

EXPERIMENT NO. 9
BANDPASS FILTER

AIM: To design, construct, test and to plot the frequency response of wide band pass filter.

APPARATUS REQUIRED:

S.No	Name of the Apparatus	Range/Value	Qty
1.	Bread Board	-	1
2.	IC Power Supply	±15 V	1
3.	Resistor	10 k Ω, 39.8 k Ω, 7.9 k Ω	4, 1
4.	IC 741 Op-Amp	-	1
5.	CRO	20 MHz.	1
6.	Signal Generator	0-3 MHz.	1
7.	Capacitor	0.01 μF	2
8.	Connecting Wires	-	Few

THEORY:

A wide band pass filter can be formed by cascading a HPF and LPF section. If the HPF and LPF are of the first order, then the band pass filter (BPF) will have a roll off rate of -20 dB/decade. A wide band pass filter formed by cascading I order HPF and I order LPF is shown in the circuit diagram.

DESIGN:

$f_h = 2\text{KHz}$; $f_l = 400\text{Hz}$; pass band gain $A_0 = 4$.

LPF and HPF sections may be designed to have a gain of 2.

As the opamp is used in non-inverting configuration $A_0 = 1 + (R_f/R_i) = 2 \Rightarrow R_f/R_i =$

$1 \Rightarrow R_f = R_i$. Let $R_i = 10\text{ k}\Omega$, $R_f =$.

$f_h = 1/(2\pi R_2 C_2) = 2\text{KHz}$. Let $C_2 = 0.01\mu\text{F}$, $R_2 =$

$1/(2\pi \times 2 \times 10^3 \times 0.01 \times 10^{-6}) = f_l = 1/(2\pi R_1 C_1) = 400\text{Hz}$. Let $C_1 =$

$0.01\mu\text{F}$, $R_1 = 1/(2\pi \times 400 \times 0.01 \times 10^{-6})$

RESULT:

Thus the Second order Band pass filter was designed and frequency response plot was drawn

Lower cutoff frequency: i. Theoretical = ii. Practical =

Upper cutoff frequency: i. Theoretical = ii. Practical