

Lab 10

BJT Two-stage Amplifier

In this lab you will build a simple two-stage op-amp, and characterize it, then improve its gain by modifying the stated requirements.

Pre-Lab

1. Complete step 1.
2. Complete step 2.

Operational Amplifier

Build and characterize an op-amp using a differential pair stage, biased with R_{EE} , and a emitter follower output stage with the output biased at zero when the input is also biased at zero. Use $\pm 15\text{ V}$ supply voltages. Note that because of this biasing the amplifier only works for positive input voltages, and saturates for negative input voltages.

1. Design the op-amp such that $R_{id} = 10\text{ k}\Omega$, and $R_{out} = 25\ \Omega$ (you may use the simple approximation for the output resistance).
2. Derive the actual input and output resistances, the overall gain $A_{vo} = \frac{v_o}{v_{id}}$, and the common-mode gain.
3. Measure R_{id} , R_{out} , A_{vo} , and the common-mode gain, and compare with theory.
4. Apply feedback to create an inverting amplifier with a gain of -3. Note again that because of the way it is biased it really only functions properly when positive input is applied.