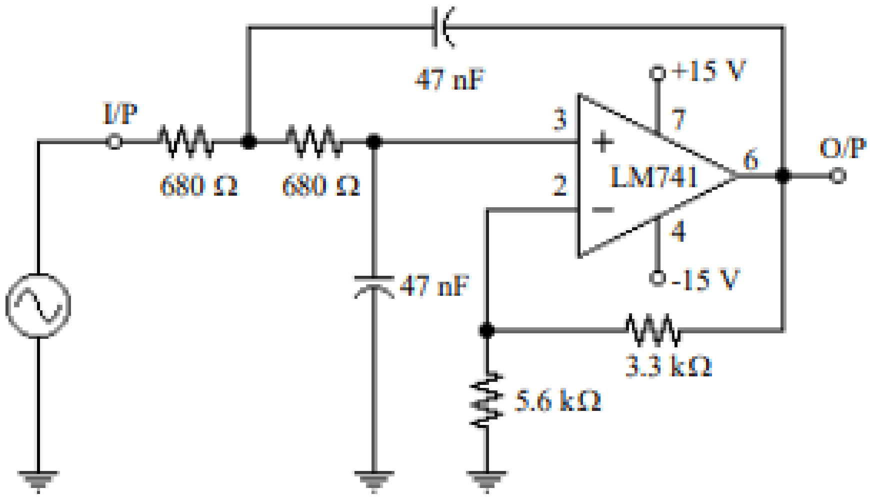
Active Filters (Butterworth)

1. Low pass 2nd order Butterworth filter.



Procedure:

Construct the circuit shown, then Fill the following table with V_{in} = 20 mV_{P-P} Calculate the output voltage (V_0) and gain (A_0) with frequency starting from 10 Hz till 1 M Hz.

Frequency (Hz)	10	20	30	50	100	150	200	400	500	800
V_{in} (mV)	20 mV_{pp}									
V_{out} (mV)										
Gain= A_V										

Frequency (KH z)	1	2	5	10	20	50	80	100	200	500
V_{in} (mV)	20 mV_{pp}									
V_{out} (mV)										
Gain= A_V										

Frequency (MH z)	1	1.5	2	2.5	3	3.5	4	4.5	5	10
V_{in} (mV)	20 mV_{pp}									
V_{out} (mV)										
Gain= A_V										

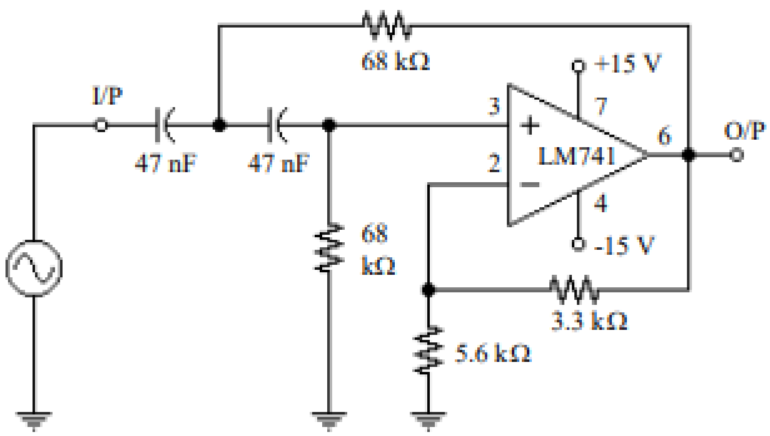
Plot a graph showing the relation between the gain (A_V) and frequency (Hz).

From graph determine:

Maximum gain A_o = ………..

Cut-off frequency f_c= ……

2. High pass 2nd order Butterworth filter.



Procedure:

Construct the circuit shown, then Fill the following table with $V_{in} = 20\ mV_{P-P}$ Calculate the output voltage (V_0) and gain (A_0) with frequency starting from 10 Hz till 1 M Hz.

Frequency (H z)	10	20	30	50	100	150	200	400	500	800
V_{in} (mV)	20 mV_{pp}									
V_{out} (mV)										
Gain= A_V										

Frequency (KH z)	1	2	5	10	20	50	80	100	200	500
V_{in} (mV)	20 mV_{pp}									
V_{out} (mV)										
Gain= A_V										

Frequency (MH z)	1	1.5	2	2.5	3	3.5	4	4.5	5	10
V_{in} (mV)	20 mV_{pp}									
V_{out} (mV)										
Gain= A_V										

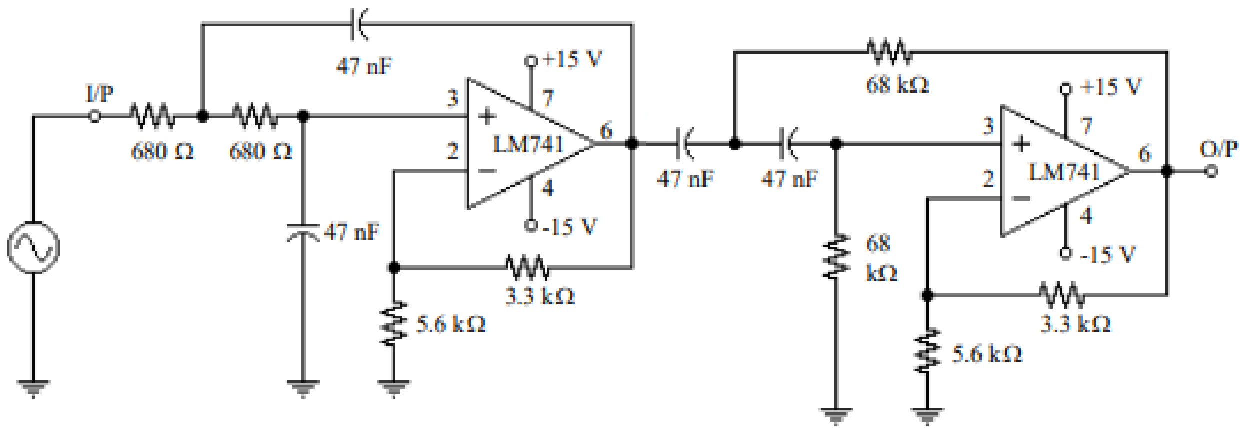
Plot a graph showing the relation between the gain (A_V) and frequency (Hz).

From graph determine:

Maximum gain A_o = ………..

Cut-off frequency f_c = …….

3. Band pass 2nd order Butterworth filter.



Frequency (H z)	10	20	30	50	100	150	200	400	500	800
V_{in} (mV)	20 mV_{pp}									
V_{out} (mV)										
Gain= A_V										

Frequency (KH z)	1	2	5	10	20	50	80	100	200	500
V_{in} (mV)	20 mV_{pp}									
V_{out} (mV)										
Gain= A_V										

Frequency (MH z)	1	1.5	2	2.5	3	3.5	4	4.5	5	10
V_{in} (mV)	20 mV_{pp}									
V_{out} (mV)										
Gain= A_V										

Plot a graph showing the relation between the gain (A_V) and frequency (Hz).

From graph determine:

Maximum gain A_o = ………..

Cut-off frequencies f_{c1}, f_{c2} = …….