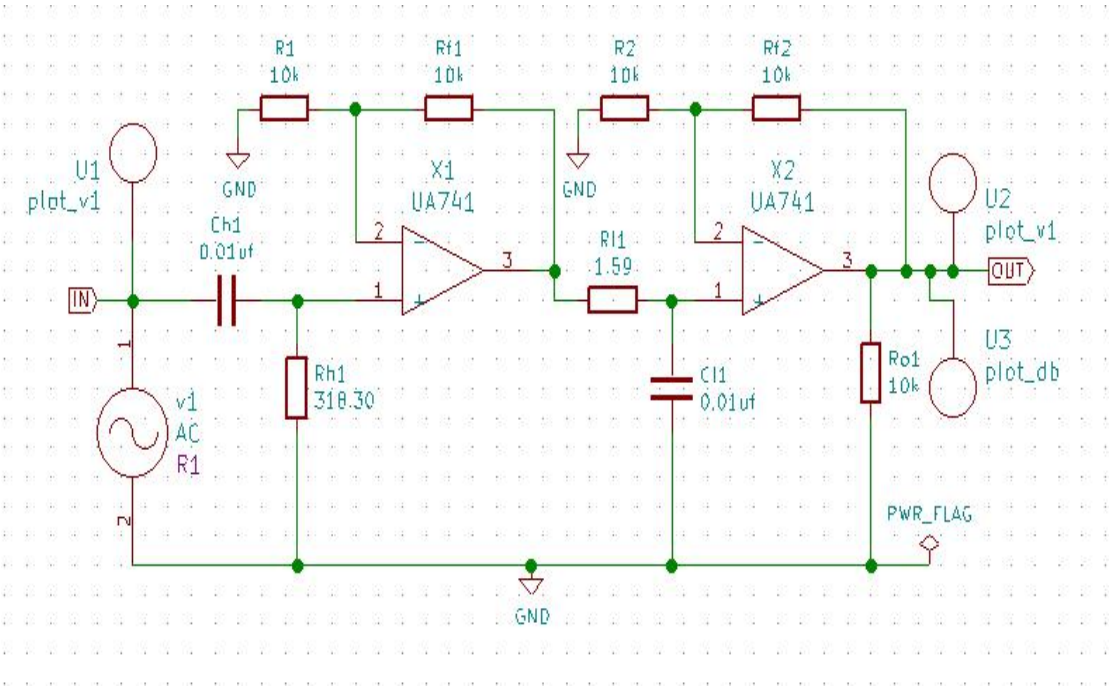

Figure 1: schematic diagram of Band pass filter using op-amp

SIMULATION PLOT:

1.NGSPICE PLOT:

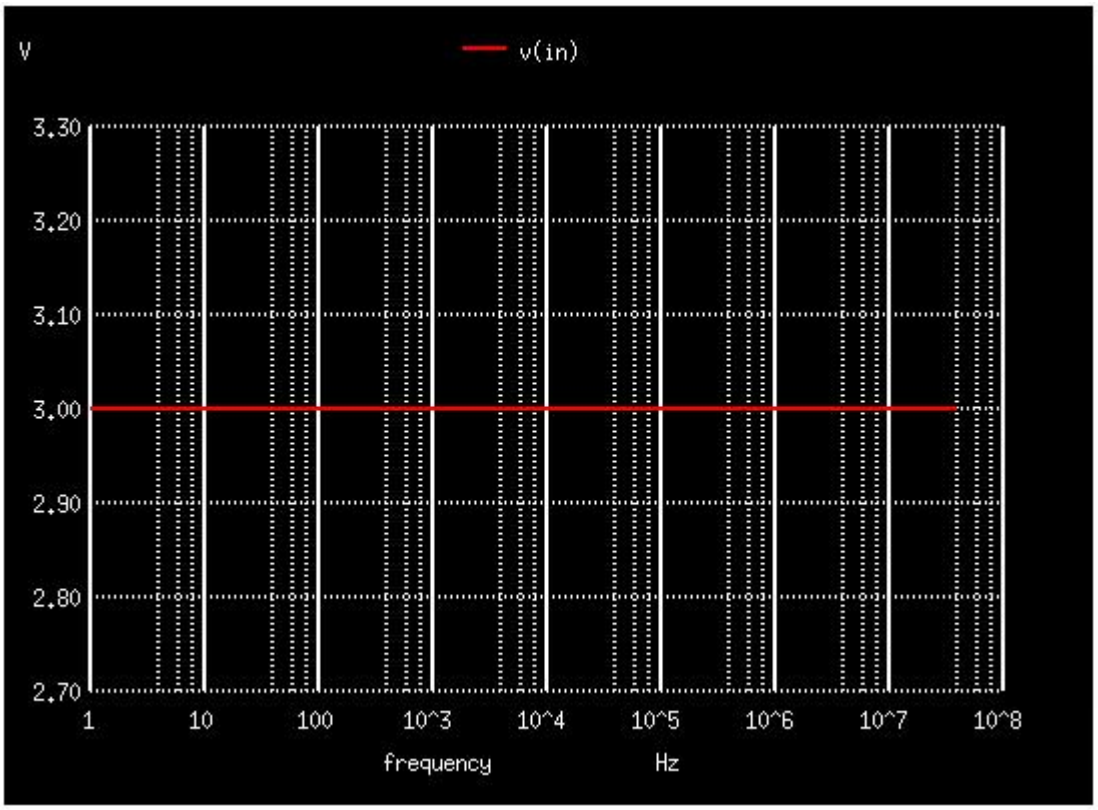

Figure 1: Ngspice input plot

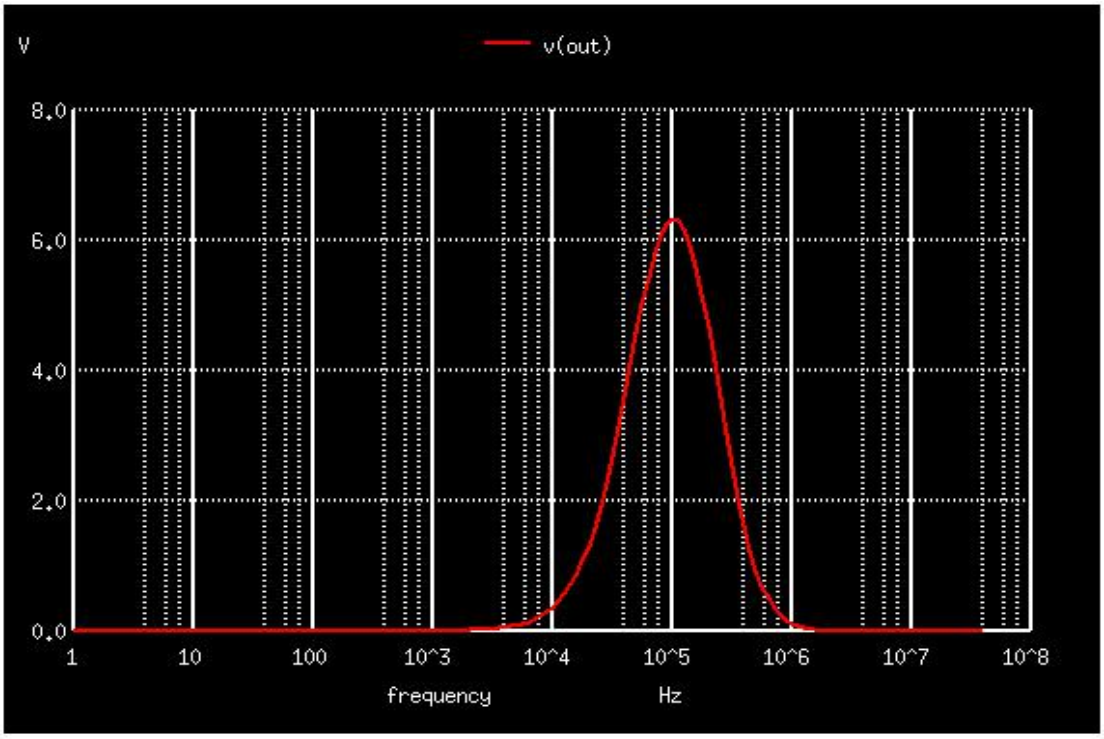

Figure 2: Ngspice output plot

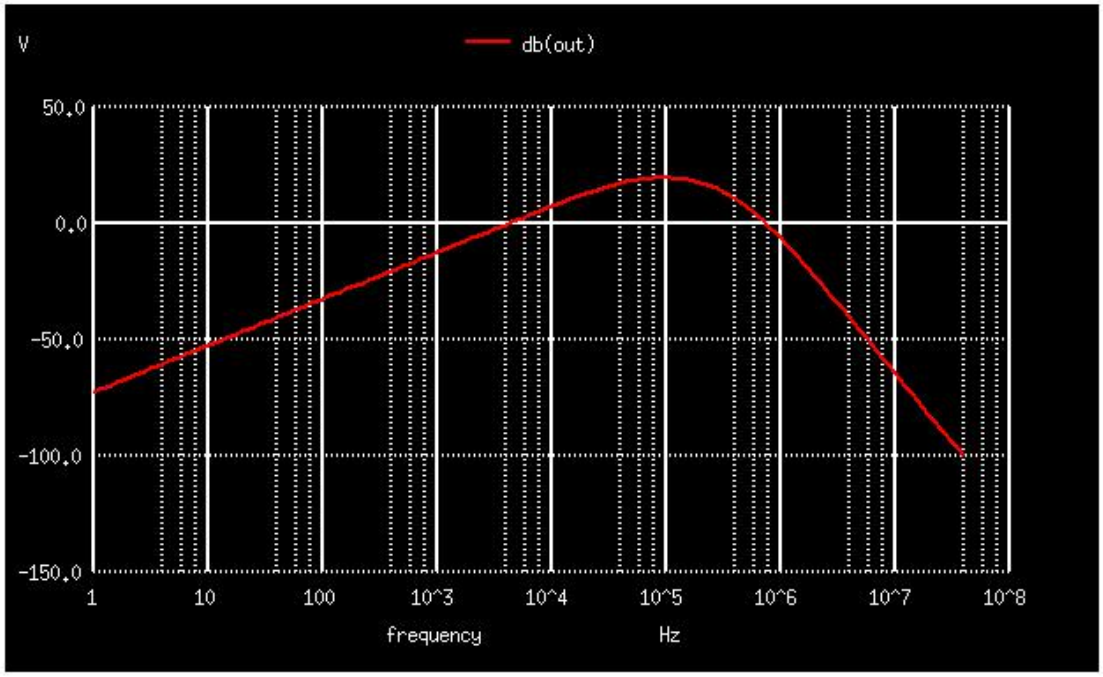

Figure 3: Ngspice frequency plot

CONCLUSION:

Thus we have studied the frequency response of the Band pass filter design using Op-Amp using eSim software and then simulated to get the appropriate waveforms.

REFERENCES:

1. https://www.electronicshub.org/active-band-pass-filter/
2. http://www.circuitstoday.com/band-pass-filters