NAME: NDIBE ARIZE CHUKWUEMEKA

MATRIC NO: 17/ENG06/056

DEPARTMENT: MECHANICAL ENGINEERING

COURSE: ENG 342

A. What are the Benefits of filters in Engineering Systems

In engineering system, a filter is a device or process that removes some unwanted components or features from a signal. They are also widely used in electronics and telecommunications, in radio, television, image processing, computer graphics etc. There are many different bases of classifying filters and these overlap in many different ways; there is no simple hierarchical classification. Filters may be:

- ✓ Non-linear or linear
- ✓ Time-variant or time-invariant, also known as shift invariance. If the filter operates in a spatial domain then the characterization is space invariance.
- ✓ Causal or not-causal: A filter is non-causal if its present output depends on future input. Filters processing time-domain signals in real time must be causal, but not filters acting on spatial domain signals or deferred-time processing of time-domain signals.
- ✓ Analogue or digital.
- ✓ Discrete-time (sampled) or continuous-time.
- ✓ Passive or active type of continuous-time filter.
- ✓ Infinite impulse response (IIR) or finite impulse response (FIR) type of discrete-time or digital filter.

  Below are few applications of filters:

  In Transmission Communications: with the aid of filters, transmission receivers will be able to only "see" the desired signal while rejecting all other signals that may be interfering.

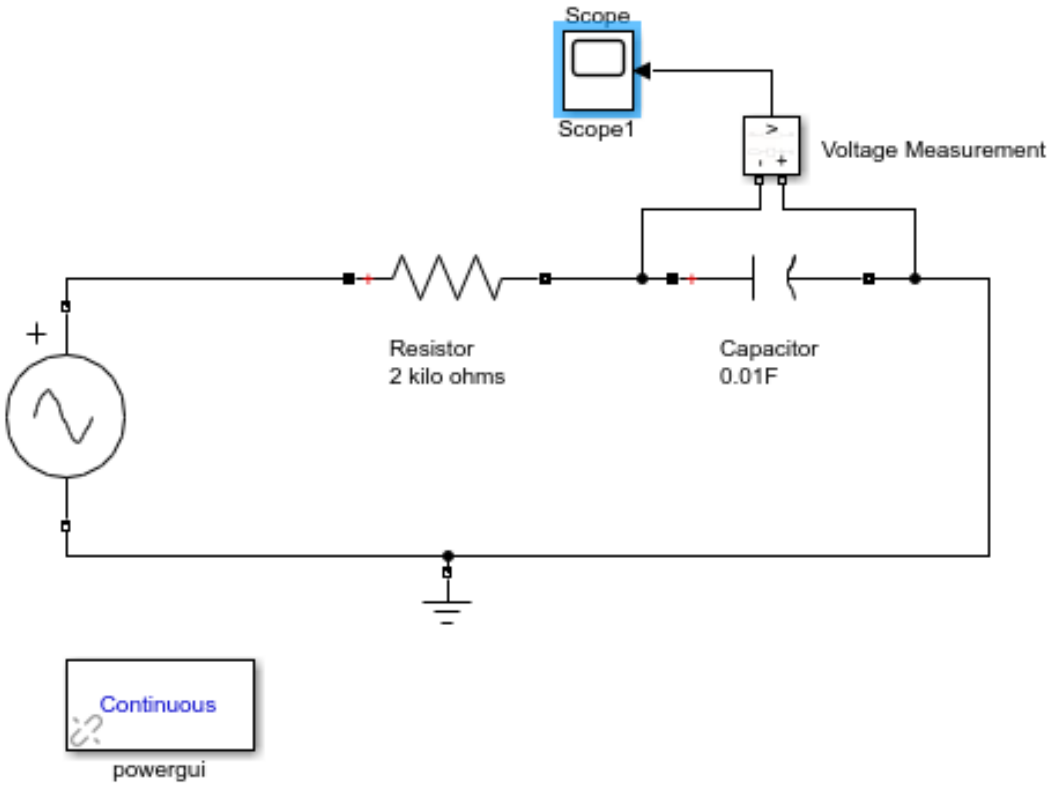
  In Multilevel and multiphase digital modulation: systems require filters that have flat phase delay. They are linear phase in the pass band. They are used to preserve pulse integrity in the time domain, giving less intersymbol interference than other kinds of filters.

  Analog audio systems using analog transmission can tolerate much larger ripples in phase delay, and so designers of such systems often deliberately sacrifice linear phase to get filters that are better in other ways i.e. better stop-band rejection, lower passband amplitude ripple, lower cost, etc.

  High-pass and low-pass filters are also used in digital image processing to perform image modifications, enhancements, noise reduction, etc.

