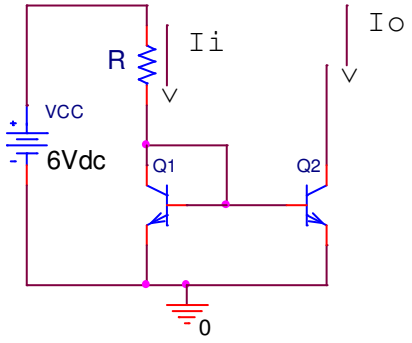
File: f:/coursesS12/303/303S12Midtrm.doc RWN 03/12/12

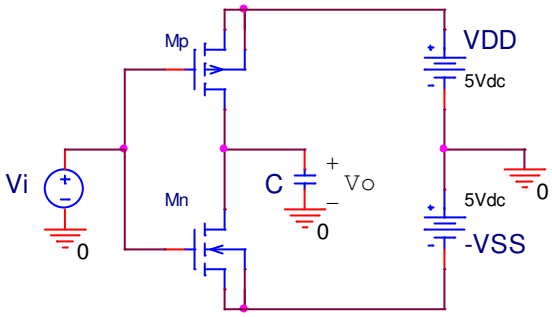
ENEE 303 Midterm Exam, Spring 2012

100 points, 75 minutes, open book, open notes, open calculators [but not open computers]. If stuck go on to the next problem. Good luck and have a good spring break!

1. (35 points, 20 minutes) Assuming identical transistors with their base-emitter diode governed by the base emitter saturation current, Is = 6E-16, and having the forward beta, Bf=100, give the resistance, R, needed to give an output current of 6 milliAmps.



2. (30 points, 20 minutes) For the following inverter assume that Mp and Mn are fully complementary with Spice parameters KP=4E-5, |VTO|=1, LAMBDA=0.1, Cgs=Cgd=10pFd, and W=L=10uM. Find symbolically and numerically the small signal gain, Vo/Vi(s) when loaded with the capacitor C=20pFd. Give also its zeros and poles.



3. (35 points, 20 minutes) For the following circuit assume the open circuit transfer function is $V1/Vo(s) = 1/[C_1C_2LRs^3 + C_2Ls^2 + (C_1+C_2)Rs + 1]$.
   Assume also that R1=Ri are very large and K=Rf/R1..
   a) Give the transfer function Vo/Vi(s) as a ratio of two polynomials.
   b) Give the conditions for sinusoidal oscillations and the oscillation frequency as well as the poles of the transfer function Vo/Vi.