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17/ENG02/045
COMPUTER ENGINEERING
Assignment Title: Classwork
Course Title: Software Development and Applications
Course Code: ENG 342

A **PDF** report of the solutions showing in details the step by step of my design, results and observations.

<u>**SOLUTIONS**</u>

A. **Benefits of filters in the engineering system**

- Filter Circuits are used to eliminate background Noise
- They are used in Radio tuning to a specific frequency
- Used in Pre-amplification, Equalization, Tone Control in Audio Systems
- They are also used in Signal Processing Circuits and Data Conversion
- Filter Circuits are extensively used in Medical Electronic Systems

B. **Design Process of Low Pass Filter Using MATLAB**

- First of all, I launched the MATLAB program and navigated to Simulink.

- I created a new file and I opened the *Model Libraries.*

- After which I selected **sources** then **sinks,** then I dragged the **scope block** into the model.

- I opened the *Libraries Browser* tab again, I searched **AC Voltage Source** in the search bar then I dragged the **AC Voltage Source block** into the model.

- I opened the *Libraries Browser* tab again, I searched **Series RLC Branch** then I dragged the **Series RLC Branch block** into the model.

- I duplicated the **Series RLC Branch** in the model.

- I opened the *Model Libraries* tab again, I searched **Power GUI** in the search bar then I dragged the **Power GUI block** into the model.

- I opened the *Model Libraries* tab again, I searched **Voltage Measurement** in the search bar then I dragged the **Voltage Measurement block** into the model.
- I opened the *Model Libraries* tab again, I searched **Ground** in the search bar then I dragged the **Ground block** into the model.
- All the electronics related blocks used were found under **simscape/simpowersystems/specialized technology/fundamental blocks.**
- After adding all the blocks to my model, I connected them to form a simple Low Pass filter circuit as shown below
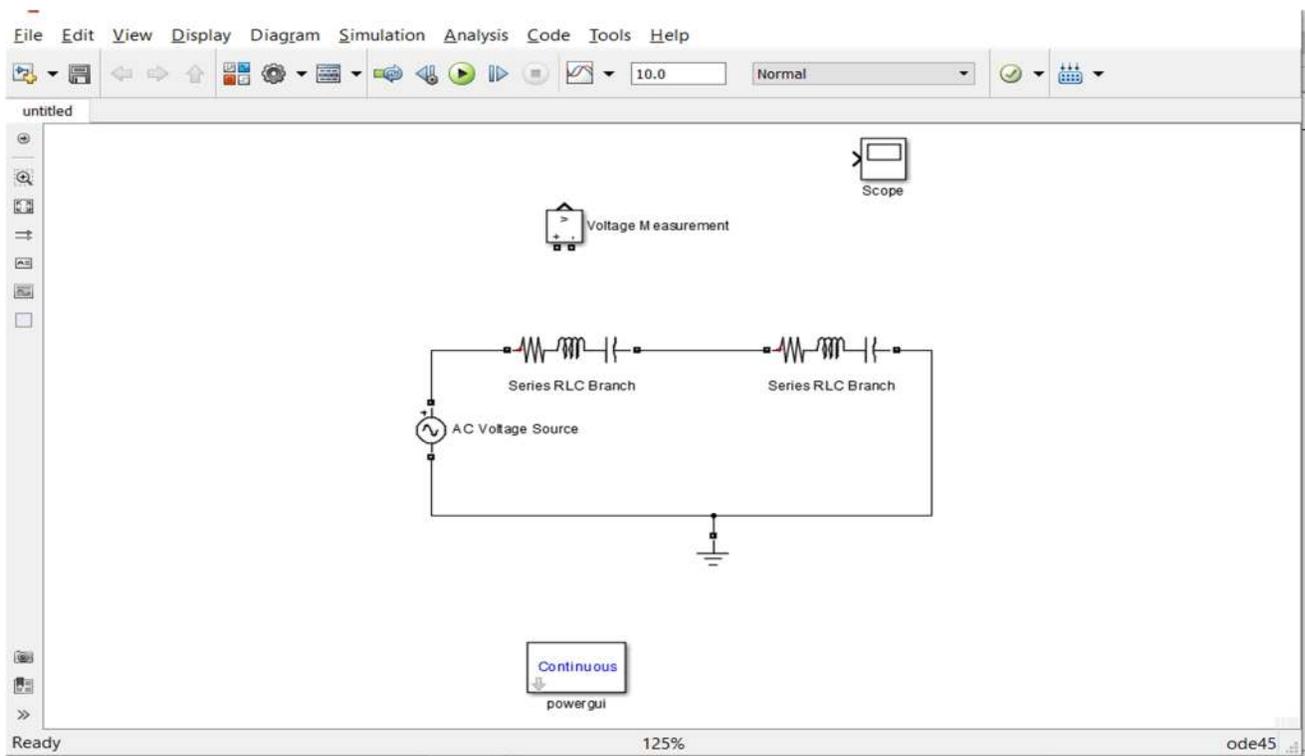