B. A Low-Pass Filter with 0.005Ω resistor and 0.01F capacitor

For the Ac Voltage source 100V Amplitude was chosen with a frequency of 10Hz



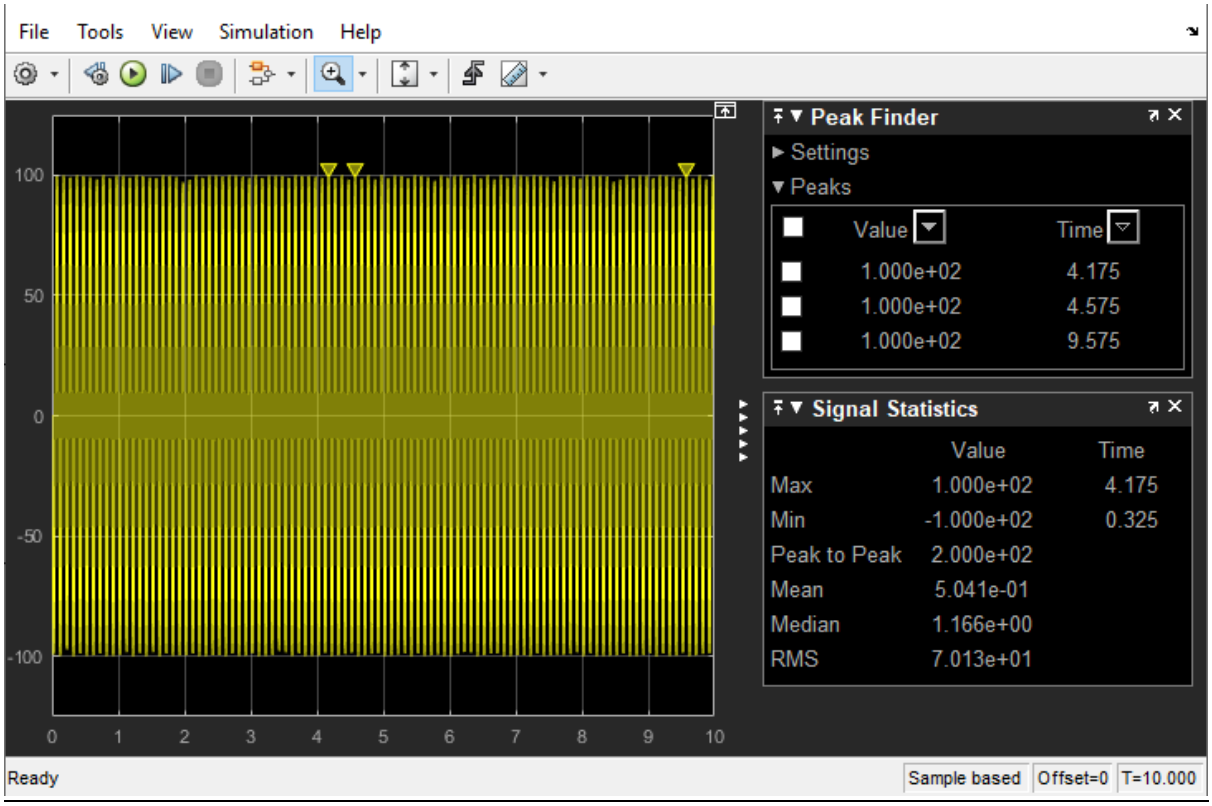
C. The Cut-off frequency of the above

The cut-off frequency can be determined by F= ½*(pi*R*C)

