Title of The Experiment:

A Two Stage Common Emitter Amplifier In a Cascade Configuration with NPN and PNP Transistor.

Theory:

A two-stage common-emitter amplifier with NPN and PNP transistors in a cascade configuration is a type of BJT amplifier that utilizes two transistor stages, one NPN and one PNP, connected in a specific arrangement to achieve desired amplification characteristics.

NPN common-emitter stage: This stage acts as a conventional inverting amplifier. When a positive input voltage is applied to the base of the NPN transistor, it increases the collector current, leading to a decrease in the output voltage (due to the voltage divider formed by the collector resistor and load).

PNP common-emitter stage: This stage also inverts the input signal. However, since it's a PNP transistor, the current flow direction and biasing conditions are reversed compared to the NPN stage.

Design:

1) Source Resistance, Rs=0.5K (ohm)
2) Voltage Divider Resistance, R1=100K (ohm)
3) Voltage Divider Resistance, R2=50K (ohm)
4) Resistance Connected to Collector (NPN), Rc1=5K (ohm)
5) Resistance Connected to Collector (PNP), Rc2=1.5K (ohm)
6) Resistance Connected to Emitter (NPN), Re1=2K (ohm)
7) Resistance Connected to Emitter (PNP), Re2=2K (ohm)
8) Coupling Capacitor, Cc1=Cc2=100uF
9) Emitter Capacitance, Ce1=Ce2=50uF

Schematic Diagram:

A Circuit Schematic of a Two Stage Common Emitter Amplifier In a Cascade Configuration with npn and pnp transistor using e-sim as shown below:

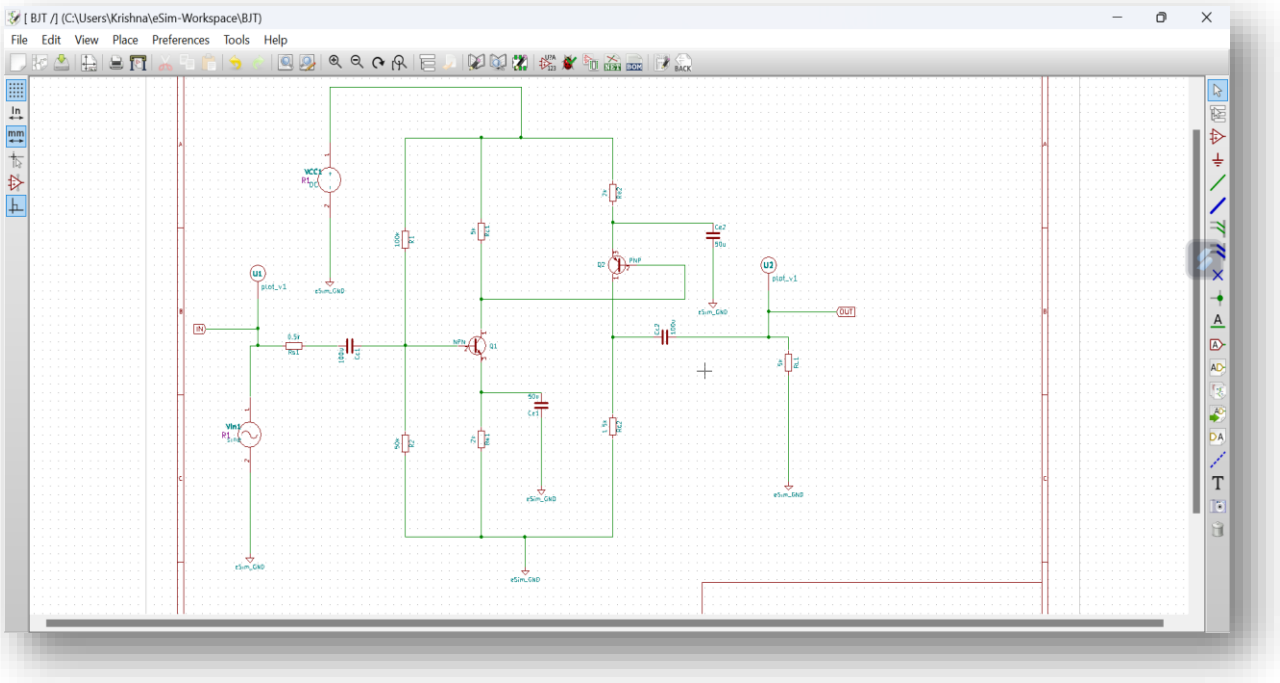

Figure 1: A Two Stage Common Emitter Cascade Amplifier in a Cascade Configuration with npn and pnp transistor

Simulation Results:

1. Ngspice plots:

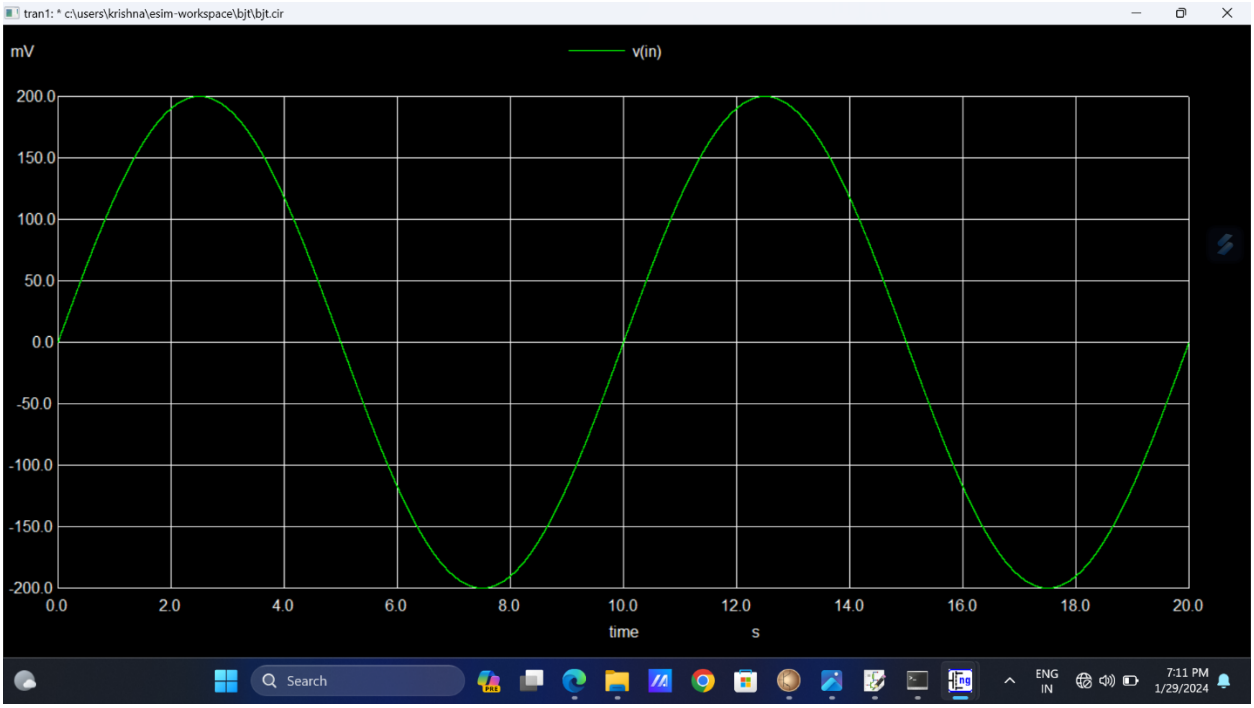

Figure 2: Ngspice Input Plot

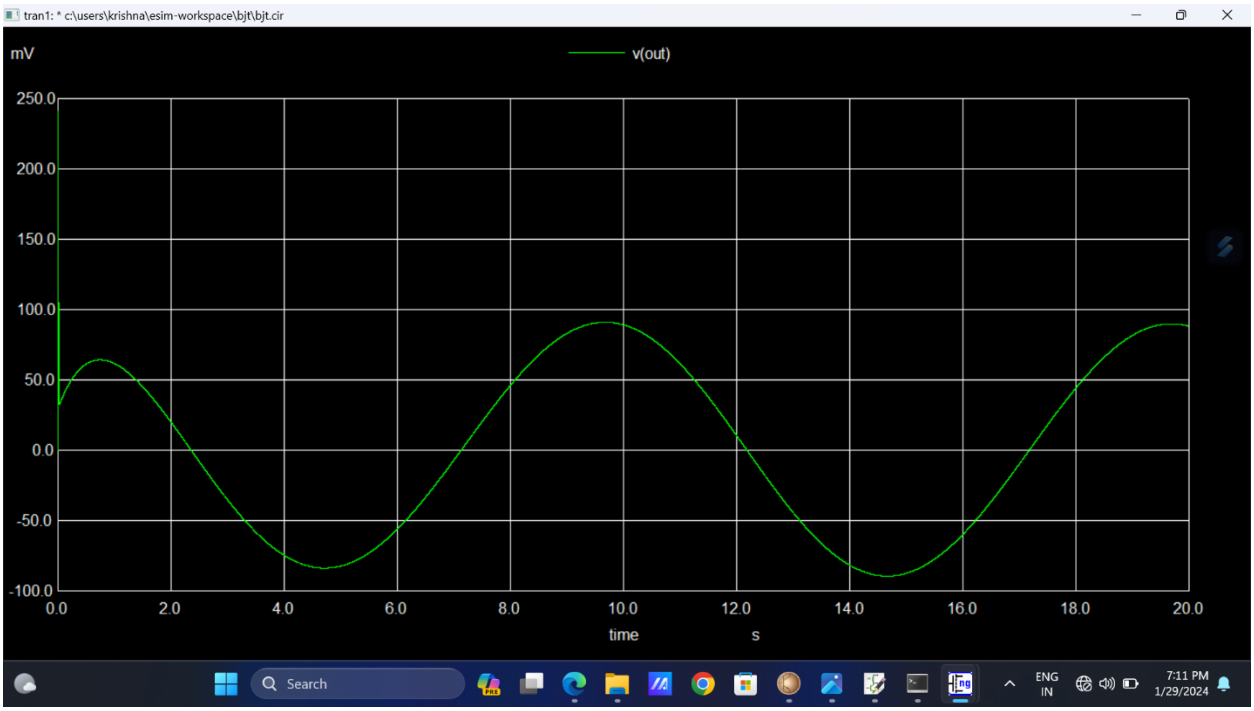

Figure 3: Ngspice Output Plot

2. Python Plots:

