Subject: EEE598D Homework #3
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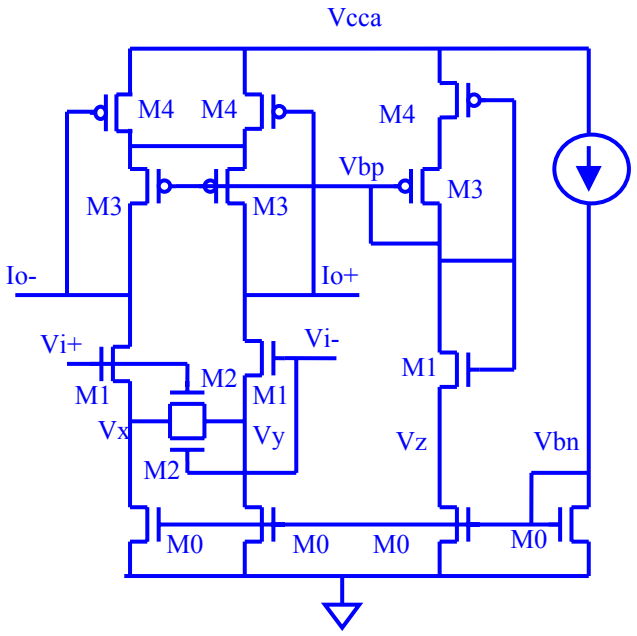
A fully differential CMOS transconductor circuit is shown in Fig.1.



$(W/L)_0$ = 20u/2u
$(W/L)_1$ = 20u/2u
$(W/L)_2$ = 10u/10u
$(W/L)_3$ = 60u/4u
$(W/L)_4$ = 60u/4u
Ib = 50uA
Vcca = 3v

Body of all PMOS and NMOS transistors are connected to vcca, gnd respectively.

Fig.1 Fully differential CMOS transconductor circuit

Problem 1.Derive the expression of differential transconductance gm of this circuit and calculate gm for the 0.5um CMOS process (given in Homework#1). (Assuming 1.5v input common-mode voltage and neglecting body effects)

Problem 2. Simulate the differential gm for the 1V peak-to-peak input voltage and a 1k resistive load across I+ and I-. Plot I (across R) and gm vs. (vi^+-vi^-). Extract a_2 and a_3 from your simulation data using the curve fitting technique. Where a_2 and a_3 are non-linearity parameters defined as:

$$I^+ - I^- = I = g_m(V_i^+ - V_i^-) + a_2(V_i^+ - V_i^-)^2 + a_3(V_i^+ - V_i^-)^3$$