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Title of the experiment

BJT based Differential Amplifier

Theory:

The electronic amplifier used for amplifying the difference between two input signals can be called as a differential amplifier. In general, these differential amplifiers consist of two terminals namely inverting terminal and non-inverting terminal. These inverting and non-inverting terminals are represented with – and + respectively.

The differential amplifier can be considered as an analog circuit which consists of two inputs and one output.

The output voltage of a differential amplifier is proportional to the difference between the two input voltages. This can be represented in equation form as follows:

$$V_{out} = A(V_{in}^{+} - V_{in}^{-})$$

Schematic diagram:

The circuit schematic of the BJT based Differential Amplifier in eSim is as shown below:

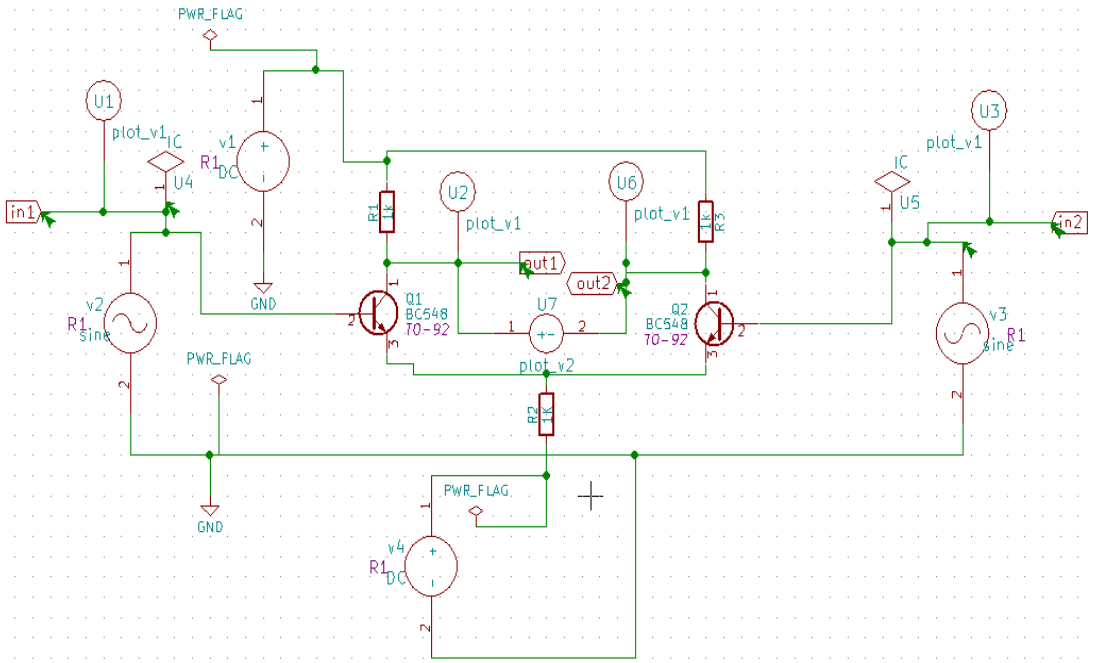

Figure 1: BJT based Differential Amplifier

Simulation Results:

1.Ngspice Plots-

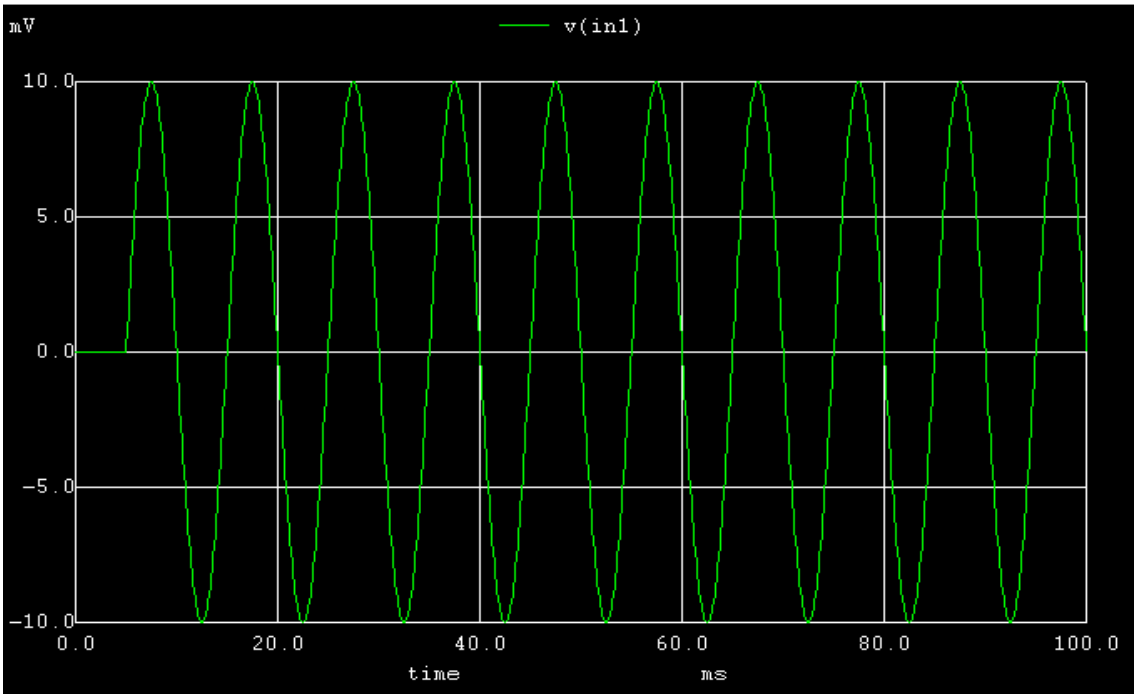

Figure 2: Ngspice Input 1 Plot

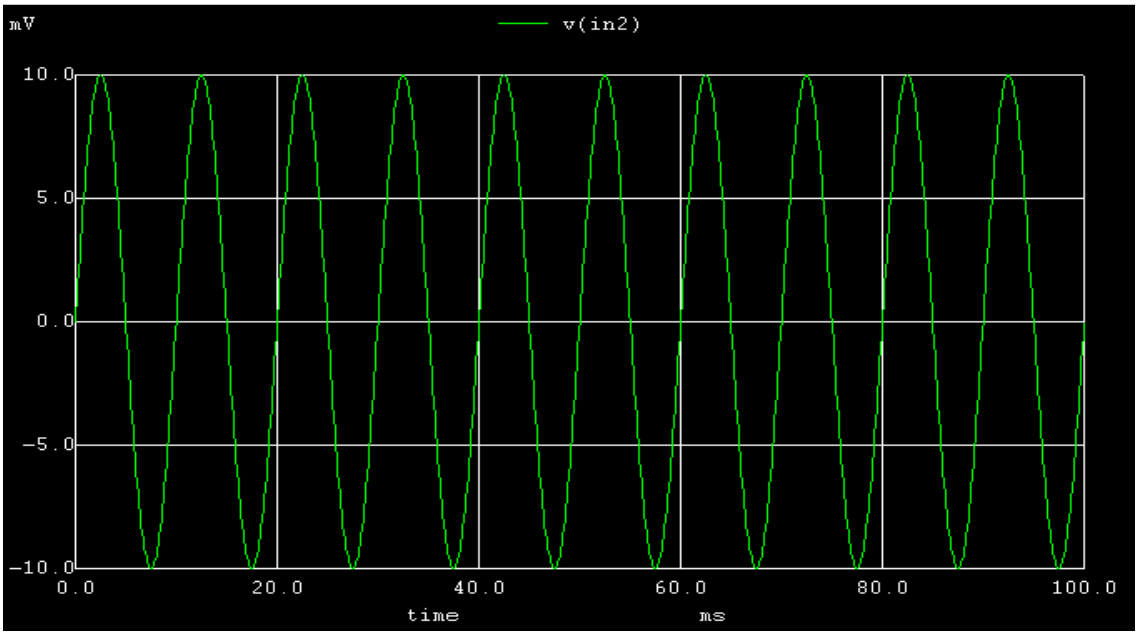

Figure 3: Ngspice Input 2 Plot

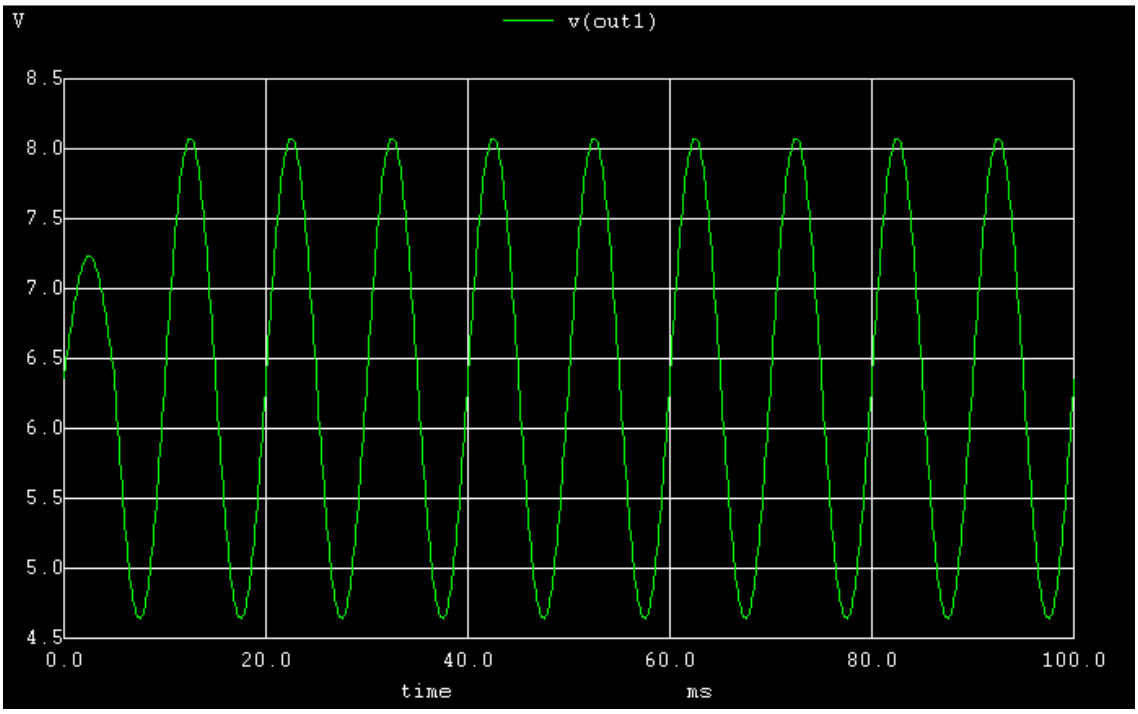

