**CMPE 314: Principles of Electronic Circuits**

**Dr. Yan**

**Lab 06 Report**

**Emitter-Follower Amplifier Circuit**

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1. **Objective**

Construct and study the emitter-follower amplifier circuit.

1. **Equipment**
   1. Resistors;
      1. Given: 1 × 560 Ω, 2 × 2.2 kΩ, 2 × 10 kΩ
      2. Potentiometer: 1 × 2 MΩ
   2. Capacitor; 1 × 0.22 µF, 1 × 1 µF
   3. Transistor; 1 × 2N3904 NPN
   4. Breadboard, DC power supply, digital multi-meter(s), oscilloscope, function generator
2. **Background**

A common-collector (also known as an emitter follower or voltage follower) amplifier is one of three basic single-stage bipolar junction transistor (BJT) amplifier topologies, typically used as a voltage buffer. In this circuit the base terminal of the transistor serves as the input, the emitter the output, and the collector is common to both, hence its name. The analogous field-effect transistor circuit is the common drain amplifier.

1. **Procedures**

**4.1 Part A. Study the Voltage Gain**

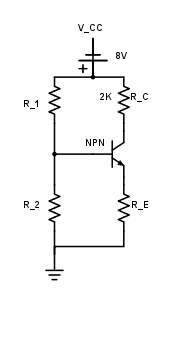
**Figure 1: Common Emitter Amplifier with an NPN Transistor**

* 1. Construct the DC portion of the amplifier circuit shown in Figure 2. Set VCC = 6 V.
  2. Measure VR1, VR2, and VE to calculate VCEQ, IBQ, and ICQ.
  3. Connect the sinusoidal voltage source with amplitude ±100 mV and at frequency 10 kHz to construct the circuit in Figure 1. Capture the input and output voltages. Comment on the phase relationship. Find the small signal voltage gain and compare to the theoretical value.
  4. Increase the input sinusoidal voltage, and record down any signal distortion. Comment on whether it is due to cutoff clipping or saturation clipping.

**4.2 Part B. Output Resistance**

1. Take out RL and capture the voltage waveforms.
2. Replace the load with a potentiometer. Vary the resistance until the output voltage is a half of the voltage measured in Step a. Measure the resistance of the potentiometer. Compare the output resistance of emitter-follower to a common emitter circuit in Lab 6.
3. Vary the potentiometer and measure at least three different resistances, in order that the output waveform shows three different peak to peak values. Record down the corresponding output waveforms. Comment on how the small signal gain is influenced by the value of the load resistance and output resistance of the amplifier circuit.
4. Calculate the DC Q-parameters (VCEQ, IBQ, ICQ, etc.) and AC parameters (Ri, Ro, Av, etc.) for the circuit. Compare them with the measured values.
5. **Results**

For computing the resistor values, only the portion of the circuit affected by the DC voltage was considered.



**Figure 2: DC Portion of Common Emitter Amplifier with an NPN Transistor**

1. **Conclusion**

There were several aspects of this lab that yielded outputs with significant errors. If more time was permitted, and more preparation was made by the team members especially in the pre-lab assignment, the issues would have been resolved. Nevertheless, a voltage gain was demonstrated and even with an error in this lab report, provided better insight on small signal waves.