類比積體電路設計概論 HW8, 不用交.

HW8.1 (40 points)

如圖 8.1 所示，是一個 Two-Satge Opamp 的 Miller compensation 相關電路。

(a) 請列出在使用Miller Capacitor (C)做極點分離之頻率補償時，若沒有Rz的問題是甚麼? 請說明此問題的原因為何?

(b) 在滿足極點－零點抵消之情況下，假設C_E可忽略，M9, M11 (g_m, W/L, Id), Cc, and C_L皆是已知。請設計M13, M14, M15 and I_1。

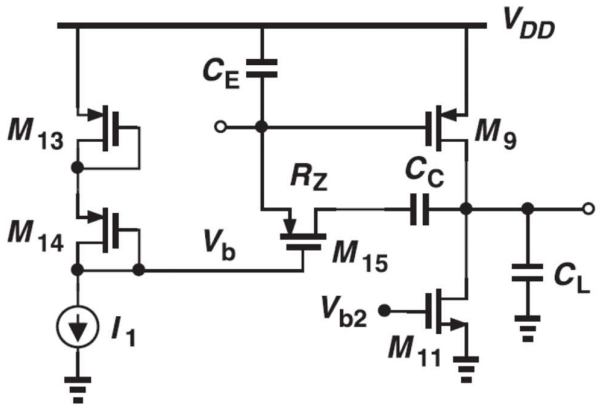

Fig. 8.1

HW8.2 (30 points)

Suppose the open-loop transfer function of a two-stage op amp is expressed as

$$H_{open}(s) = \frac{A_0\left(1+\frac{s}{\omega_z}\right)}{\left(1+\frac{s}{\omega_{p1}}\right)\left(1+\frac{s}{\omega_{p2}}\right)}$$

(a) 假如$\omega_{p2}=10A_0\omega_{p1}$ and $\omega_z=10\omega_{p2}$，請劃出$H_{open}(s)$'s bode plots for Magnitude and phase 並標示出unit-gain frequency ω_u = ?.

(b) 承上，其phase margin (PM) = ?

(c) 若是$\omega_{p2}=A_0\omega_{p1}$ and $\omega_z=2\omega_{p2}$，其phase margin (PM) = ?

類比積體電路設計概論 HW8, 不用交.

HW8.3 (15 points)

The two-stage op amp of Fig. 8.3 incorporates Miller compensation to reach a phase margin of 45◦. Estimate the compensation capacitor value. Usimg all teansistors' small-signal parameters (g_m, r_o).

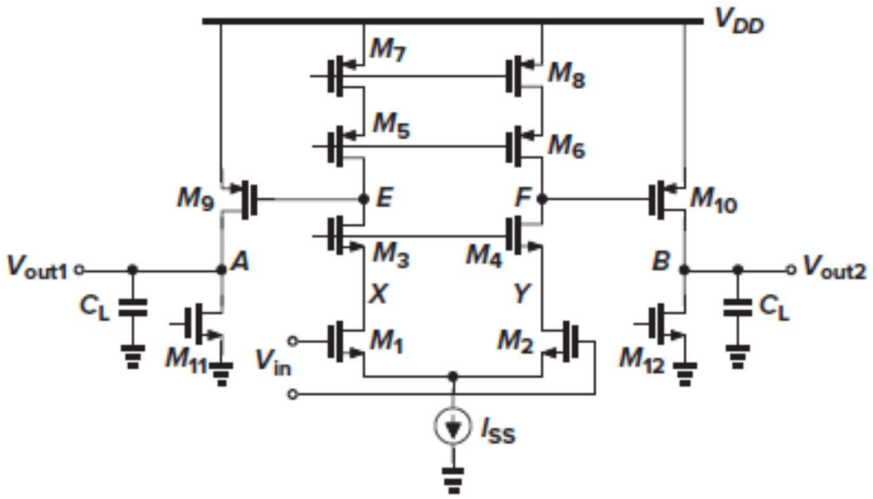

Fig. 8.3

HW8.4 (15 points)

Consider the transimpedance amplifier shown in Fig. 8.4, where R_D = 1 kΩ, R_F = 10 kΩ, $g_{m1} = g_{m2}$ = 1/(100Ω), and $C_A = C_X = C_Y$ = 100 fF. Neglecting all other capacitances and assuming that $\lambda = \gamma = 0$, compute the phase margin of the circuit. (Hint: break the loop at node X.)

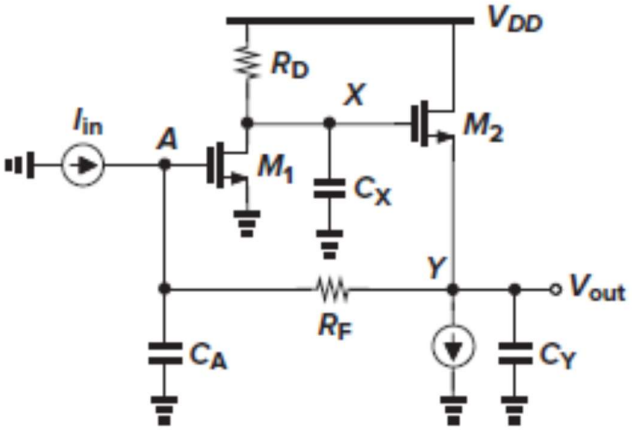

Fig. 8.4