

303H Fall 2015 – Homework 4 Due Tu 10/06/15

For the following problems assume a 9V battery available.

1. (50 points, BJT CE design)
 - a) Design a common emitter amplifier using a 2N3904 transistor for a voltage gain of $A_v = -10$ with the collector current near 10mA.
 - b) Check your design by running Spice with sinusoidal input signals at a frequency near 3KHz. .
 - c) Do a frequency response from 10Hz to 1GHz and comment on the results.

2. (50 points, current mirrors)

For transistors use 2N3904, 2N3906, and 4007-CMOS

 - a. Using resistors and transistors design four current mirrors to mirror 5mA, two for sinking and two for sourcing, one of each of these two using BJTs and one each of them using MOS.
 - b. Check your designs in Spice by placing a resistor load on an output transistor and comment upon what values of the load the circuit acts as a valid mirror.
 - c. By replacing the current determining resistor by a PMOS transistor, repeat the above two parts for the current sinking MOS mirror.
 - d. For any one of the four circuits of part a, discuss what happens if only 10% resistors of commercially standard sizes are available.