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MATRIC NO: 17/ENG04/011

DEPARTMENT: ELECT/ELECT

ENG 342

ANSWERS

A. Benefits of filters in engineering

- Filters are essential building blocks of any Electronics and Communication Systems that alter the amplitude and phase characteristics.
- Filters is basically linear circuit that helps remove unwanted components such as Noise, Interference and Distortion from the input signal
- They are used in Radio tuning
- They are used In Signal Processing Circuits and Data Conversion
- Filters are used in pre-amplification, Equalization in Audio systems

B. Building a low pass filter with 0.005ohms and 0.01F

Gathering Blocks

Step 1: Create new model

Step 2: Insert *Scope*

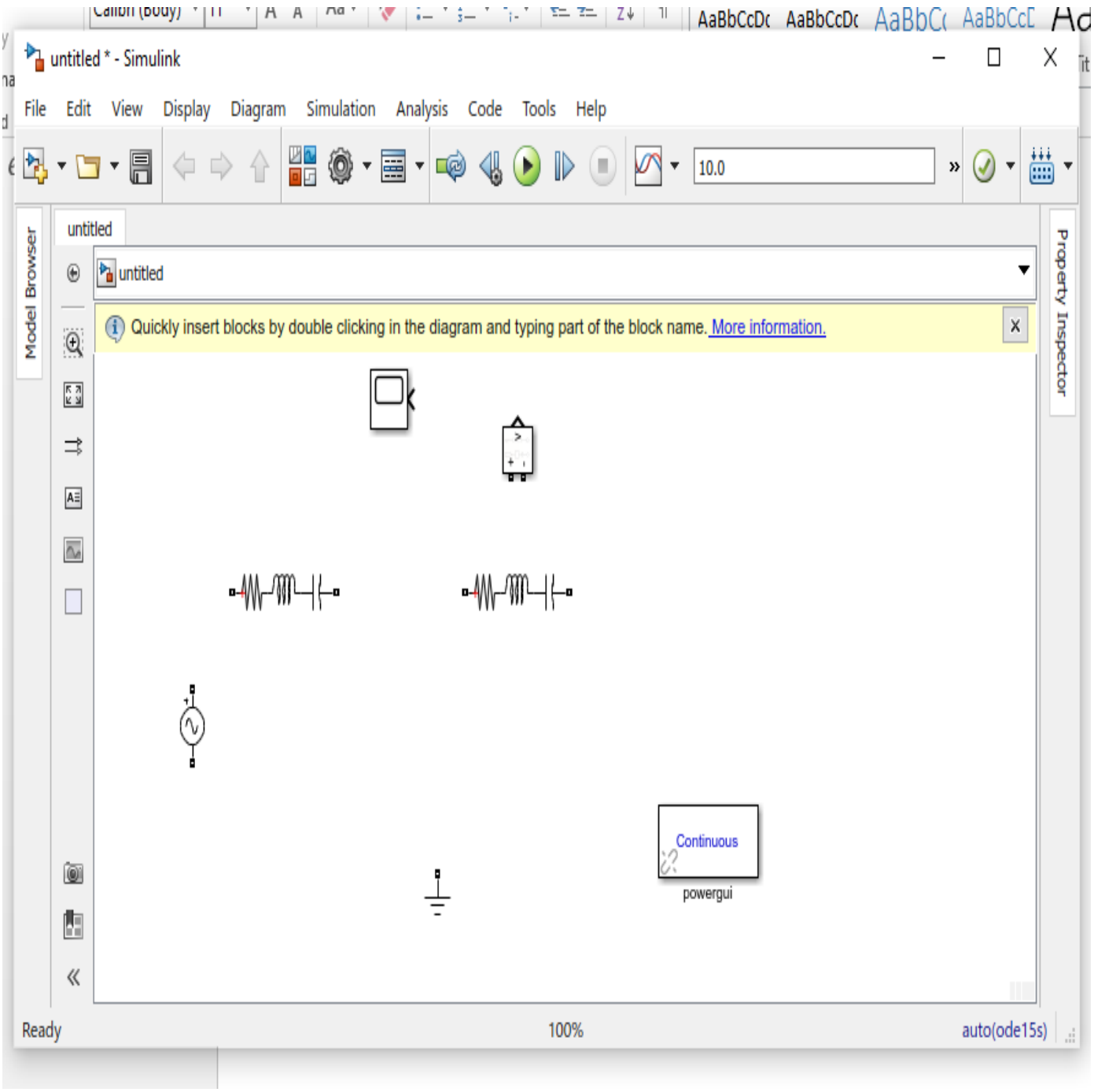
Step 3: Insert *AC Voltage Supply*

Step 4: Insert *Series RLC Branch and another Series RLC Branch*

Step 5: Insert *Ground*

Step 6: Insert *powergui*

Step 7: Insert *Voltage Measurement*

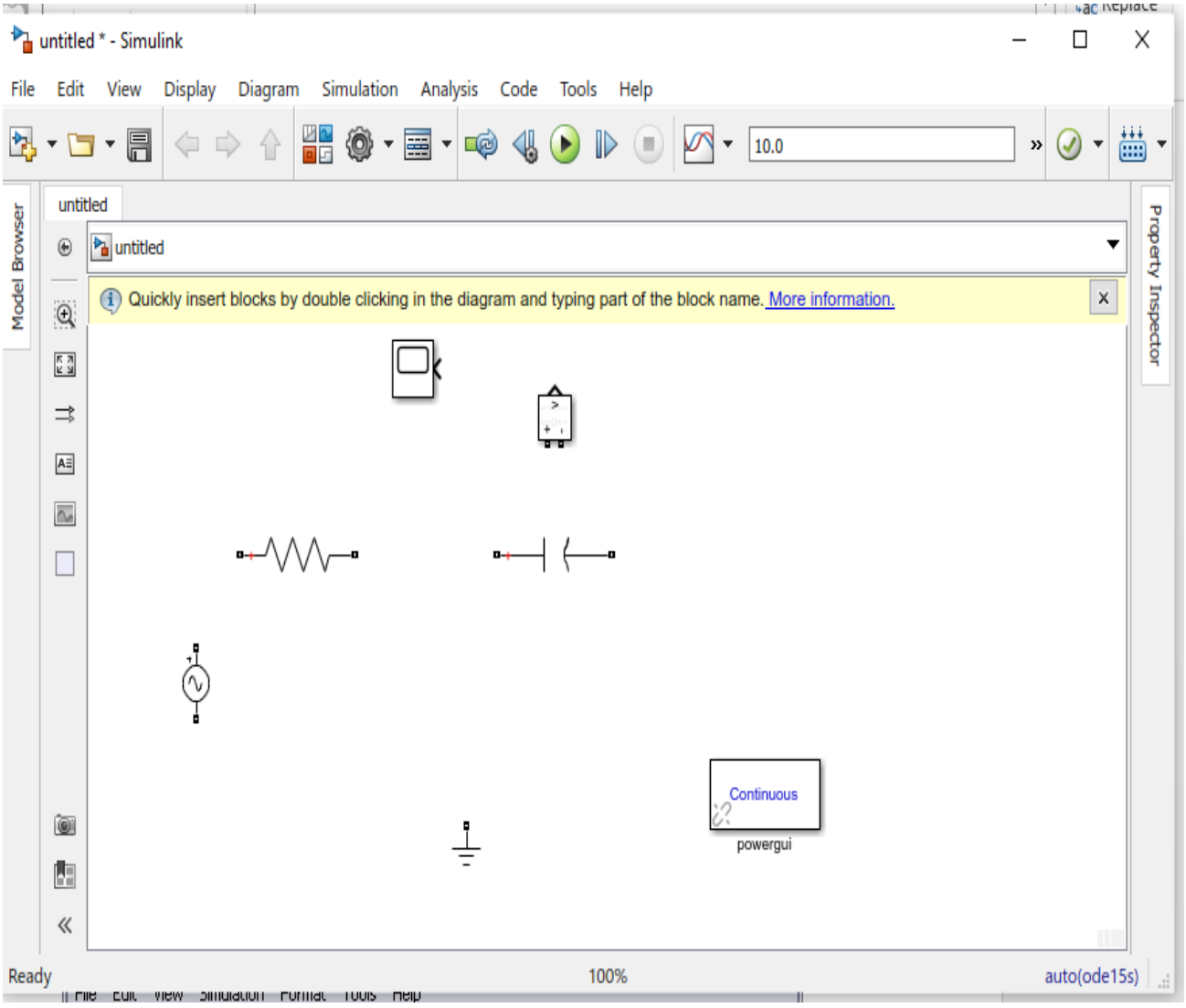

untitled * - Simulink
File Edit View Display Diagram Simulation Analysis Code Tools Help
10.0
Model Browser
Property Inspector
untitled
Quickly insert blocks by double clicking in the diagram and typing part of the block name. More information.
Continuous
powergui
Ready
100%
auto(ode15s)

