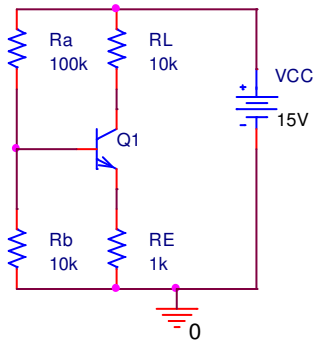
File: f:/coursesF09/303H/303hF09Hmwk4.doc RWN 09/27/09

303H Fall 2009 – Homework 4 Due Th 10/08/09

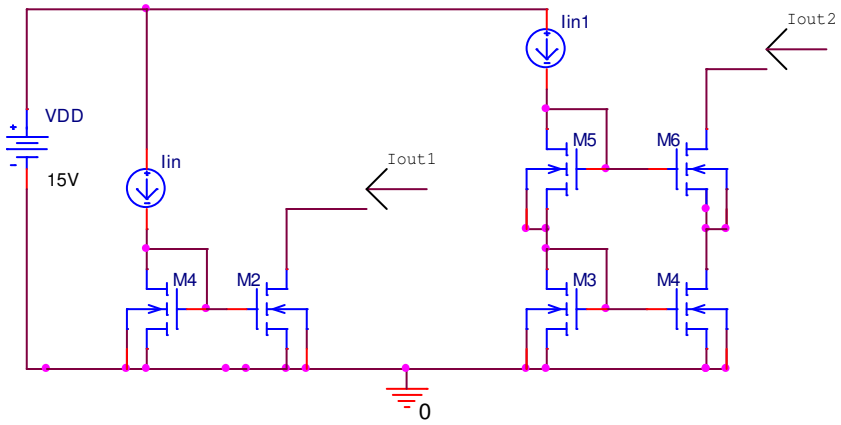
1. [50 points] [biasing a BJT]



For the above circuit the transistor is a 2N3904. [the models in the ECE PSpice bipolar library seem to be in error; use those on the 303H web page]. The problem is to check its biasing.

a) Find the Q point for this circuit and give the voltages on Rb and RE, referenced to ground; also give the transistor Q point IC, IB, VCE, VCB.
b) Run Spice and compare the Q point found in Spice with that found in part a).
c) Do a parametric run in Spice for RE=500, 1K, and 2KOhms and compare the resulting Q points.

2. [50 points] [cascade current mirrors]



Here all transistors are 4007's and the problem is to show how the cascade current mirror is an improvement.

a) Form the current sources Iin=Iin1 by a 4007 PMOS and a source to gate voltage to give Iin to be 2mA.
b) Apply DC sources to the drains of the two output transistors, M2 and M6. Find the minimum value of these voltages needed to keep M2 and M6 in saturation.
c) Make the voltages of these two applied sources equal by making their values to be a parameter. Run a DC sweep in Spice varying this voltage parameter from 0 to VDD. Compare the two currents Iout1 and Iout2; plot their difference in PSpice as well as the actual currents; include Iin in your plots..