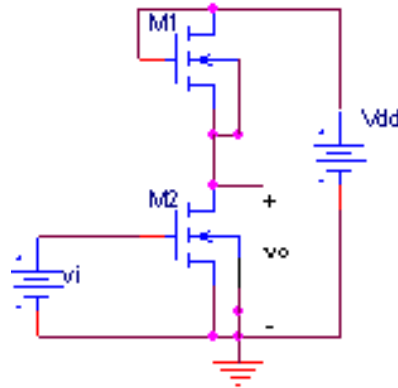


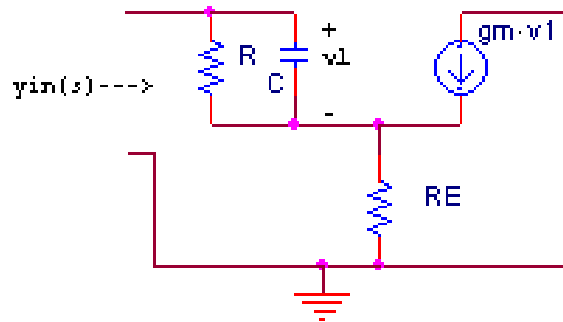
CIRCUITS – Ph.D. Qualifying Exam Fall 2009

- (i) (4 pts.) The following circuit has two identical transistors M1 and M2 which have positive threshold voltage ($V_{th} = V_{T0} > 0$) and zero output conductance ($\lambda=0$). Here $V_{dd} \gg 2V_{T0}$ and $v_i > 0$.

When M2 is in saturation, give v_o as a function of v_i , that is, $v_o(v_i)$, and sketch.



- (ii) (4 pts.) For the same circuit and conditions as in problem (i), find those v_i for which M2 is in saturation.
- (iii) (6 pts.) The following circuit is an equivalent circuit for an emitter follower. Find the input admittance $y_{in}(s)$ and give its poles and zeros.



- (iv) (6 pts.) The following circuit holds for all time t , $-\infty < t < +\infty$. At $t = 0$, the switches $S1$ and $S2$ both open. The element values E , $C1$, $C2$, and R are all real and positive.

Give $v_1(t)$ and $v_2(t)$ for all time.