Modifying the Blocks

Step 1: Double click on the first *Series RLC Branch*, edit Branch type to **R** and Resistance (ohms) to **0.005**

Step 2: Double click on the second *Series RLC Branch*, edit Branch type to **C** and Resistance (farrads) to **0.01**

Step 3: Double click on the *AC Voltage Supply*, edit the Peak Amplitude to 50V and Frequency to 10Hz



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Connecting Blocks with Lines

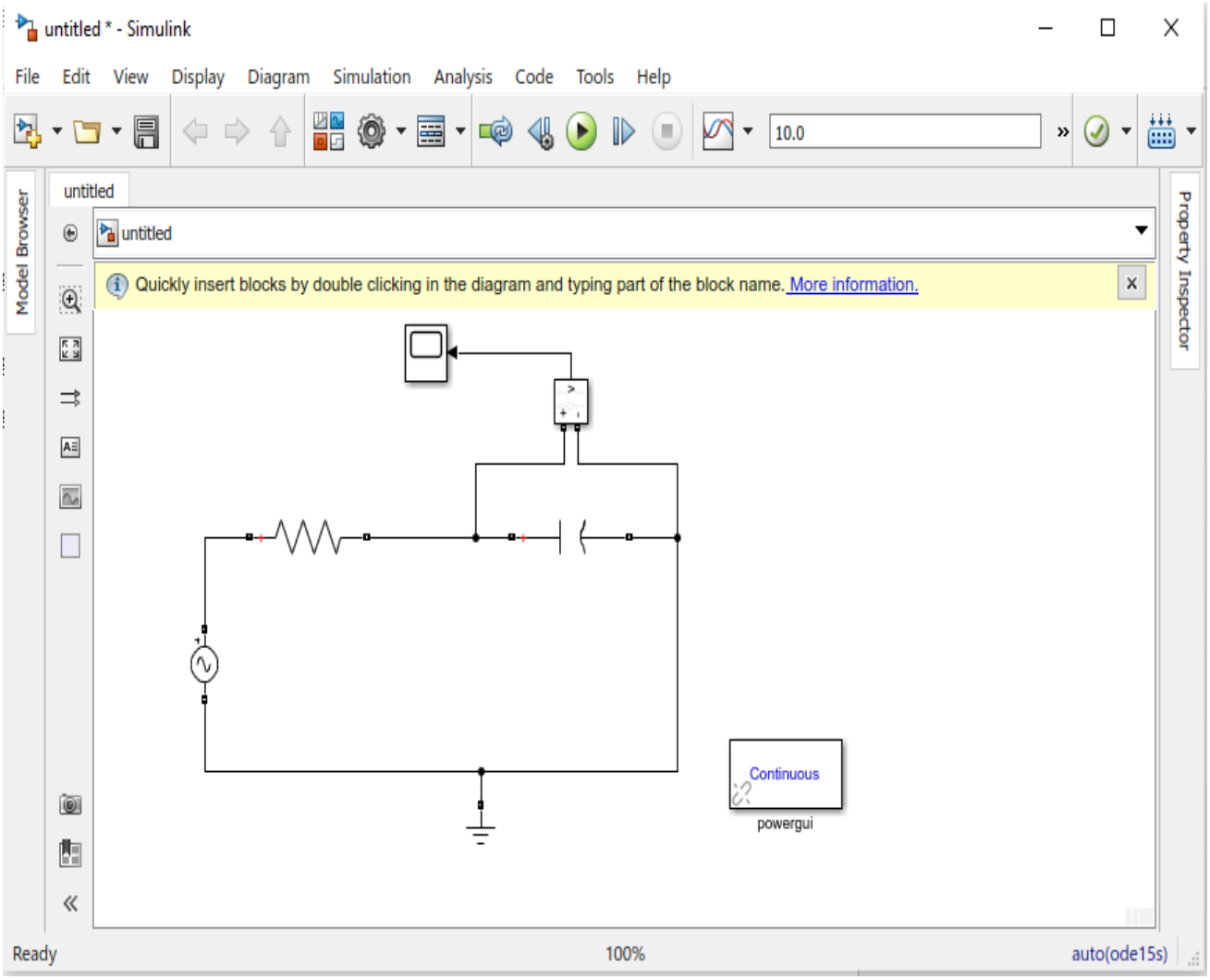
Step 1: Drag the mouse from the output terminal of the *AC Voltage Supply* to the *Series Resistor and to the Series Capacitor.*

Step 2: Negative terminal of the *Series Capacitor* is connected to the Negative terminal of *Voltage Measurement*. The Positive terminal of the *Voltage Terminal* is bridged to the connection between the *Series Resistor and Series Capacitor*

Step 3: Drag the mouse from the output terminal of the *Voltage Measurement* to the input of the *Scope*

Step 4: Drag the mouse from the negative terminal of the *AC Voltage Supply* to the *Ground*

Step 5: Drag the mouse from the *Ground* to the negative terminal of the *Series Capacitor*.

