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303H Spring 2009 – Homework 3 Due Th 02/19/09

1. a) Using β=150 and an Early voltage of $|V_A|$=infinite, find the voltages in part e) of Problem P. 5.79, pages 525-526 of the text. Discuss the change if $|V_A|$=100.
   b) Replace the pnp by an npn with the same parameters (and with collector at the top, emitter at the bottom) and repeat a).

2. In the circuit of Problem P 5.112, page 531 of the text, use β=100 and $|V_A|$=150 with Cπ =10pFarad (see figure 5.67 with Cμ=0 and rx=0)
   a) Find the f_T of the transistor.
   b) Draw the small signal equivalent circuit.
   c) Using the collector voltage as output find the voltage gain vo(s)/vi(s).

3. For the circuit of Problem 4.54 of page 367 assume identical transistors and that V_{DD} is sufficiently large to allow both transistors to work in the saturation region.
   a) Work Problem 4.54 of page 367 (here Vt=VTO of Spice) and draw the small signal equivalent circuit (assume VGS=2VTO and use 4007 transistor parameters, KP, W, L, VTO and LAMBDA).
   b) Using the 4007=CA3600 package draw the schematic for the circuit of Figure P4.54 in PSpice and do a DC run with VDD=9v and 0≤Vi≤VDD. [due to the substrate connections this will require two 4007 packages; be sure to tie off the transistors not used. Also have PMOS substrates at VDD and NMOs substrates at the lowest potential of the package (=chip)].