

# ECE 4043 Spring 2020

## Homework Problem Set No 9 for Experiment No 11

**Due on Final Exam Unless Otherwise Specified**

1. Perform SPICE simulations of the circuits that will be built in the procedure for the Discrete Op Amp. Use the SPICE parameters for the NPN transistors given in the Preliminary SPICE Simulations sections. Assume that the current source for the differential amplifier is an ideal current source of 2 mA. Use the actual values measured for the resistors and the compensation capacitor used in lab. Obtain the dc operating point, an ac analysis, noise analysis, and a transient analysis sufficient to show the clipping behavior and the slew rate. For design calculations you may invoke the infinite  $\beta$  assumption which means the collector and emitter currents are the same and the base currents are zero.