

James evidence

17/eng06/049

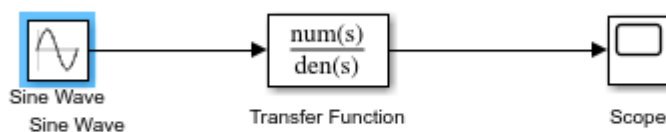
Mechanical engineering.

A.

- **Radio Communications:** Filters enable radio receivers to only "see" the desired signal while rejecting all other signals (assuming the other signals have different frequency content).
- **DC power supplies:** Filters are used to eliminate undesired high frequencies (i.e., noise) that are present on AC input lines. Additionally, filters are used on a power supply's output to reduce ripple.
- **Audio electronics:** A crossover network is a network of filters used to channel low-frequency audio to woofers, mid-range frequencies to midrange speakers, and high-frequency sounds to tweeters.
- Used in Audio Applications for Equalization purposes.
- Used in Receivers such as Superheterodyne etc for efficient reception of the baseband signals.

**B. Designing a Low-Pass Filter with 0.005Ω resistor and 0.01F capacitor**

A 100V Amplitude was selected with a frequency of 1Hz for the Sine Wave Source.



### C. Determining the Cut-off frequency

The cut-off frequency is calculated by  $F = \frac{1}{2\pi RC}$

When  $R = 0.005\Omega$  and  $C = 0.01F$

$F = \frac{1}{2\pi \cdot 0.005 \cdot 0.01} = 3189.099 \text{ Hz}$

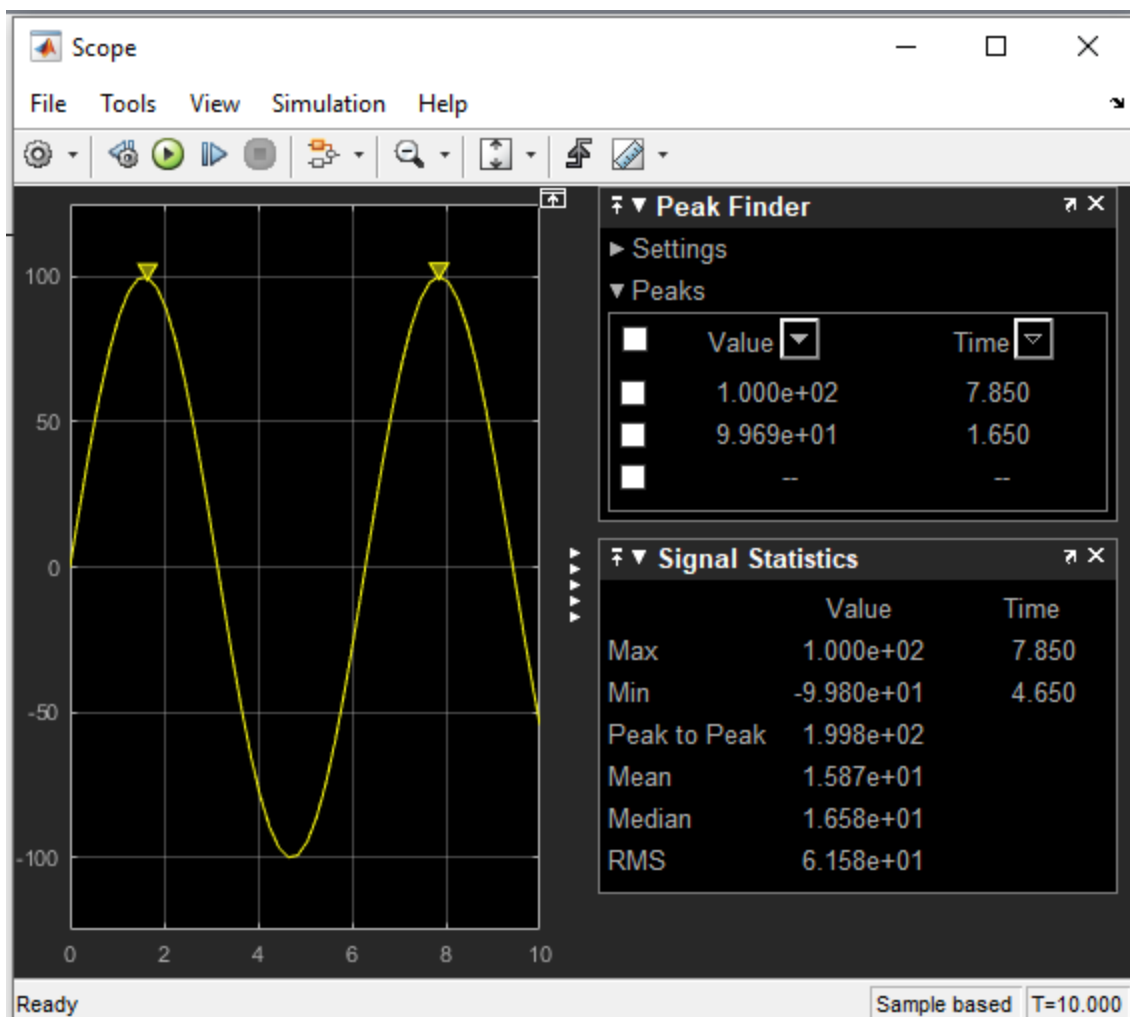
### D. Design Output

The transfer function equation for the circuit is given as

$$\frac{1/RC}{S + 1/RC}$$

When  $R = 0.005\Omega$  and  $C = 0.01F$

$$\text{Transfer Fcn} = \frac{1/0.005 \cdot 0.01}{S + (0.005 \cdot 0.01)} = \frac{20000}{s + 20000}$$



**A. If two signals of 5 KΩ and 2 KΩ are pass through the filter at different intervals. Discuss your observation**

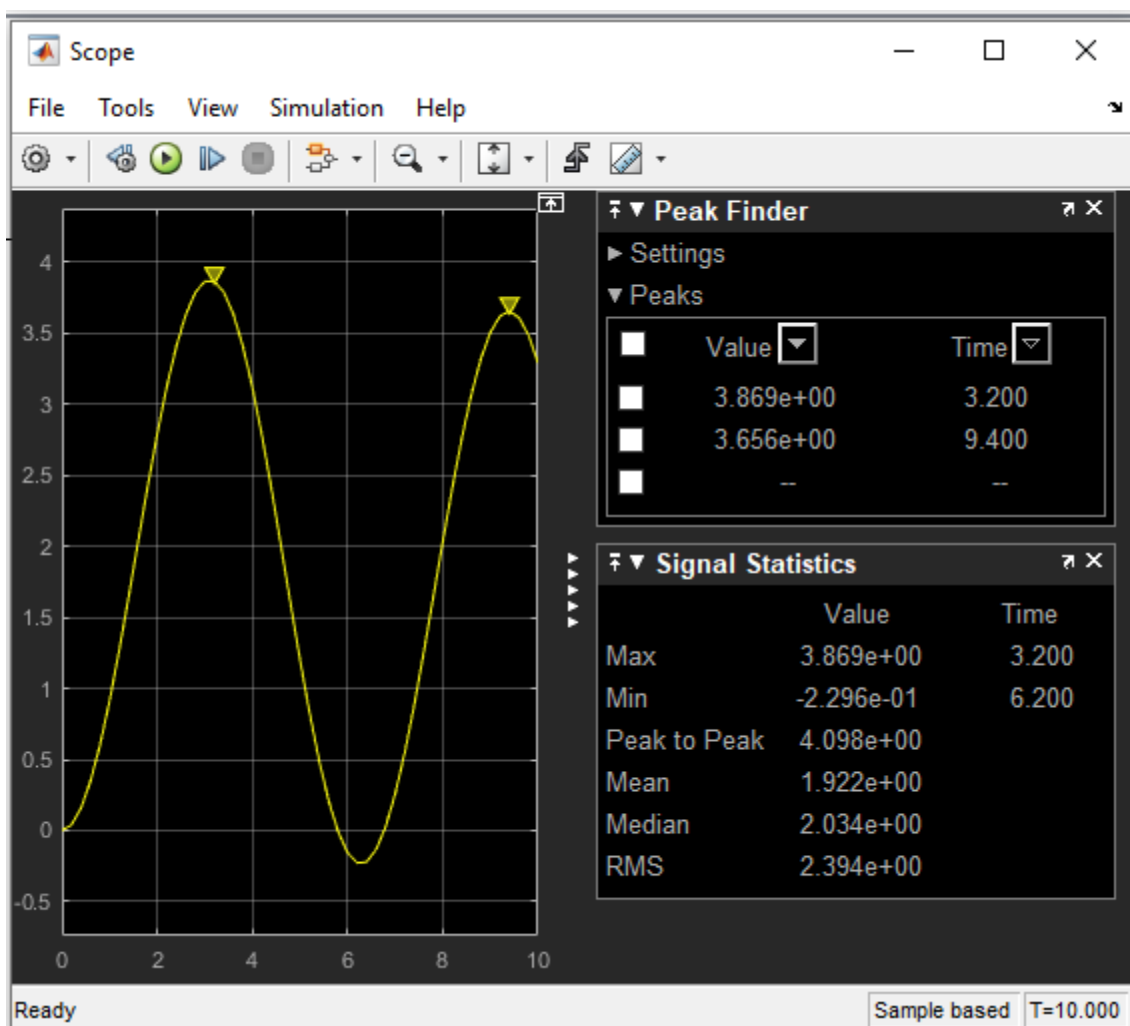
**When the signal of 5 KΩ is passed through the filter, the following result is obtained:**

