Lab experiment: Part 1: RC circuits

1. Connect the RC circuit shown in Fig.1. Observe input and output voltage waveforms for V_{in} = 10Vpp, $50Hz$ sinusoidal signal, R=1KΩ and C=1μF.

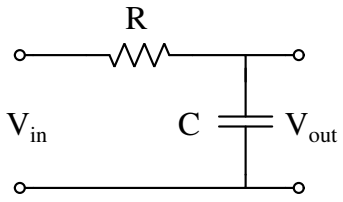

Figure 1: RC circuit-1

2. Vary the frequency of V_{in} from $50Hz$ to 50kHz with appropriate steps and measure V_{out} and phase difference between V_{out} and V_{in} keeping the magnitude of V_{in} constant.
3. Plot the frequency response (log magnitude and phase w.r.t. log frequency).
4. Comment on these plots.
5. Now apply a square wave input of $10V_{PP}$ and $100Hz$ that varies from -5V to +5V.
6. Observe the input and output waveforms for 100Hz, 500Hz, 1kHz, 5kHz, 10kHz, 50kHz, and 100kHz.
7. Explain your observations.
8. Now add a DC offset of +5V so that V_{in} varies from 0 to 10V.
9. Observe the input and output waveforms for 100Hz, 1kHz, 10kHz, and 100kHz.
10. Change the duty cycle of the input voltage to 10 % and observe the input output waveforms.
11. Modify the circuit as shown in Fig.2. and repeat the steps 1 to 10 for this circuit.
12. Explain your observations.

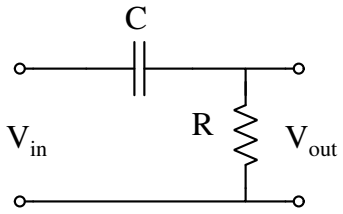

Figure 2: RC circuit-2