- After the connection I edited each block, I changed the branch type of the first **Series RLC Branch to Resistance** then I changed the branch type of the second **Series RLC Branch to Capacitor.** I then set the parameters for **R and C** to 0.005 and 0.01 respectively, by double-clicking on them. I also renamed them to **R and C** to represent the resistor and capacitor respectively.
- I also set the parameters for the **AC Voltage Source** as follows; Amplitude: 100 and Frequency: 10.
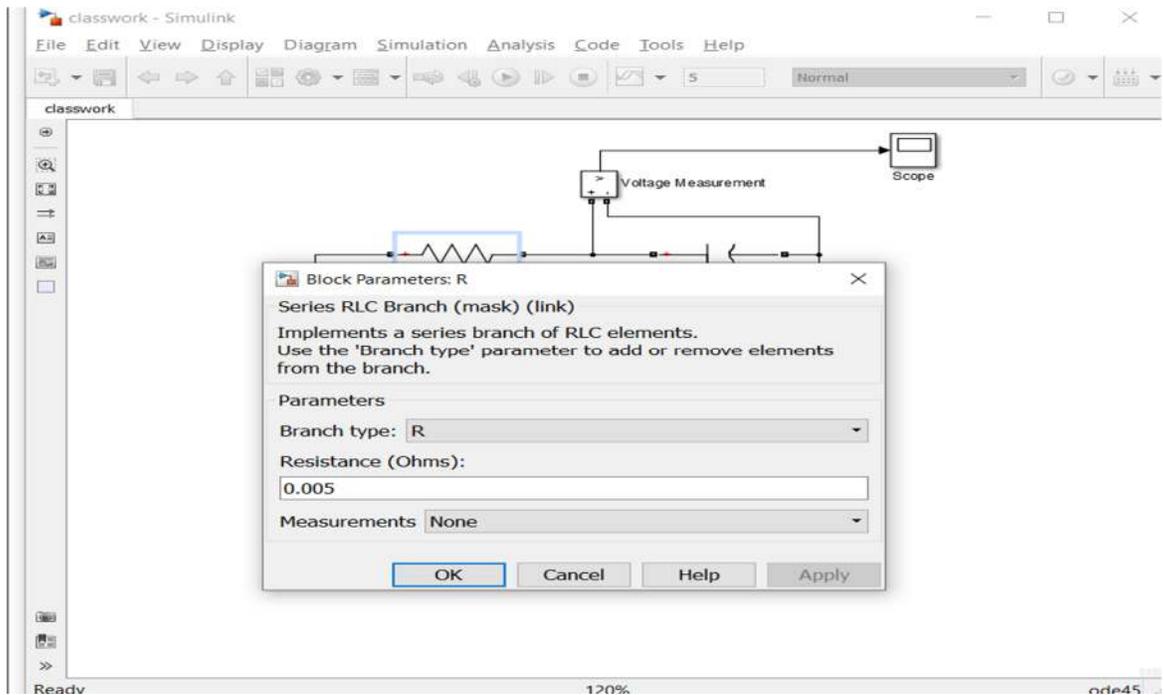
Screenshot showing parameter change of **Resistor Block**
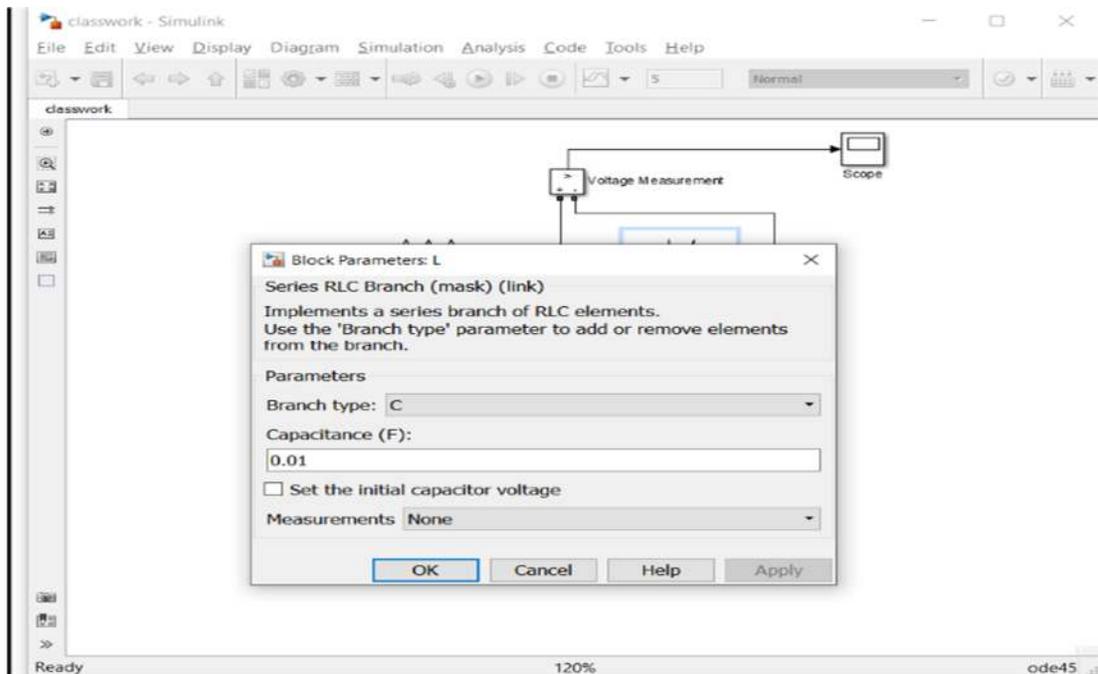
Screenshot showing parameter change of **Capacitor Block**
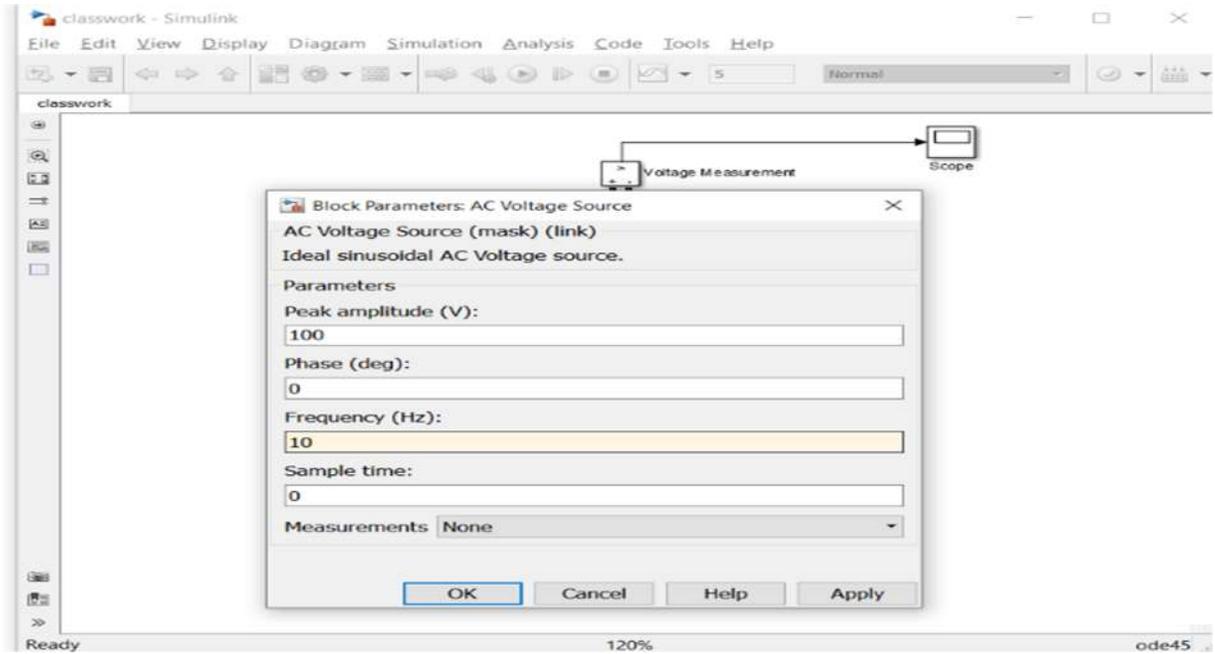
Screenshot showing parameter change of **AC Voltage Source Block**