Figure 4: Ngspice Output 1 Plot

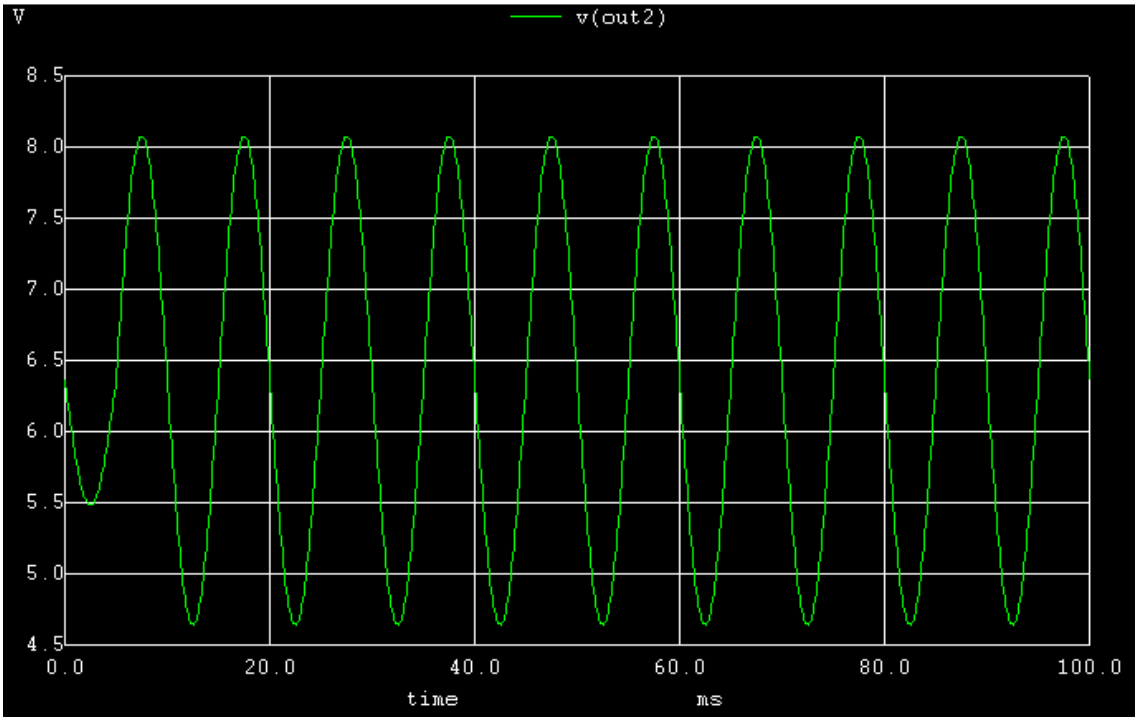

Figure 5: Ngspice Output 2 Plot

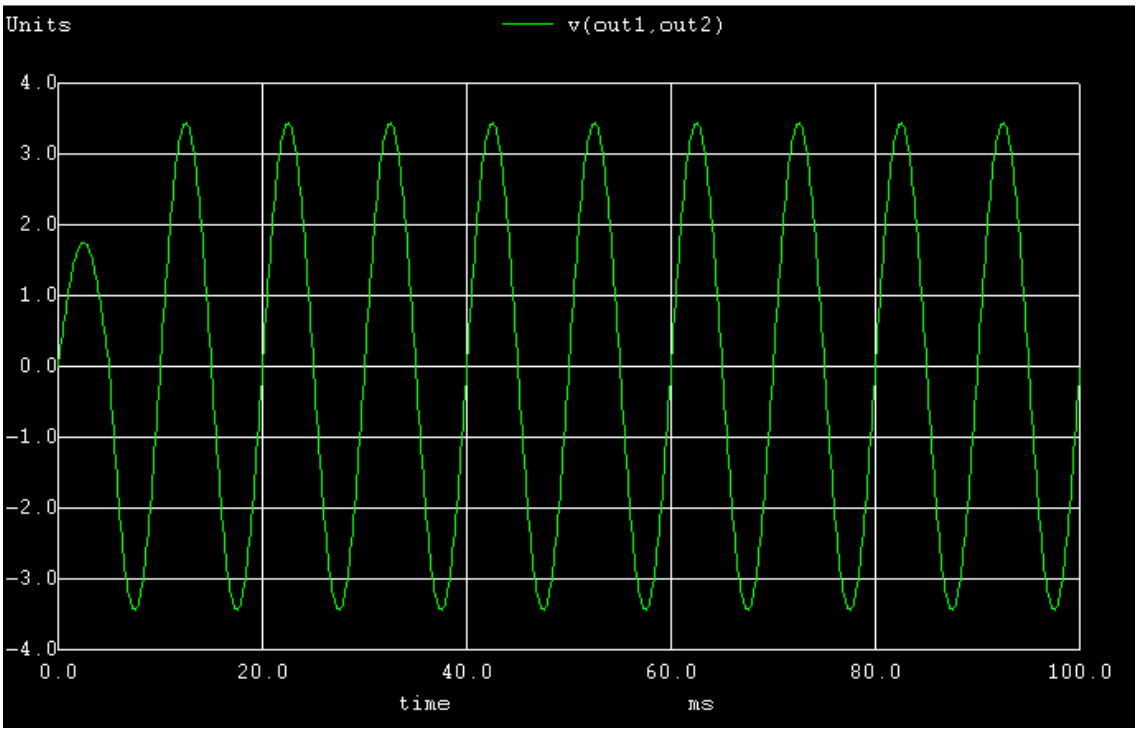

Figure 6: Ngspice Final Output(Output 1, Output2) Plot

2.Python Plots-

