

303 Spring 2019 – Homework 4 new Due ~~Th 02/28/19~~ Tu 03/05/19

For the following problems assume a 6 Volt battery available.

1. (50 points, BJT CE design)
 - a) Design a common emitter amplifier using an npn 2N3904 transistor for a voltage gain of $A_v = -20$ with the collector current near 2.6mA. Assume that $R_E = 1\text{K}\Omega$
 - b) Check your design by running Spice with small amplitude sinusoidal input signals at a frequency near 10KHz.
 - c) In Spice do a frequency response, looking at magnitude and phase from 10Hz to 1GHz (on a log of frequency scale) and comment on the results.
 - d) Repeat using a pnp 2N3906.

2. (50 points, current mirrors)

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

 - a. Using resistors and transistors design two current mirrors to mirror 5mA, one for sinking and one for sourcing, using BJTs.
 - b. Repeat using CMOS.
 - c. 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.