- After configuring my blocks, I connected the inputs of the **Voltage Measurement block** to the RC circuit and the connected the out to **Scope** block.

- I saved my model, then selected **Start** from the **Simulation** menu to run the simulation. Then Double-clicked on the **Scope block** to view its output.
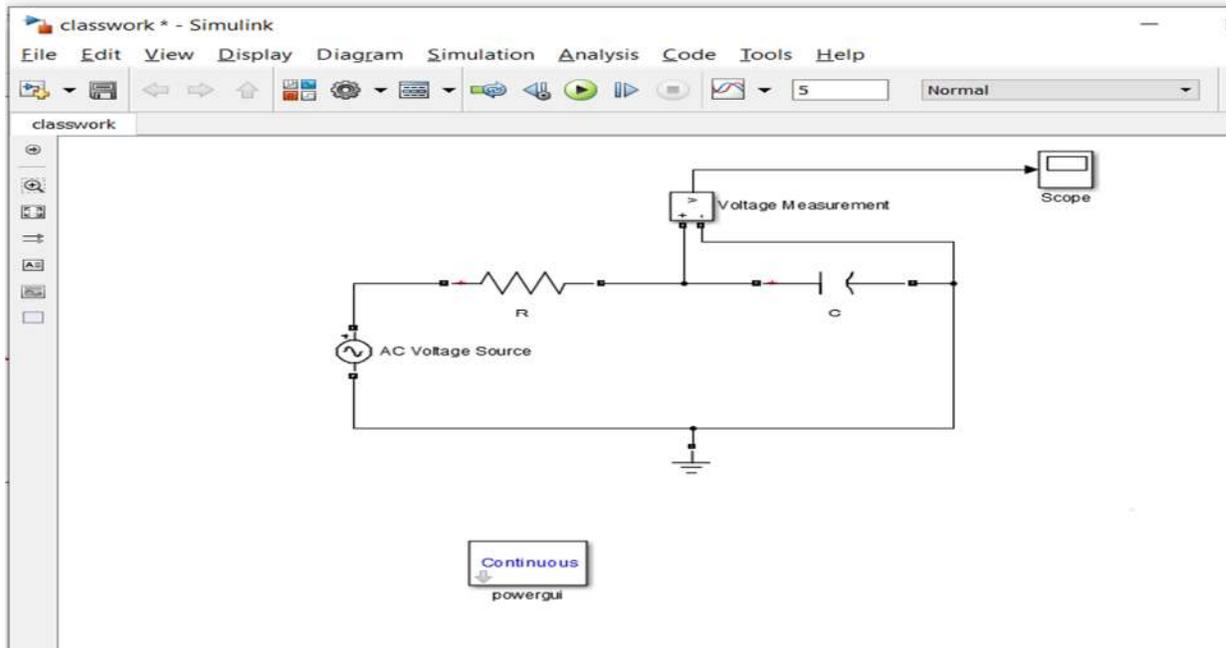
C.

