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MATRIC NUMBER: 17/ENG02/061

DEPARTMENT: COMPUTER ENGINEERING

A. Discuss the benefits of filters in engineering system.

1. Treble & bass of the speaker: The bass has lower frequencies & treble has higher frequencies. They are separated using high pass & low pass filter and are separately routed to corresponding bass speaker & treble speaker for clear music.

2. Anti-Aliasing: it is a low pass filter that filters out the high-frequency components from a signal before sampling. It prevents the aliasing component form being sampled.

3. The tuner in radio: The bandpass filter in the tuner of the radio allows a fixed frequency to the output speaker.

4. Notch Filter: they are band rejects filters with a narrow bandwidth that filter out any interfering signal.

5. Power Supply Smoothing: The output of the power supply which is a rectifier has an AC ripple in it. These frequencies are filtered out using a low pass filter which results in smoothing the output signal.

6. Noise suppression: They are used in communication systems for noise removal from the received signals.

B.

Procedure

Amplitude: 0.5V

1. I opened the Simulink Library Browser and chose the following blocks:

1. Ground

2. Ac Voltage Source

3. Voltage Measurement

4. Scope

5. Series RLC Branch

2. I connected the resistor, capacitor, AC voltage source and the ground terminal signals together.

3. I connected the voltage measurement device with the terminals of the resistor and the capacitor signals.

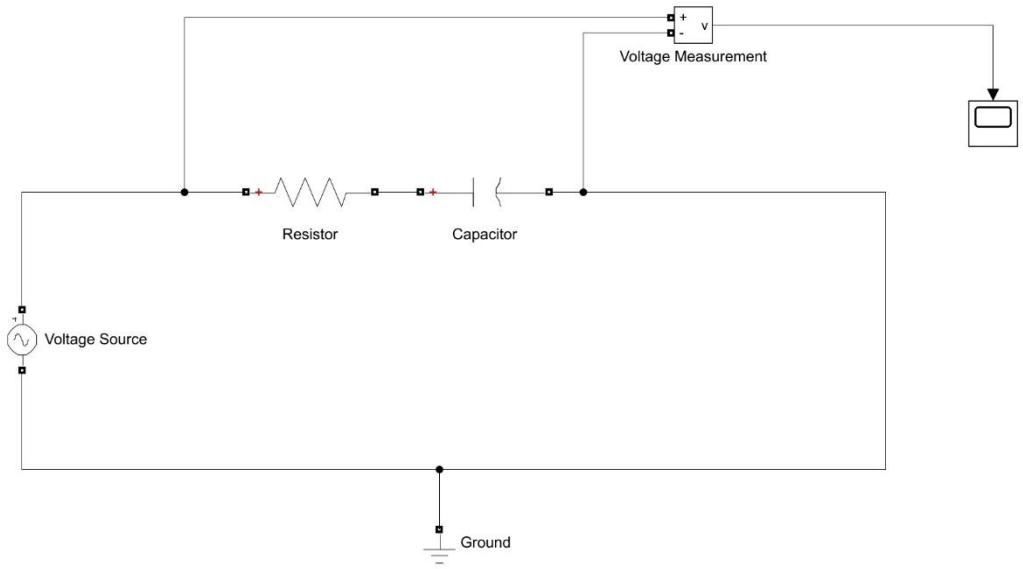
4. I connected the scope with the voltage measurement device.

