File: G/coursesF13/303H/303HF13Midtrm.doc RWN 10/28/13

ENEE 303H Fall 2013 – Midterm Exam Th 11/07/13

Open book open notes but not open computers; 100 points total (75 minutes); if stuck go on to the next problem. Good luck

For the following problems use VDD=10V.

For the npn transistors: $\beta = 100$, VA=100V, $C_\pi = 10$pFd, $C_\mu = 0$; bias VBE=0.7

For pnp transistors, assume they are completely complementary to the npn ones.

For the NMOS transistors: KP=$5x10^{-4}$, VTO=1, LAMBDA=0.01, W/L= to be chosen.

For PMOS transistors, they are completely complementary to the NMOS ones.

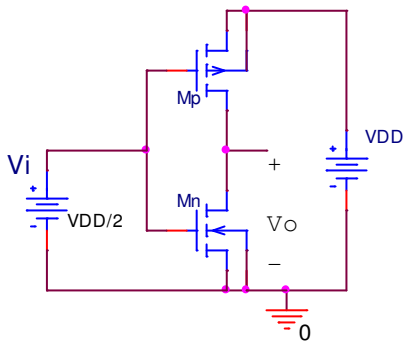
1. (30 points, 20 min)

Design a current mirror using two pnp transistors and a resistor to source a current of 3mA. If this gives 3mA at an output voltage of 8V determine the output current at 9V.

2. (30 points, 20 min)

a) Find I_S for Mp when W/L=1.

b) Give the power delivered by the two batteries.



3 (40 points, 25 min)

For the following circuit assume that W/L is chosen such that Vo is biased to Vo = 3V

a) Give numerically the transistor's source current I_S, gm and go.

b) Draw the small signal equivalent circuit including Cgs & Cgd using generic symbols (= without numerical values).

c) Find (without numerical values) the small signal voltage gain, vo/vi(s) and give its poles and zeros.

d) Evaluate numerically the poles and zeros when Cgs=Cgd=5pFd.