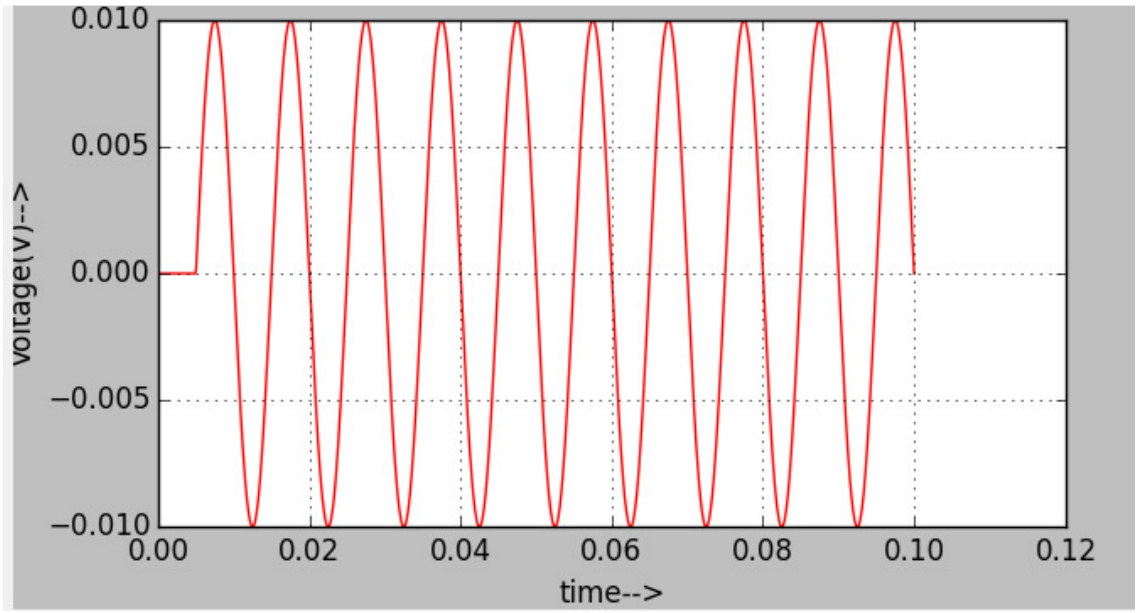

Figure 7: Python Input 1 Plot

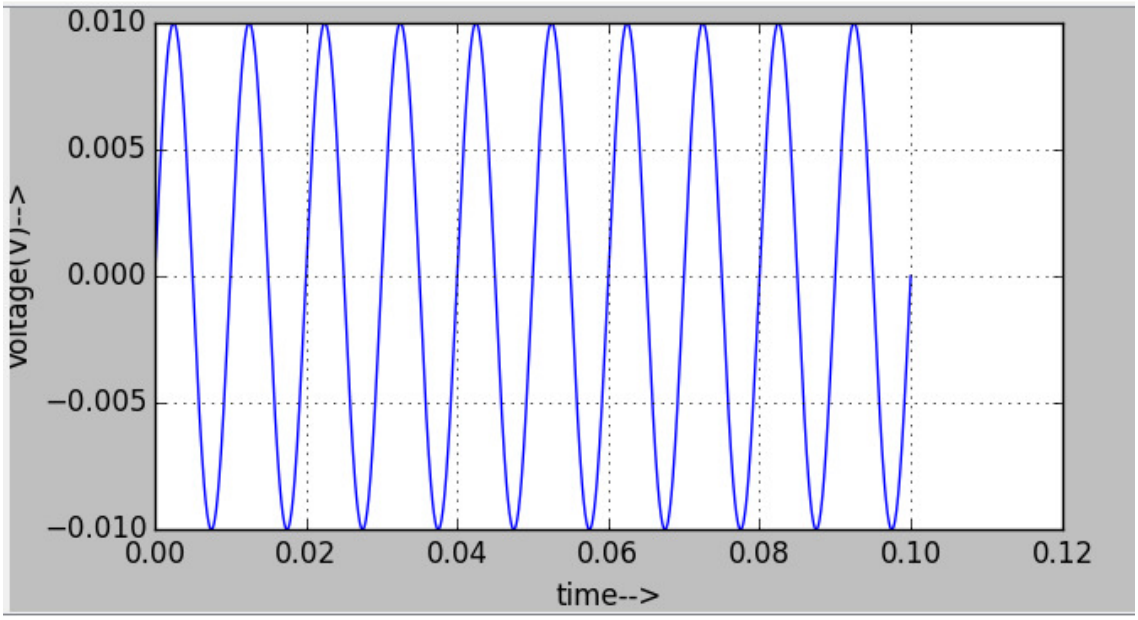

Figure 8: Python Input 2 Plot

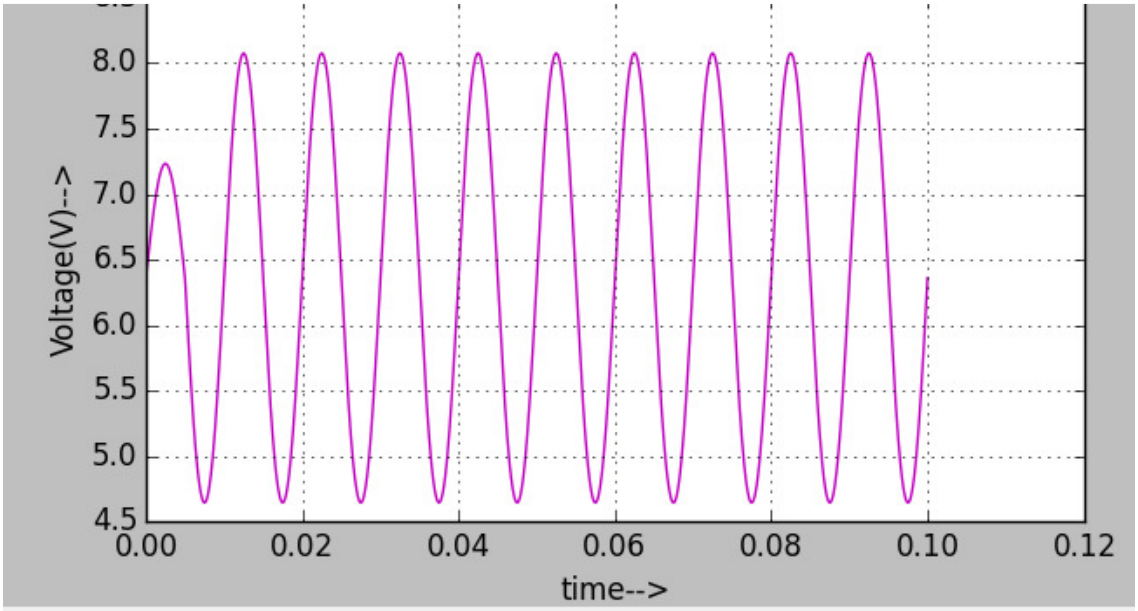

Figure 9: Python Output 1 Plot