C. The cut-off frequency is $\frac{1}{2*pi*R*C}$

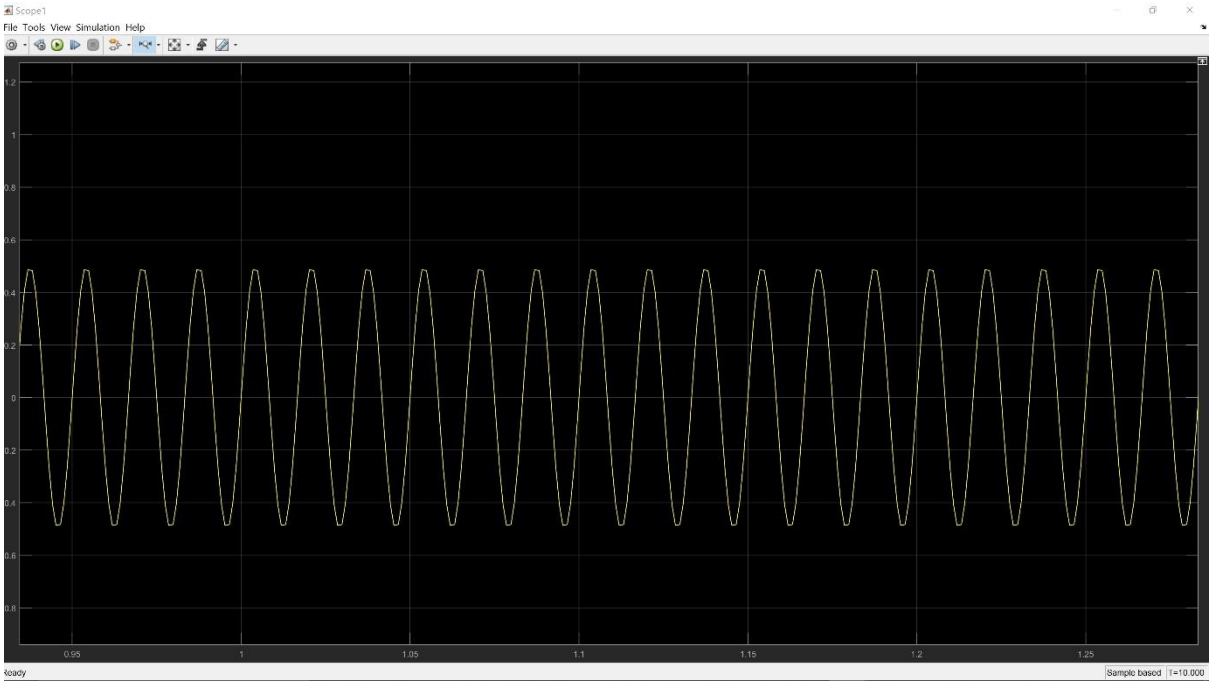
Cut-off Frequency = $\frac{1}{2*3.142*(0.005)*(0.01)}$ = 3182.686 Hz

D.

