Basic EC Lab Exam

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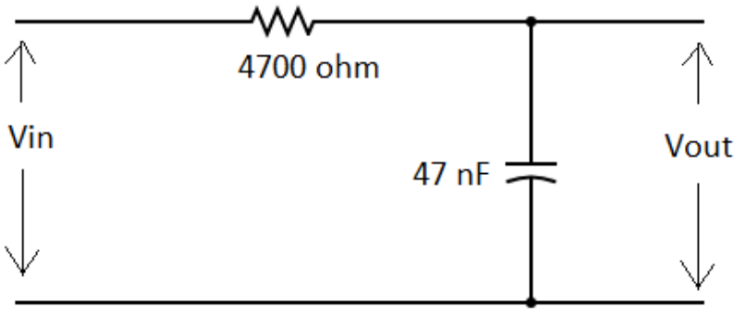
1. Problem Statement:

Experiment No. 1

Design a CR filter given below. Apply a sinusoidal signal at the input of 2 Vp-p. Vary the frequency in appropriate steps by keeping the amplitude of input signal fixed. Plot the gain vs. frequency graph. Determine the type of filter. Find the 3 dB cut-off frequency from the graph and compare it with the theoretical cut-off frequency.



2. Aim of the experiment:

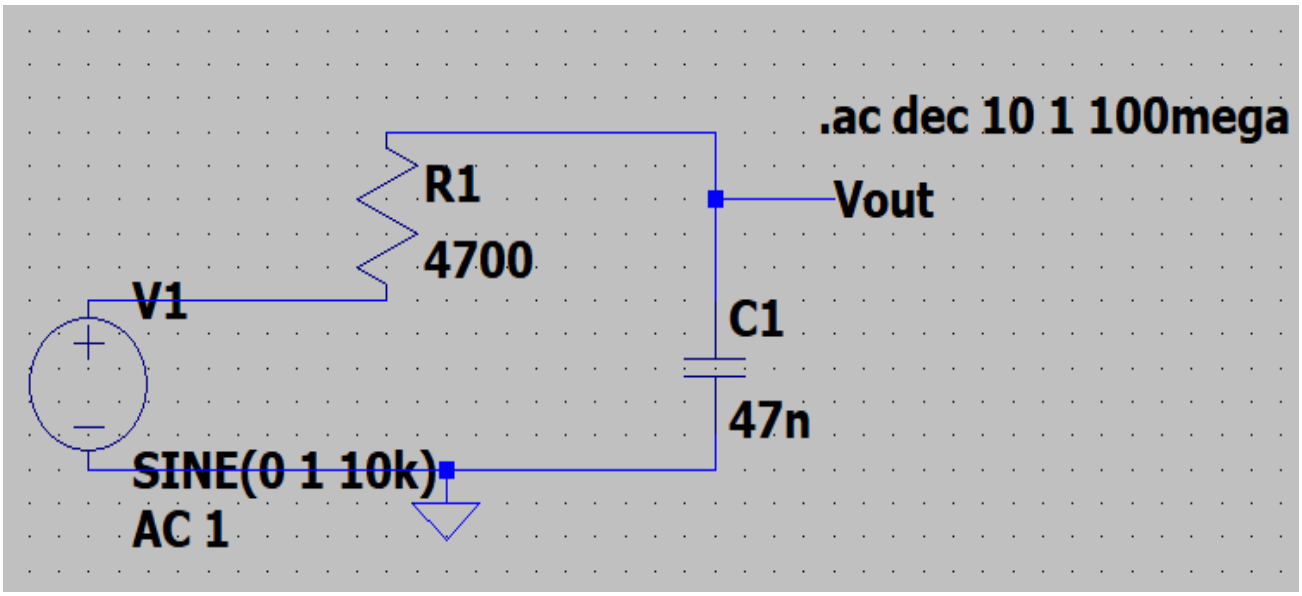
- To analyse the frequency response of the given circuit (low pass filters).
- To verify the theoretical and experimental values of 3dB cutoff frequency for the given circuit.

3. Software Used: LtSpice

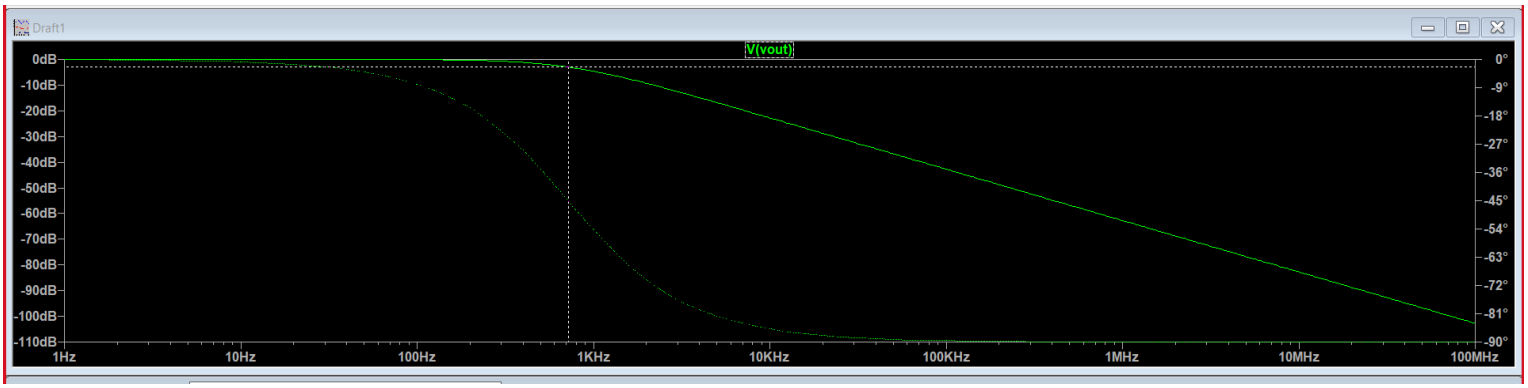
4. Tools used:

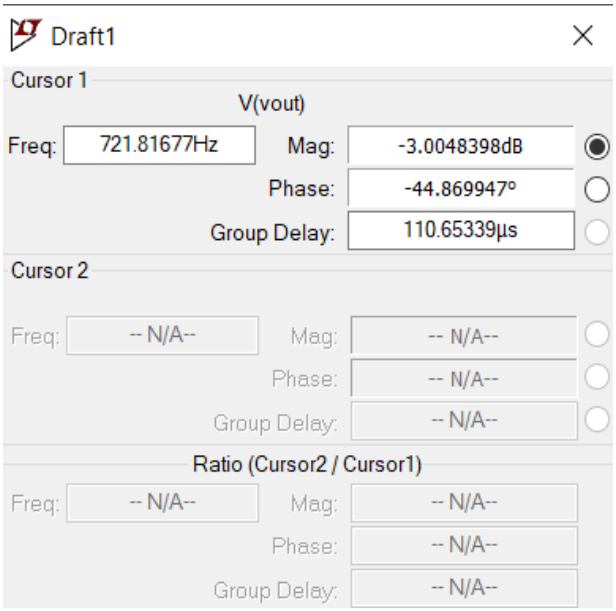
- 4700 ohm resistor
- 47 nF capacitor
- Wires
- AC voltage source with amplitude 1 V and variable frequency

5. Circuit :

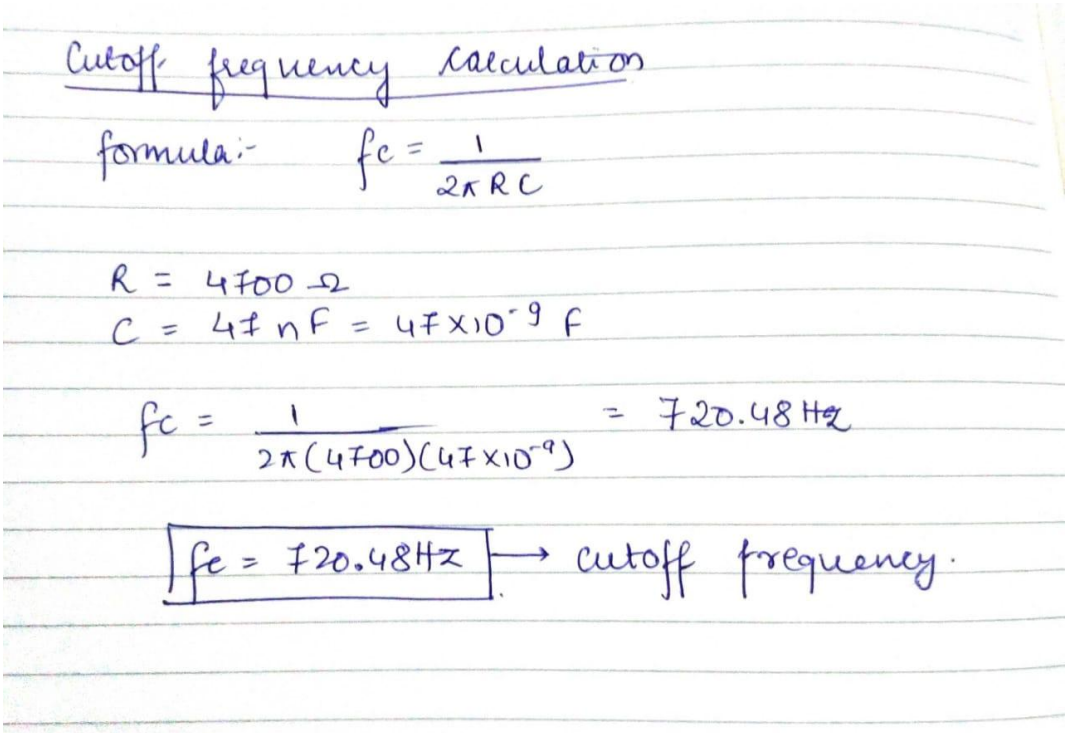


6. Graph :





7. Calculation:



8. Conclusion:

- The given RC filter is a **low pass filter.** It filters out high frequency inputs and alloes only low frequency inputs to pass through it.
- The **3 dB cutoff frequency according to the graph** is approximately **721.81 Hz.**
- The **calculated value of 3dB cutoff frequency** is **720.48 Hz.**
- Hence, the experimental and the theoretical values of cutoff frequency are are approximately of the same value.

9. Discussions:

- While performing the experiment, I observed that there were jumps in the graph initially as the data points I was plotting were far apart from each other. I finally got a smooth frequency response graph as when I increased the number of data points plotted in any frequency interval. In other words I plotted points that were close enough to give a smooth output graph.
- Low pass filters are used as noise filters. Noise has high frequency that is filtered out by low pass filters.
- Ideally we need to observe a phase shift of 90^0 but we see that this doesn't happen suddenly. The phase shift happens gradually and finally reaches -90^0 from 0^0 at high frequencies.