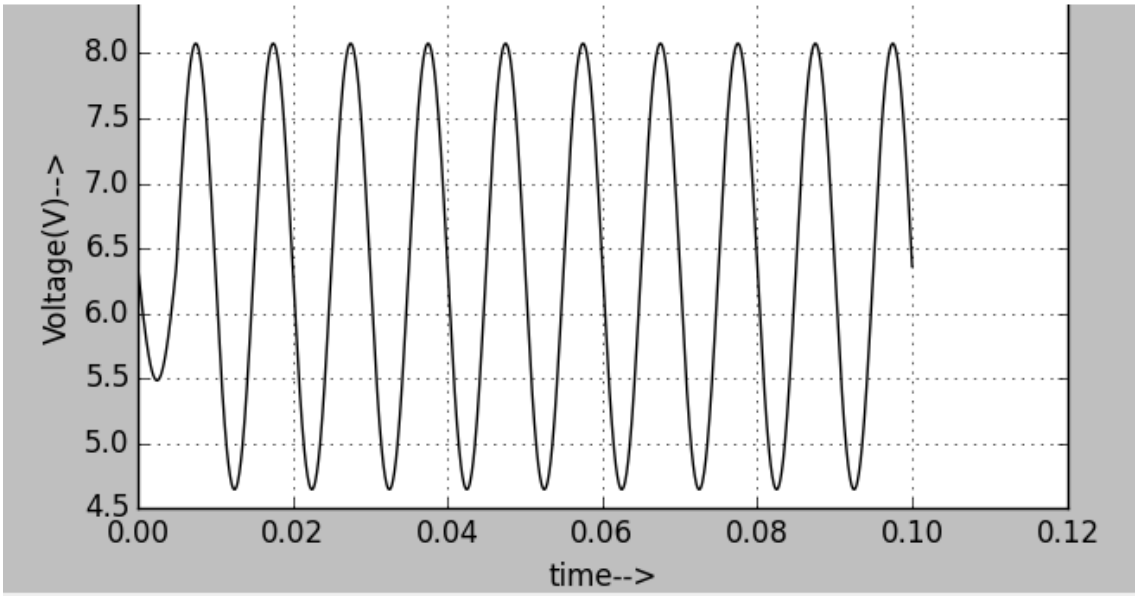

Figure 10: Python Output 2 Plot

Conclusion:

Thus, we have studied the BJT based Differential Amplifier and the simulation plot of ngspice and python plot obtained in eSim.

References:

1) https://www.elprocus.com/differential-amplifier-circuit-working/
2) http://www.circuitstoday.com/differential-amplifier
3) https://www.elprocus.com/differential-amplifier-circuit-working/