The parameters are R= 0.005Ω and C= 0.01F

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

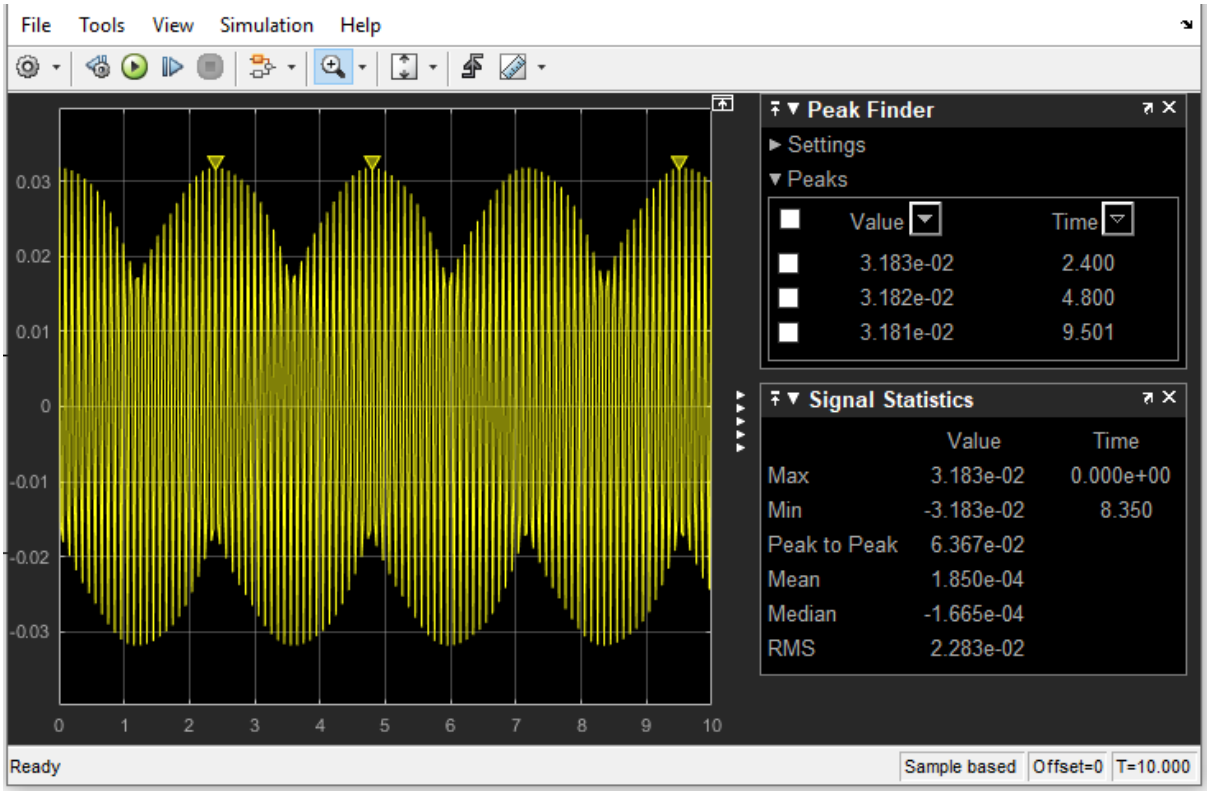
D. The Design Output



the peak value which is also the input voltage is 100.

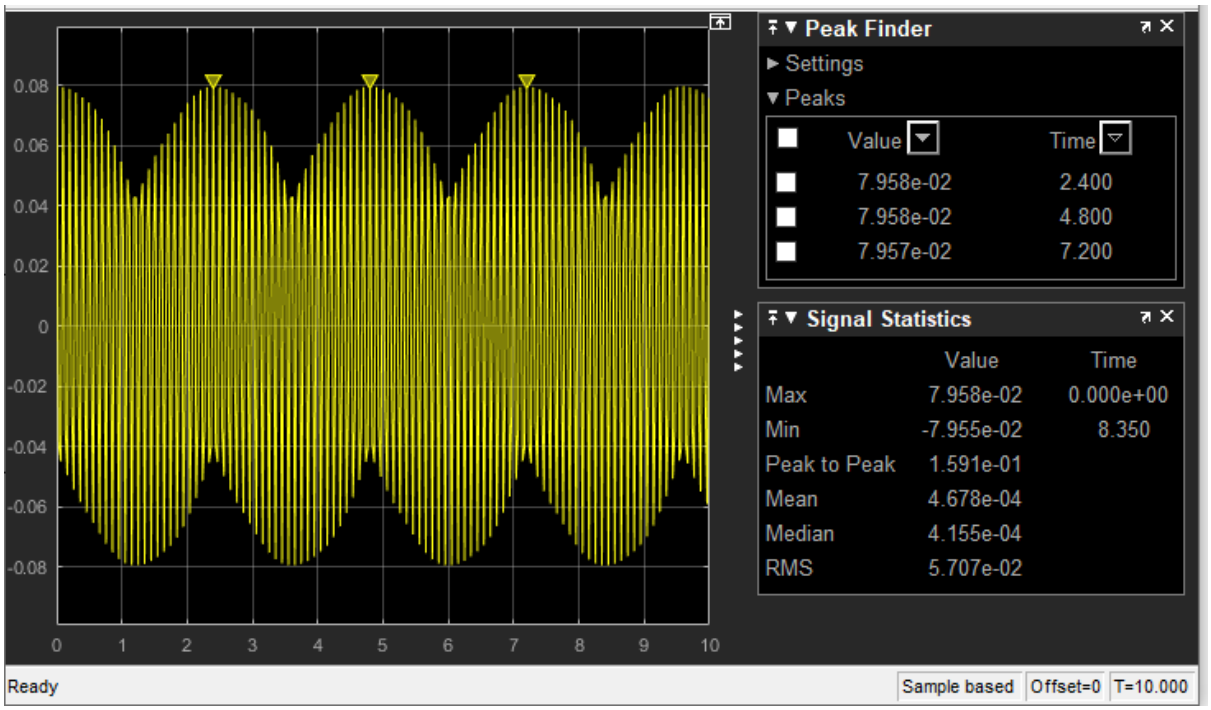
E. If two signals of 5 KΩ and 2 KΩ are pass through the filter at different intervals. Discuss your observation

When the signal of 5 KΩ is passed through the filter, we get:



Findings: from the above, I observed that when the signal of 5K ohms is passed through the filter, the signal is reduced to 0.03183 because the input frequency was high.

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



Findings: from the above, I observed that when the signal of 2K ohms is passed through the filter, the signal is also reduced to 0.07958 because of the high input frequency.