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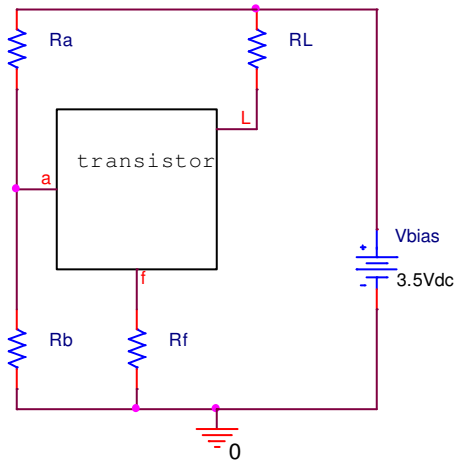
303H Fall 2013
Homework 2 – due 09/24/13

1. 50 points (Transistor biasing)
   Use the following configuration to carry out four different cases of biasing, one each for each of the four different transistors, an NPN 2N3904, a PNP 2N3906, a NMOS mnmosis, and a PMOS mpmosis. Assume that node a is the base of a BJT or the gate of a MOS, that node L is the collector of an NPN, the emitter of a PNP, the drain of an NMOS and the source of a PMOS (node f is the remaining node of the transistor) [assume the MOS transistors have the bulk tied to the source]
   Bias all transistors so that for the BJTs |IC| = 10mA and for the CMOS |ID| is 100uA (assume |VBE|=0.7V and Ra and Rb are in the MEG Ohm range and Rf as close to 100 Ohms as is reasonable)
   Give the Q point voltage and current values for each transistor and compare.



2. 50 points (BJT & MOS small signal equivalents)
   For each of the transistors biased in problem 1 draw the small signal pi equivalent circuit with the element values including gm.