The Simulated design of the Low Pass Filter Circuit

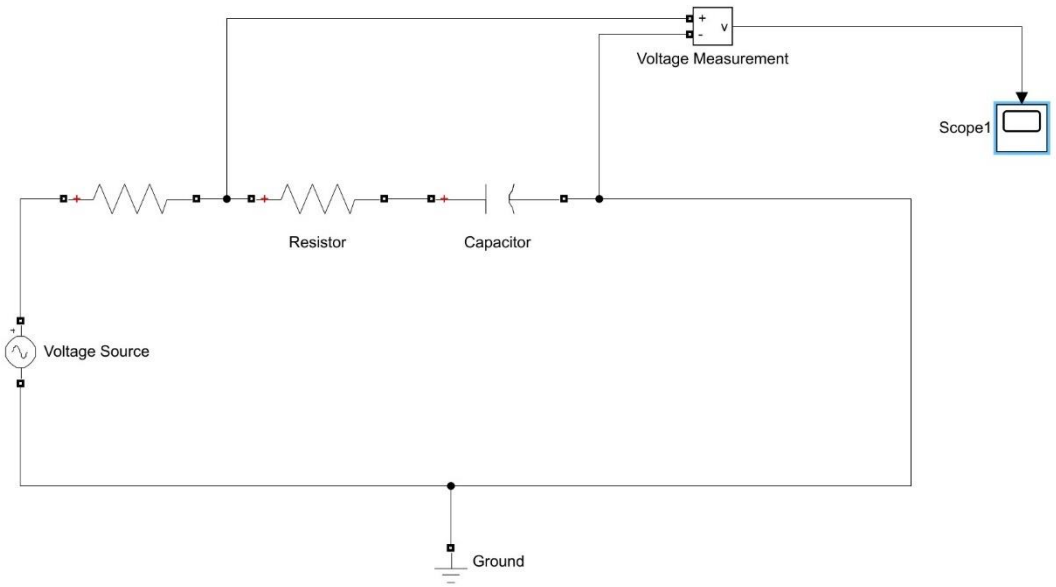


Output

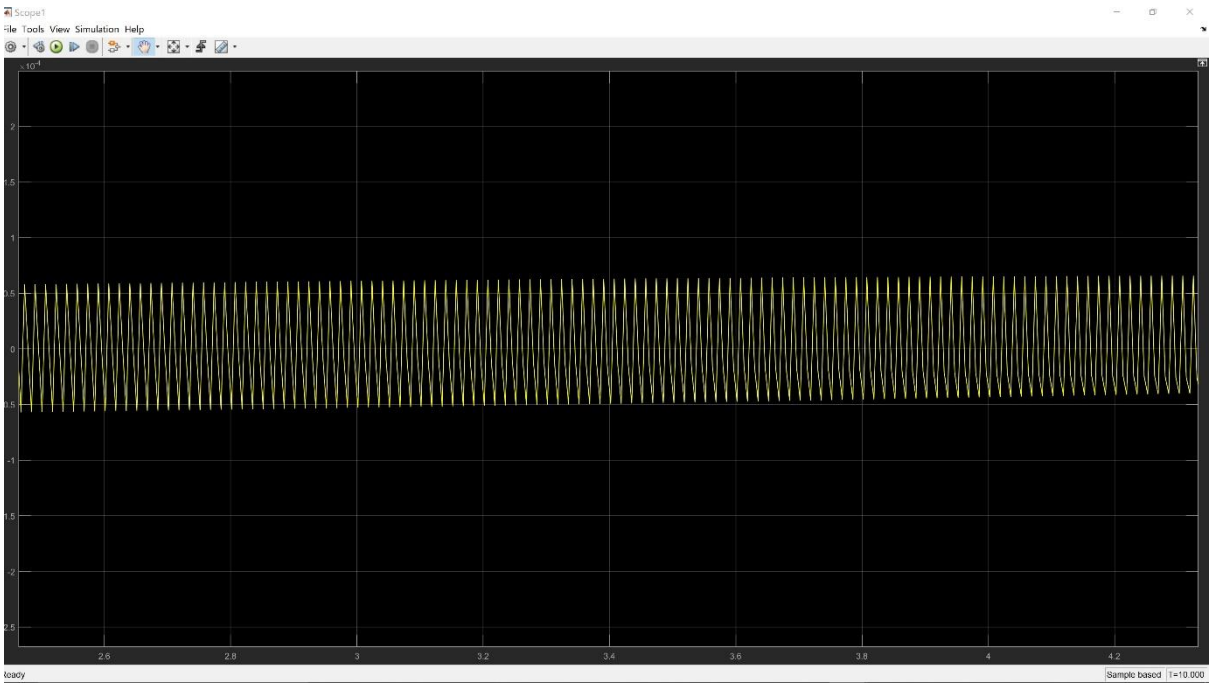


E.

When I added a signal of 5000 ohms,

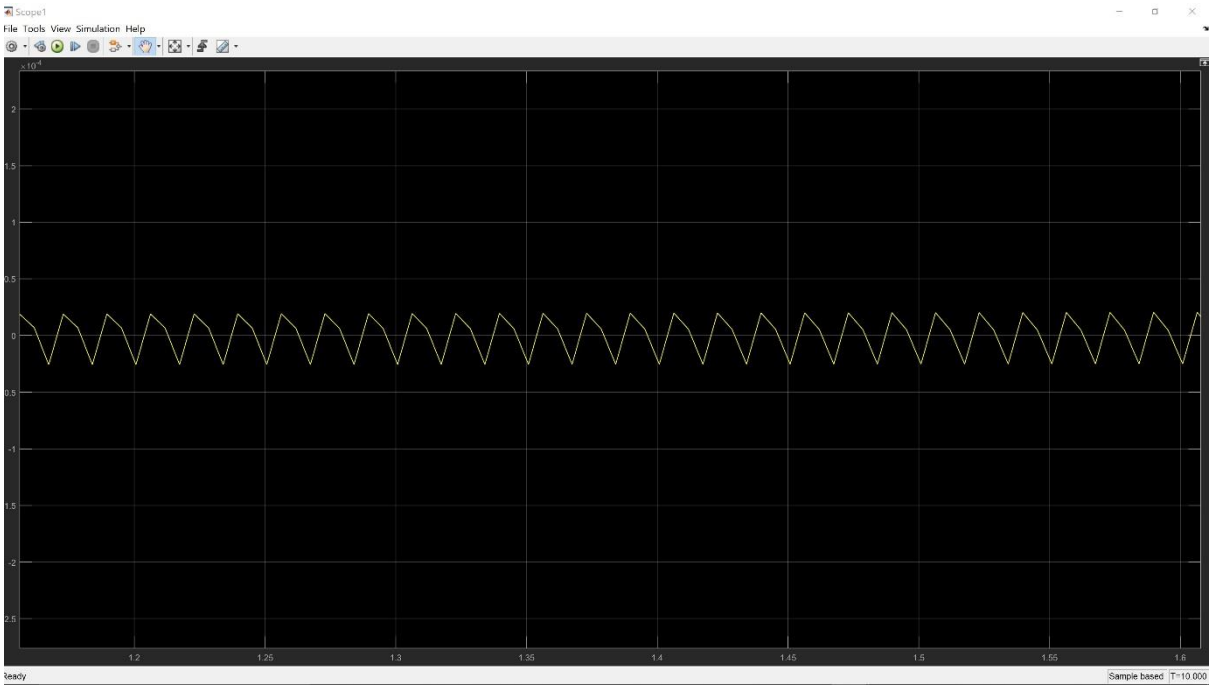


Output



I observed that the amplitude increased gradually from 0.5 through the duration of the signal.

When I added a signal of 2000 ohms,



I observed that the initial amplitude of the waveform reduced to 0.2V and it also rose gradually during the duration of the signal.