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MATRIC NUMBER: 17/ENG02/029

DEPARTMENT: COMPUTER ENGINEERING

1. A filter is a circuit capable of passing (or amplifying) certain frequencies while attenuating other frequencies. Thus, a filter can extract important frequencies from signals that also contain undesirable or irrelevant frequencies.

   I. **Radio communications:**
   Filters enable radio receivers to only "see" the desiredRadio communications: Filters enable radio receivers to only "see" the desired signal while rejecting all other signals (assuming that the other signals have different frequency content).

   II. **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.

   III. **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.

   IV. **Analog-to-digital conversion:**
   Filters are placed in front of an ADC input to minimize aliasing

2. <u>Designing a Low-Pass Filter with 0.005Ω resistor and 0.01F capacitor</u>

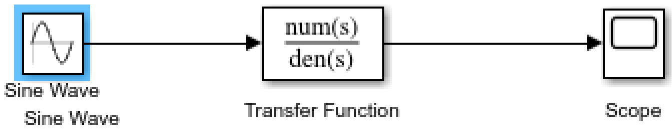
A 100V Amplitude was selected with a frequency of 1Hz for the Sine Wave Source.

3. <u>Determining the Cut-off frequency</u>

The cut-off frequency is calculated by F= ½*(pi*R*C)