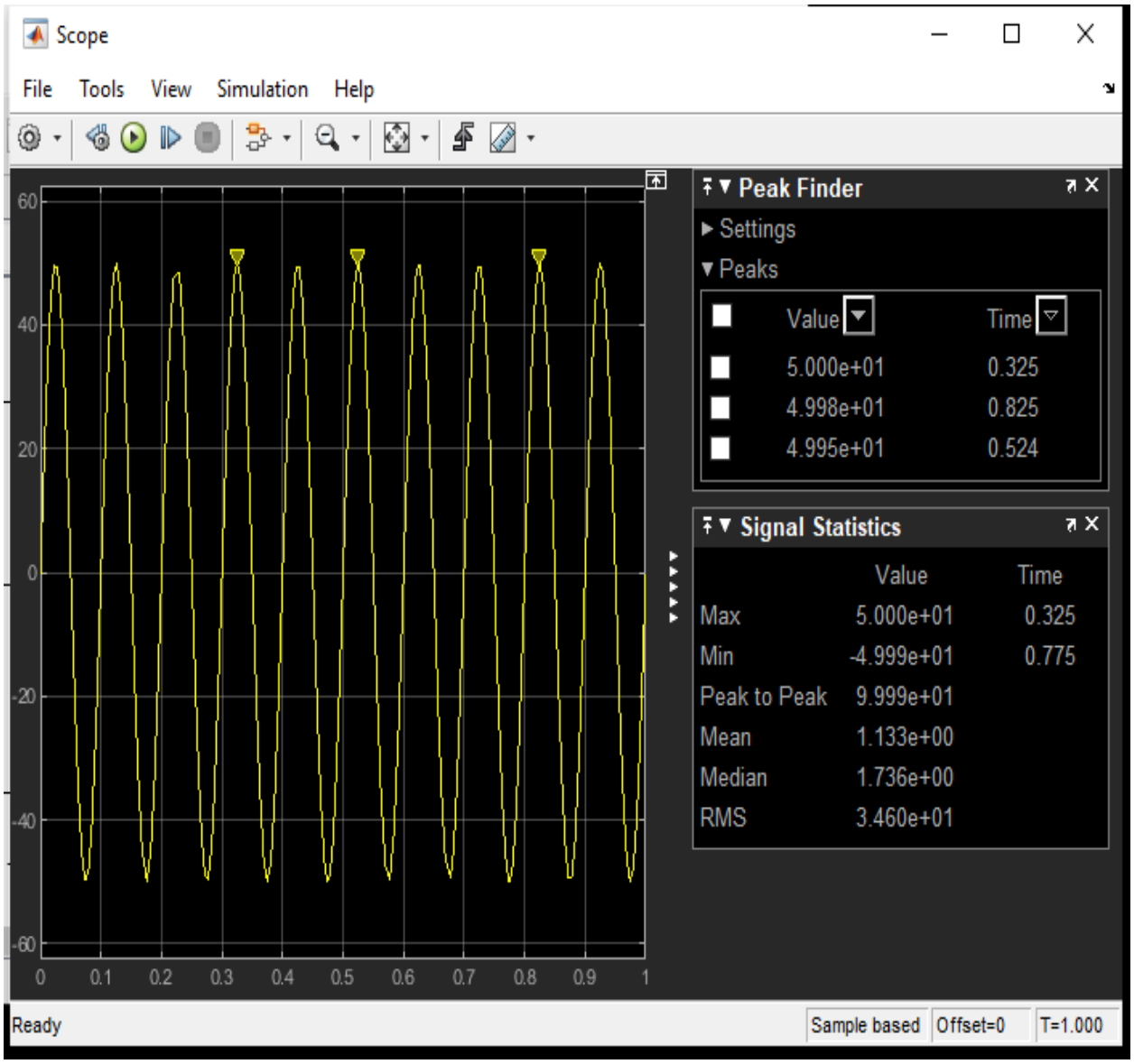


C. To determine the cutoff frequency

$$f_c = \frac{1}{2x\pi xRxC} = \frac{1}{2x\pi x0.005x0.01} = 3183.0988\ Hz$$

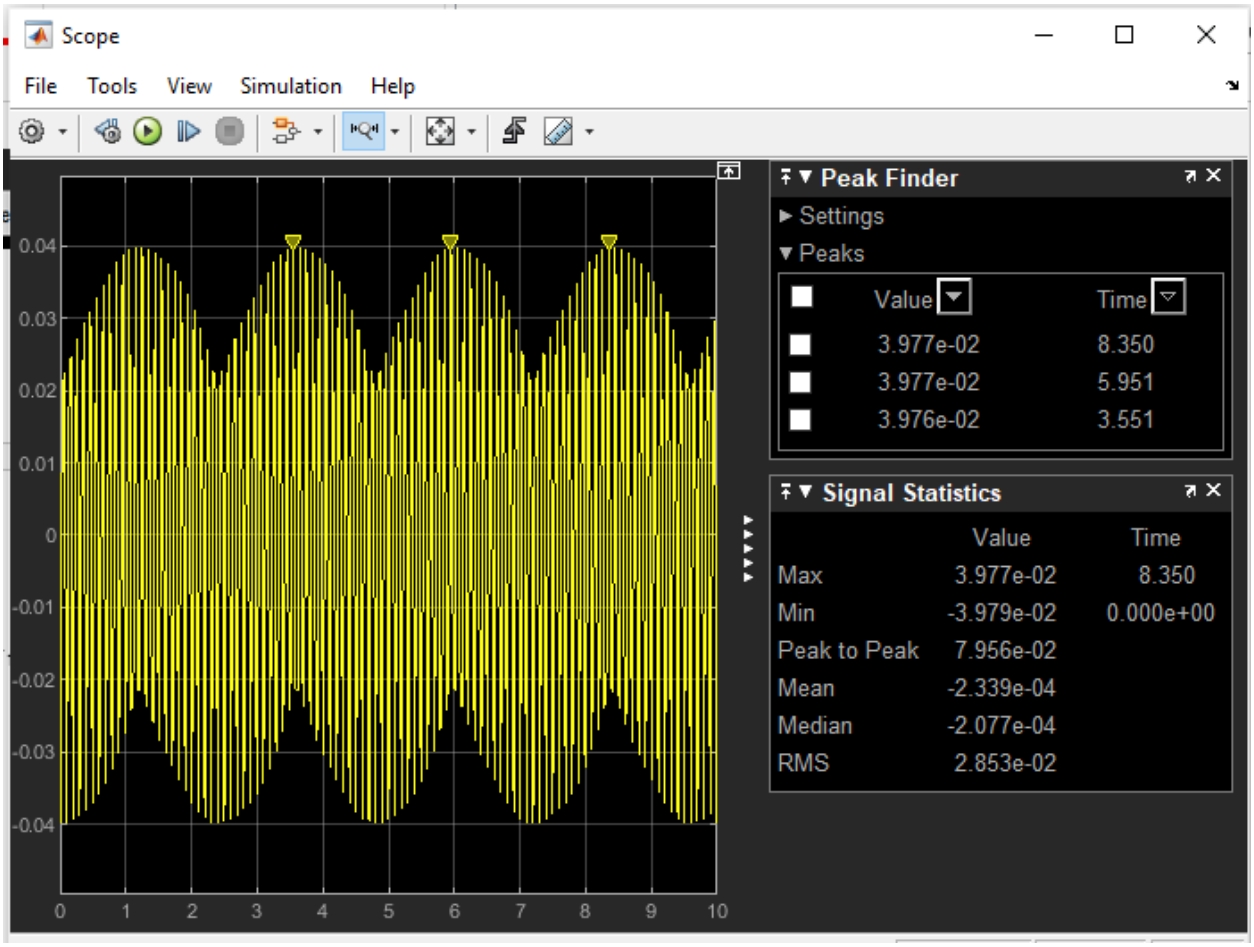
D. Simulation of Model

Now that the model is complete, you can simulate the model. Select **Start** from the **Simulation** menu to run the simulation. Double-click on the _Scope_block to view its output. Hit the **autoscale** button (binoculars) and you should see the following:



E. If two signals of 5K and 2k ohms are passed through a filter

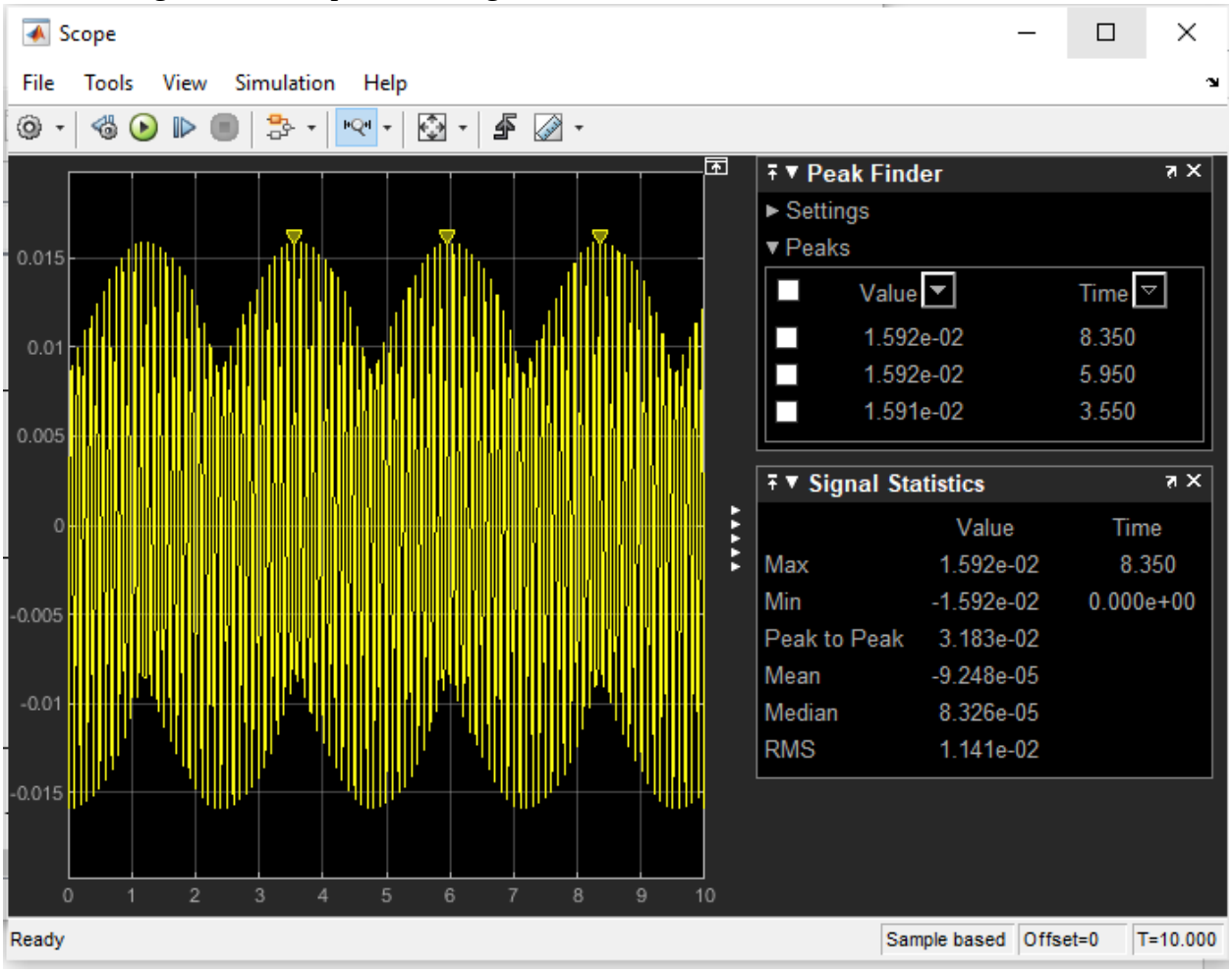
When 2k ohms signal passes through the filter



Transfer function= $\frac{(0.02)}{(s+0.02)}$

Observation: When signal of 5k ohms was passed through the filter, the signal was attenuated at **3.977e-02**. The high frequency signal was blocked out while the low frequency signal passed through. The peak to peak was 7.956e-02

When the signal 5k ohms passes through the filter



$$\text{Transfer function} = \frac{(0.05)}{(s+0.05)}$$

Observation: When signal of 5k ohms was passed through the filter, the signal was attenuated at **1.592e-02**. The high frequency signal was blocked out while the low frequency signal passed through.

The peak to peak for 5k ohms was **3.183e-02**

Conclusion

The value of peak to peak for both 5k ohms and 2k ohms are **3.183e-02** and **3.977e-02** respectively.