The transfer function equation for the circuit is given as

$$(1/RC)/(S + 1/RC)$$

When R= 5000Ω and C= 0.01F

$$\text{Transfer Fcn}=(1/5000*0.01)/(S + (5000*0.01))= (0.02)/(s+ 0.02)$$



**Observations:** The signal is attenuated to 3.869 ohms

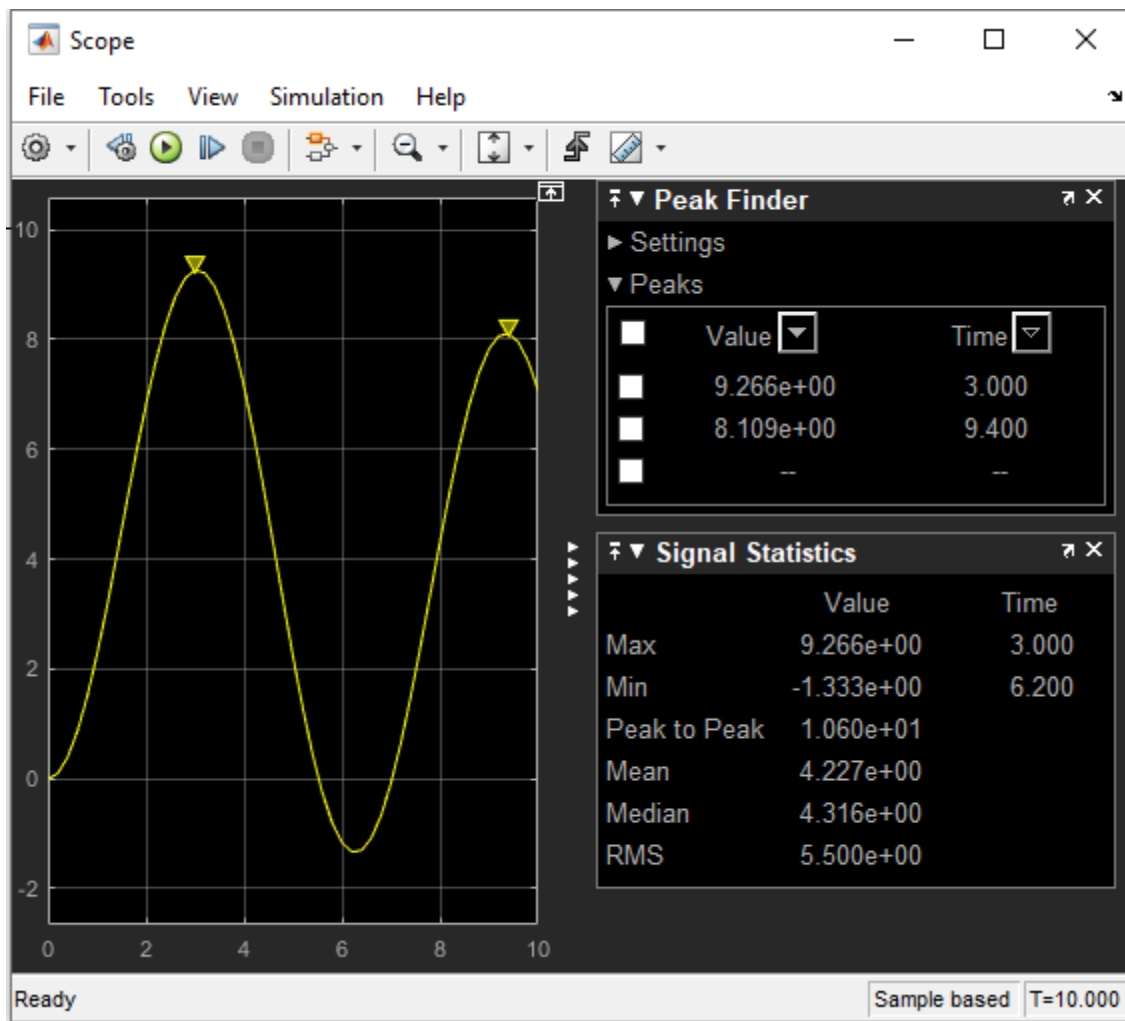
**When the signal of 2K ohms is passed through the filter the following results are obtained:**

The transfer function equation for the circuit is given as

$$(1/RC)/(S + 1/RC)$$

When R= 2000Ω and C= 0.01F

$$\text{Transfer Fcn}=(1/2000*0.01)/(S + (2000*0.01))= (0.05)/(s+ 0.05)$$



**Observations:** The signal is attenuated to 9.266 ohms