When R= 0.005Ω and C= 0.01F

F= 0.5*pi*0.005*0.01=3189.099 Hz



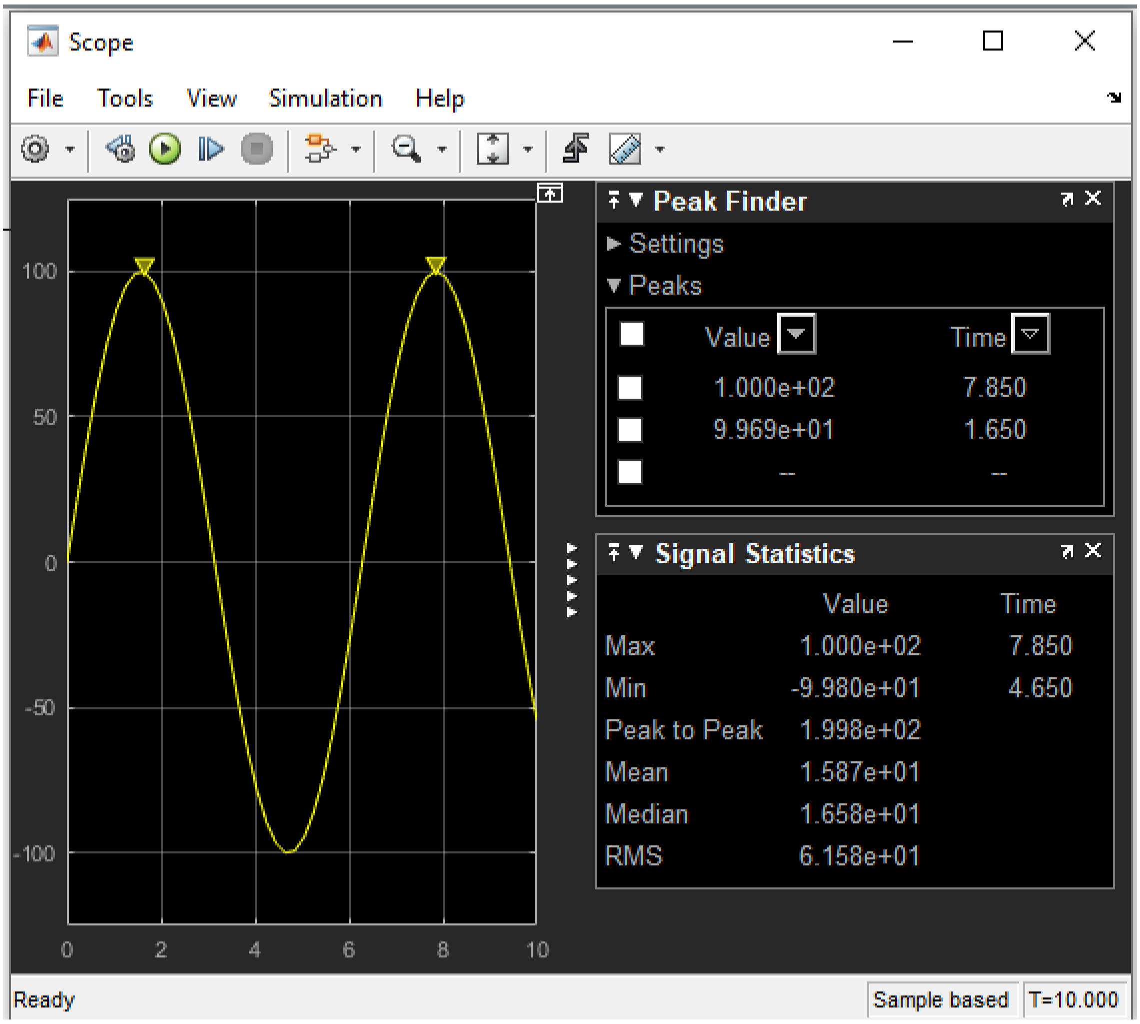
4. Design Output

The transfer function equation for the circuit is given as

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

When R= 0.005Ω and C= 0.01F

Transfer Fcn = (1/0.005*0.01)/ (S + (0.005*0.01))= (20000)/(s+ 20000)



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

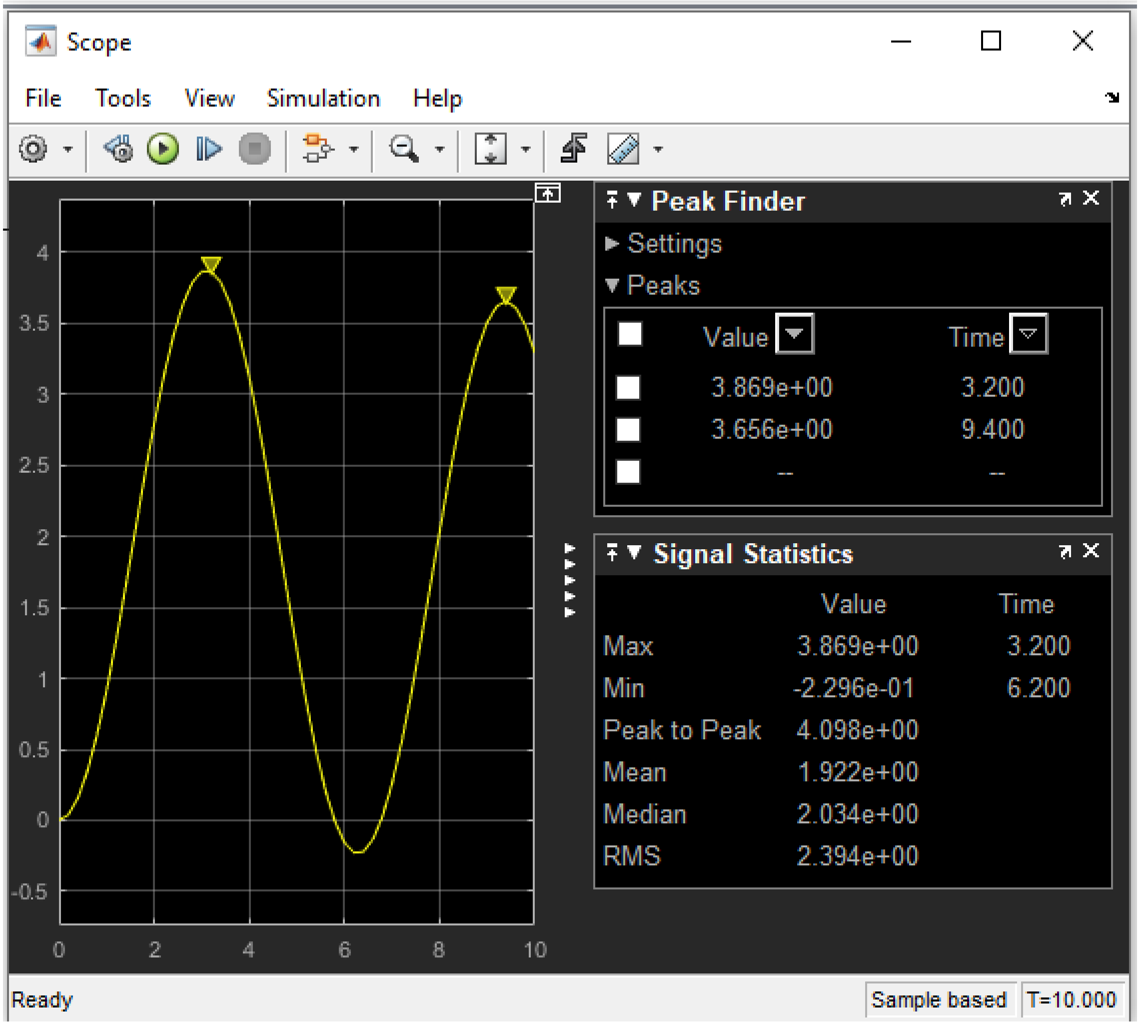
When the signal of 5 KΩ is passed through the filter, the following result is obtained:

The transfer function equation for the circuit is given as

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

When R= 5000Ω and C= 0.01F

Transfer Fcn= (1/5000*0.01)/ (S + (5000*0.01)) = (0.02)/ (s+ 0.02)



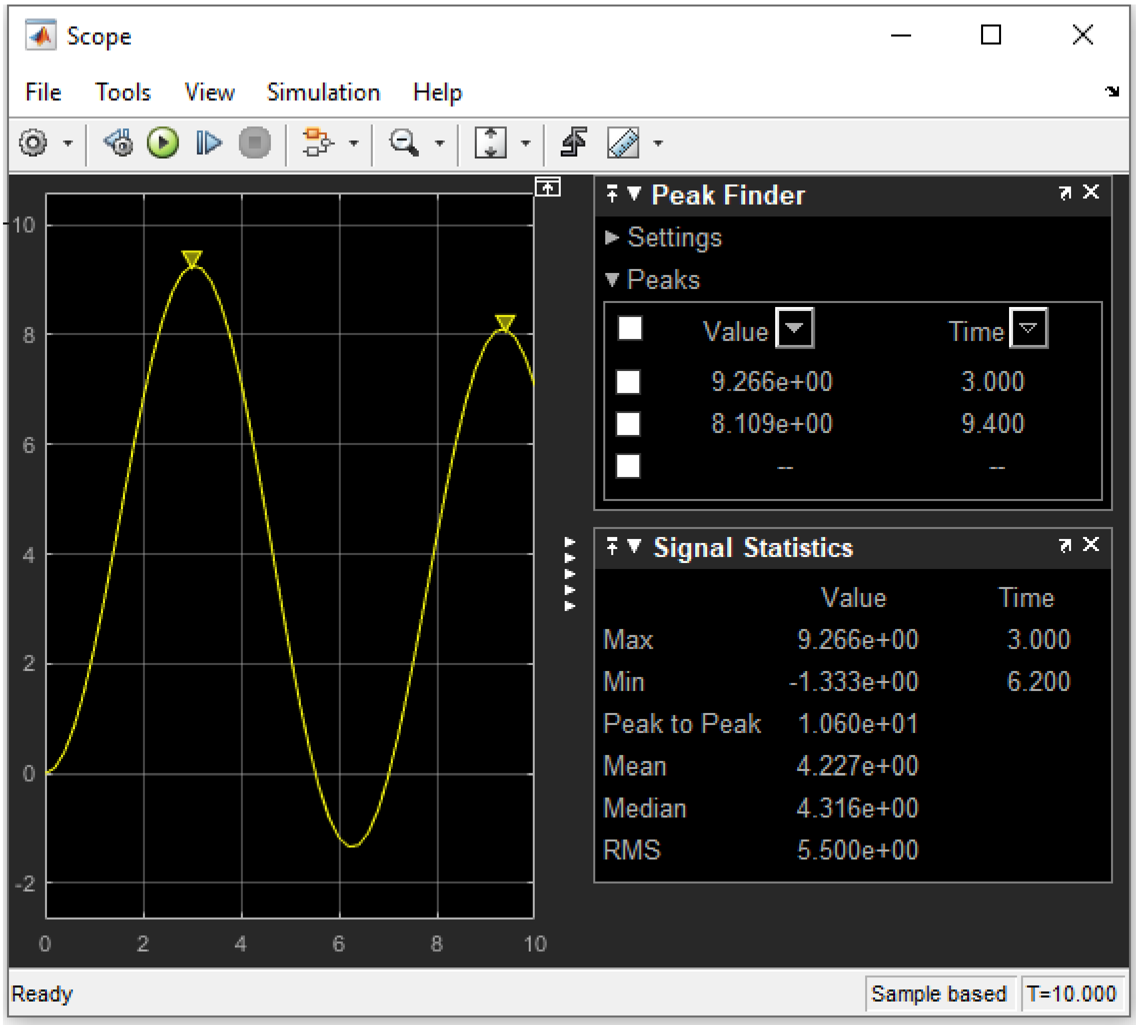
Observation**:** The signal is attenuated to 3.869 ohms

When the signal of 2K ohms is passed through the filter the following are obtained results**:** The transfer function equation for the circuit is given as

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

When R= 2000Ω and C= 0.01F

Transfer Fcn= (1/2000*0.01)/ (S + (2000*0.01)) = (0.05)/ (s+ 0.05)



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