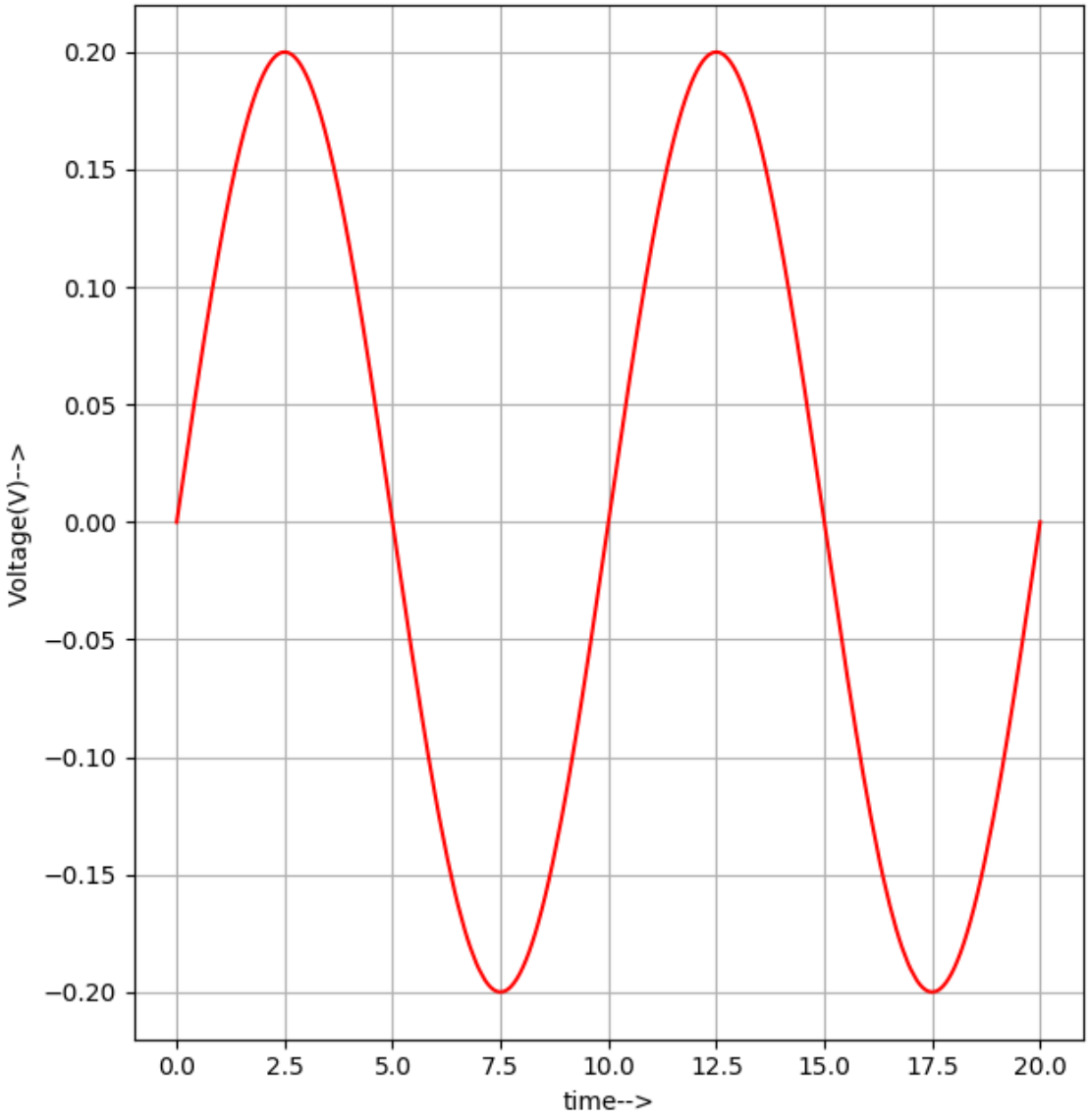

Figure 4: Python Plot Input

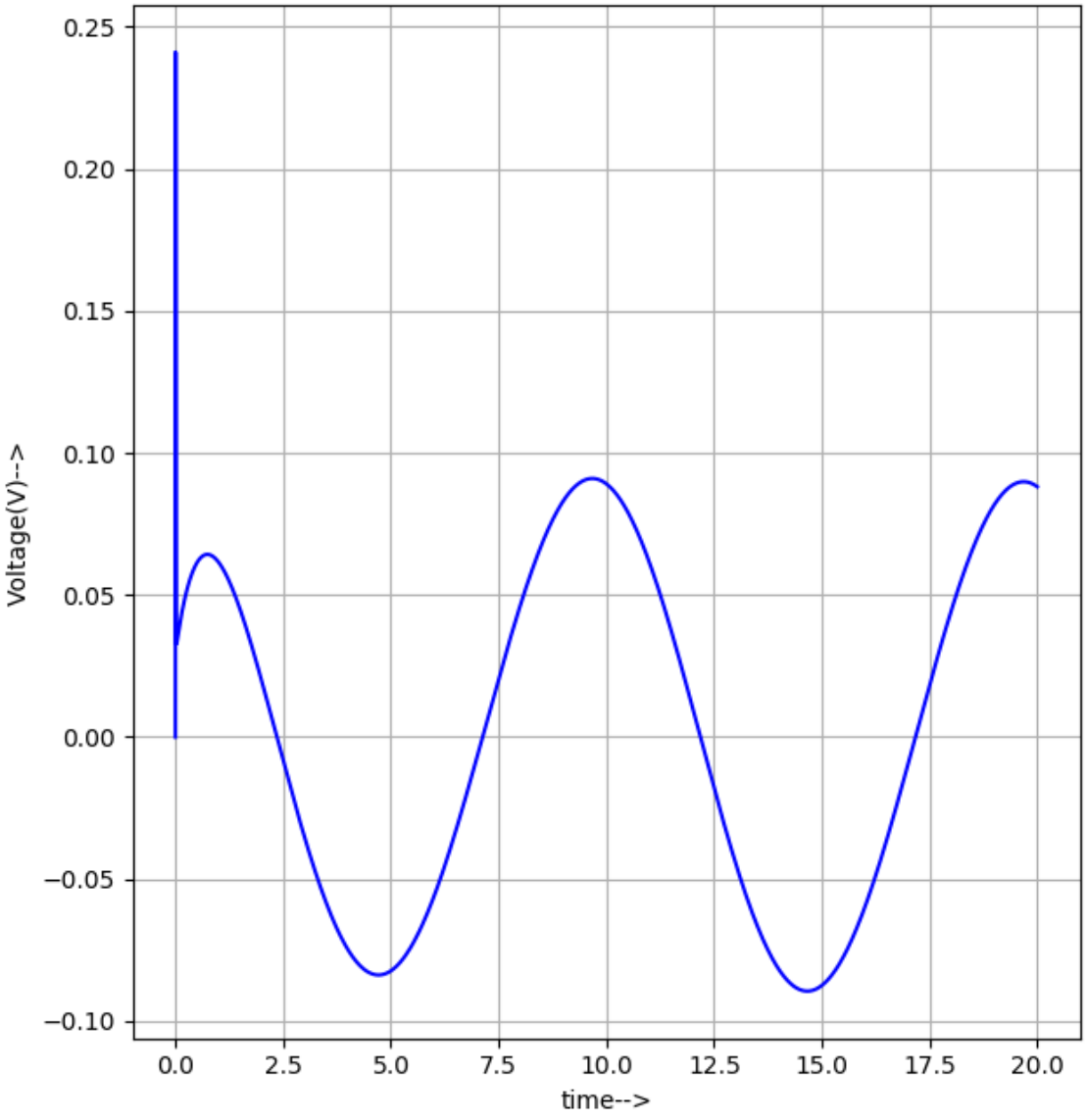

Figure 5: Python Plot Output

Conclusion:

Thus, we have study, analysis, stimulate the BJT cascade amplifier using e-sim.

Reference:

Electronics Circuits Analysis and Design (THIRD EDITION) by Donald A Neamen
Chapter 6 Basic BJT Amplifier page number:441