Cut-off frequency
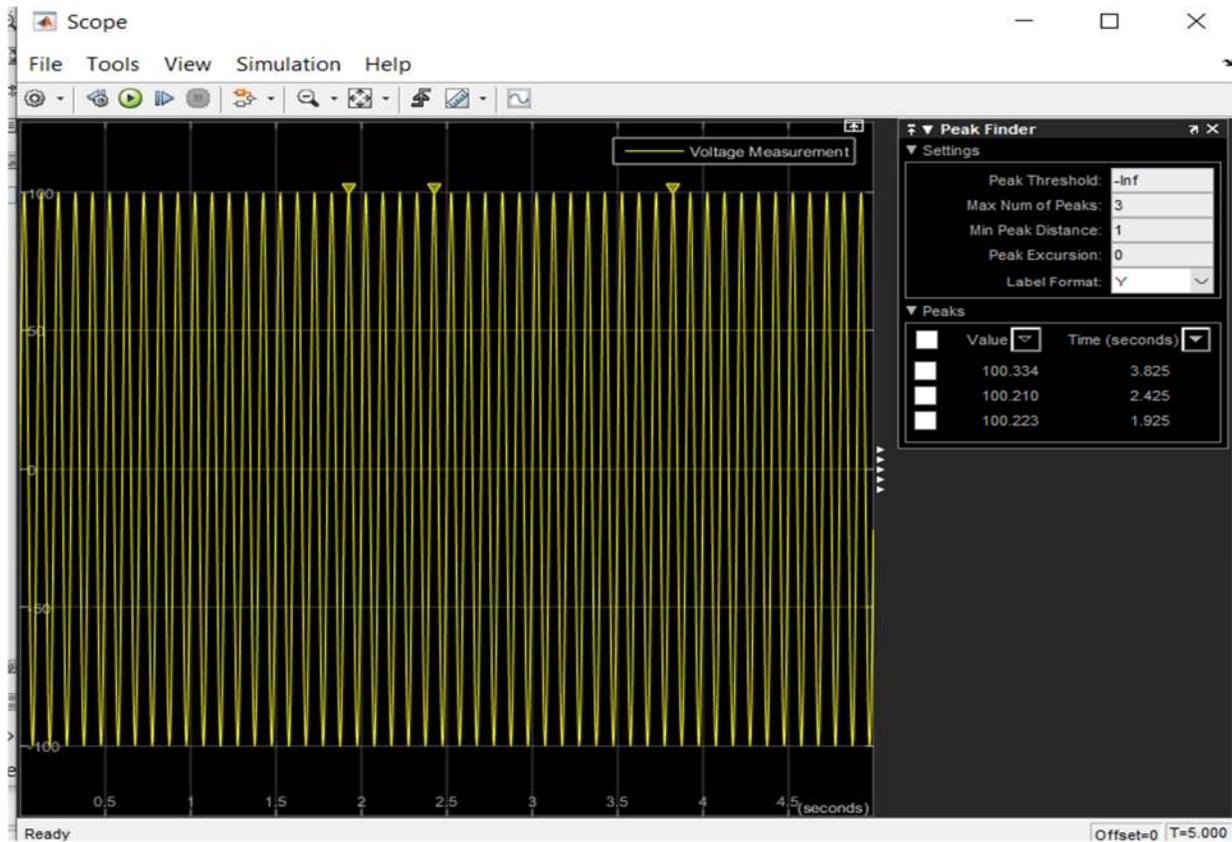
is given as:

$$\frac{1}{2\pi RC}$$

$$\Rightarrow \frac{1}{2*\pi*0.005*0.01} = W_c$$

$$W_c = 3183.099 \text{ Hz}$$

D. **DESIGN**

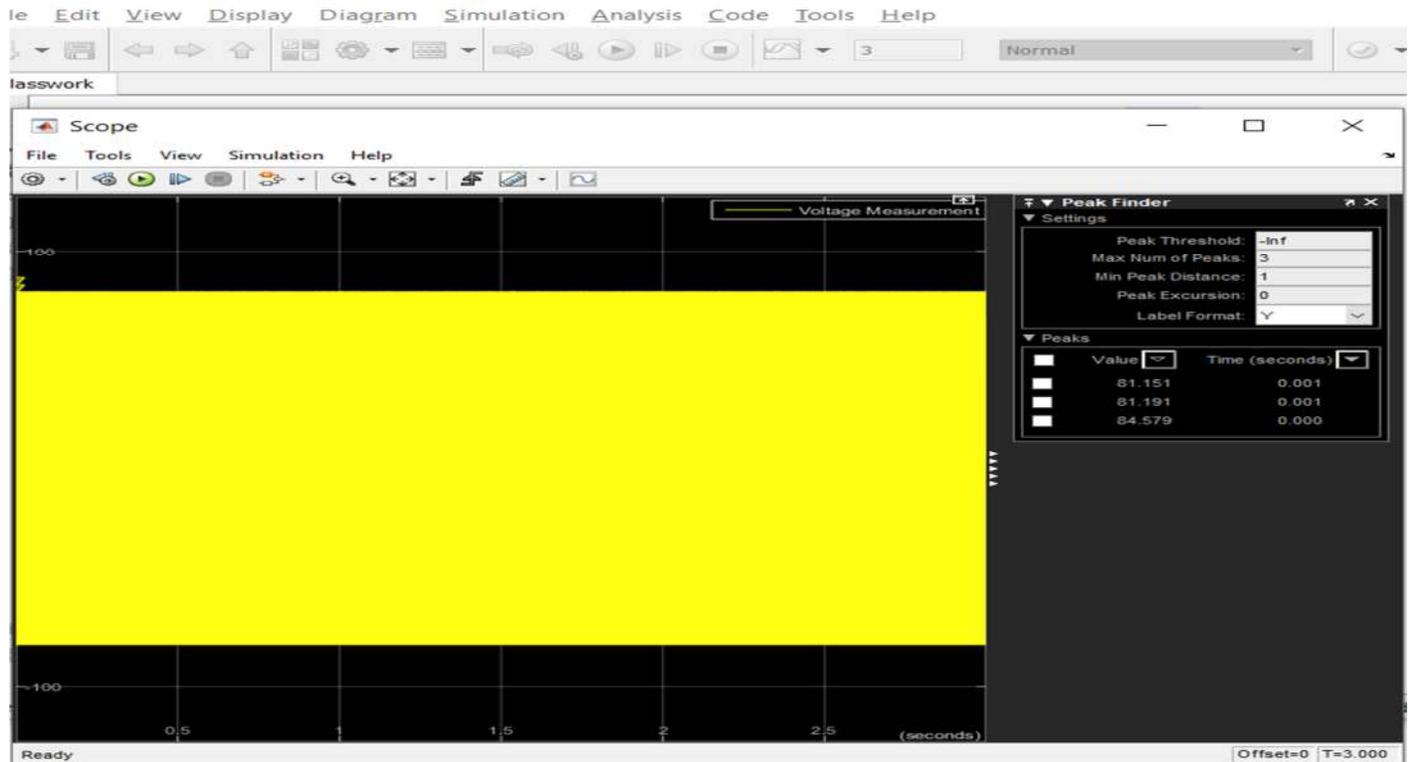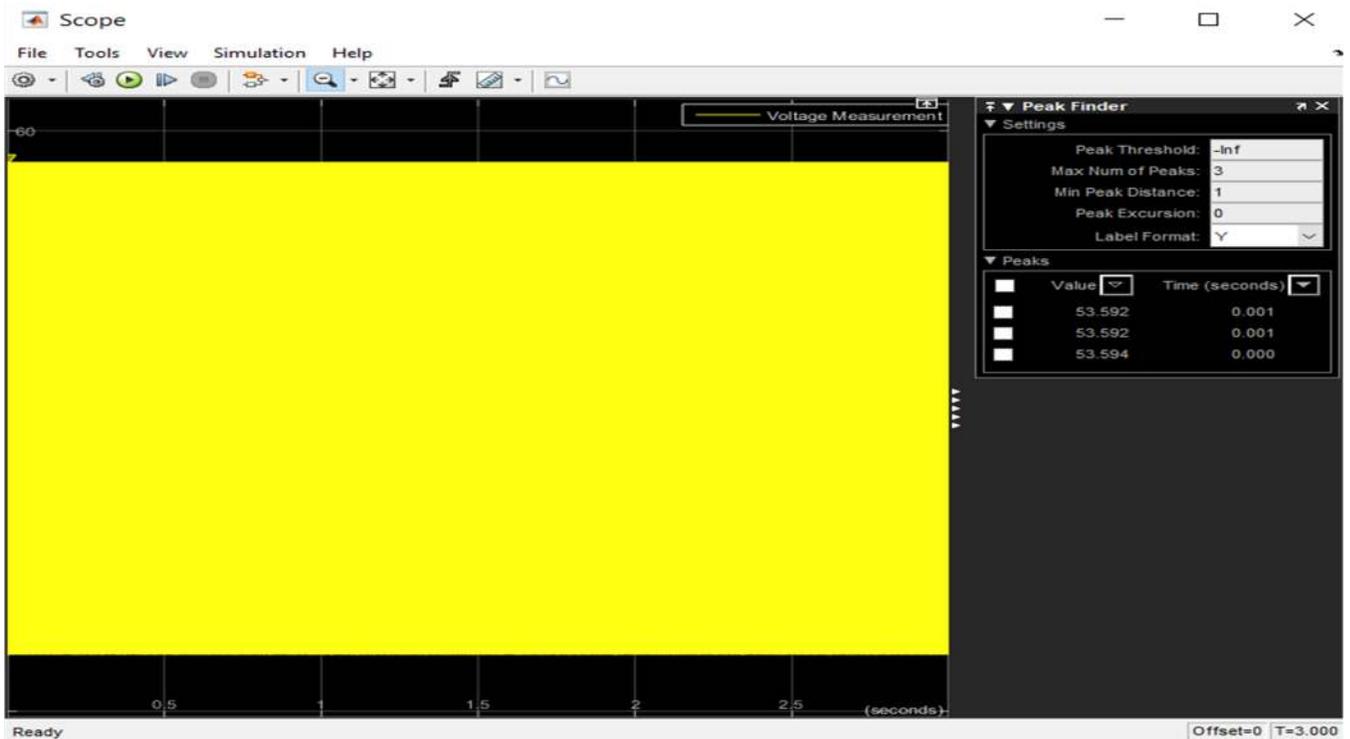## **OUTPUT**

E. I observed that, At 2K the frequency is passed with 81.5 volts while at 5K the frequency is attenuated (passed with low amplitude of voltage) of 53.5volts

Scope

File Tools View Simulation Help

———— Voltage Measurement

▼ Peak Finder

▼ Settings

Peak Threshold:	-Inf
Max Num of Peaks:	3
Min Peak Distance:	1
Peak Excursion:	0
Label Format:	Y

▼ Peaks

Value	Time (seconds)
81.151	0.001
81.191	0.001
84.579	0.000

100

-100

0.5   1   1.5   2   2.5   (seconds)

Ready   Offset=0 T=3.000

AT INPUT OF 2K

Scope

File Tools View Simulation Help

———— Voltage Measurement

▼ Peak Finder

▼ Settings

Peak Threshold:	-Inf
Max Num of Peaks:	3
Min Peak Distance:	1
Peak Excursion:	0
Label Format:	Y

▼ Peaks

Value	Time (seconds)
53.592	0.001
53.592	0.001
53.594	0.000

60

0.5   1   1.5   2   2.5   (seconds)

Ready   Offset=0 T=3.000

AT INPUT OF 5K