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	0.01μF	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 circuitdiagram.

DESIGN:

 $f_h = 2KHz$; $f_l = 400Hz$; 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 $A_0 = 1 + (R_f/R_i) = 2 \Rightarrow R_f/R_i =$

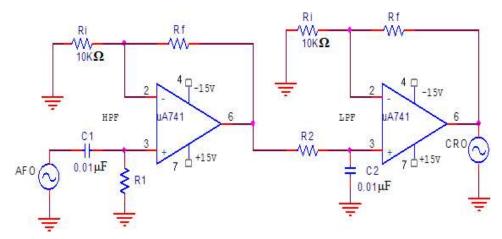
$$1 \Rightarrow R_f = R_i$$
. Let $R_i = 10 \text{ k}\Omega$, $R_f =$

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

 $1/(2\pi X2X10^3X0.01X10^{-6}) = fl = 1/(2\pi R1C1) = 400Hz$. Let C1=

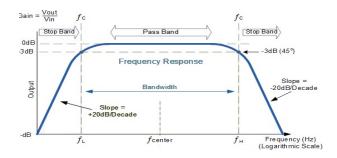
 $0.01\mu\text{F}$, R₁ = $1/(2\pi\text{X}400\text{X}0.01\text{X}10^{-6})$

CIRCUIT DIAGRAM



PROCEDURE:

- 1. Connect the Band pass filter circuit as shown in the circuit diagram.
- 2. Give an input signal V₁ of 1V (p-p) and measure the output voltage for different frequency.
- 3. Plot the frequency response 20 log V₀/V₁ versus input frequency and find 3db frequency.
- 4. Determine the cut-off frequency fh and fl.



TABULATION:

INPUT VOLTAGE: Vi = volts

Frequency (Hz)	Output voltage Vo (volts)	Gain in db 20 logV _O /V _i

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