

303H Fall 2016 – Homework 3 **New Due Date Tu 10/04/16**

The transistors are ones used in teaching labs here; some useful data is on the course web page.

1. (25 points, CMOS Y matrix)
 - a. For the NMOS (common source) give the low frequency admittance matrix, giving formulas for square-law operation.
 - b. Repeat for the PMOS (common source).
 - c. Compare numerically for an NMOS 4007 and an npn 2N3904 both biased in the forward active region at the same (output) current level, $I_C = I_D = 8\text{m}$; assume $V_{GS} = 3\text{V}$.

2. (25 points, CS amplifier)

Assume a common source NMOS 4007 circuit is biased at $I_D=10\text{mA}$ for $R_L=100$ Ohms, find the range of low frequency gains available by varying the load resistance R_L (assume a signal source resistance of $R_S=0$ and a 9V power supply). Repeat for a PMOS 4007.

3. (50 points, CMOS biasing)

Separately bias the two amplifiers of problem 2 and check in Spice your circuits' time domain responses to an input 1KHz sinusoid of 10mV amplitude.