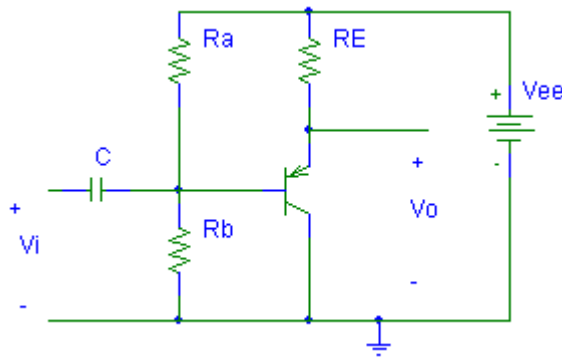303H Fall 2011 – Midterm Exam Tu 11/01/11

Open book open notes but not open computers; 100 points total; if stuck go on to the next problem. Good luck

1. (30 points, 15 min)
For this circuit, $\beta = 99$, Ra = Rb = 1Meg, Vee = 10, VA = ∞ and biased at Vo = 8
   a) Find the value of RE and I_E.

   b) Give g_m, g_π and small signal open circuit voltage gain, $\dfrac{Vo(s)}{Vi(s)}$, for $C_\pi =$

   20pFd.(assume C = ∞)

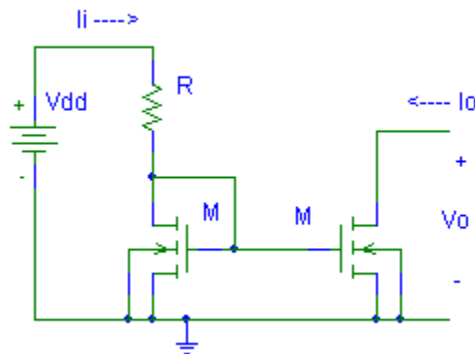2. (10 points, 5 min)

   For the transfer function $\dfrac{Vo(s)}{Vi(s)} = \dfrac{s(s^2+4)}{(s+3)(s+5)}$ give the poles and zeros.

3. (30 points, 15 min)

   For the following circuit assume identical transistors, with $\beta = \dfrac{KP}{2}\dfrac{W}{L} = 10^{-4}\,\text{A/V}^2$,

   VTO=1V, LAMBDA=λ=0.01 and Vdd=10V,
   a) Find R for VGS = 4V and give the input current Ii.
   b) Give the output voltage, Vo, such that Io=Ii.
   c) Find Io if Vo=7V and again if Vo=2V.

4. (30 points, 15 min)

   For the following circuit the op-amp has zero input currents and gain k, $V_o = kV_d$.

   a) Assuming the gain k is finite (but independent of s), find the input admittance, $y = I/V$, in terms of C, G1=1/R1, G2=1/R2, and k.

   b) Let k become infinite and give y. Comment on the result.