

**EE6240 Homework 5: Due Friday 28/10/2011**

In all problems below, neglect channel-length modulation, backgate effects and device capacitances, and assume all MOSFETs are in saturation. Use the long-channel device equation  $I = \beta(V_{GS} - V_T)^2$ . Assume the input signal consists of two closely-spaced tones at frequencies  $\omega_1$  and  $\omega_2$ , and equal amplitudes  $A$ .

1) Calculate and compare the IIP3 of the circuits shown in fig. 1(a) and (b). Assume  $V_{B1}$ ,  $V_{B2}$  and  $I_T$  are such that bias currents in  $M_1$  and  $M_2$  are the same in (a) and (b).

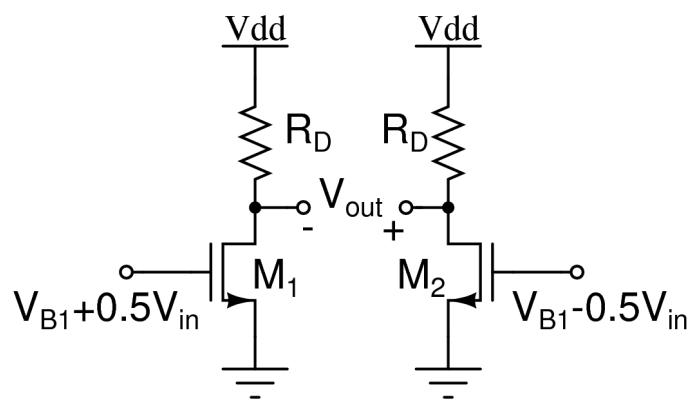


Fig. 1(a) Pseudo-differential amplifier

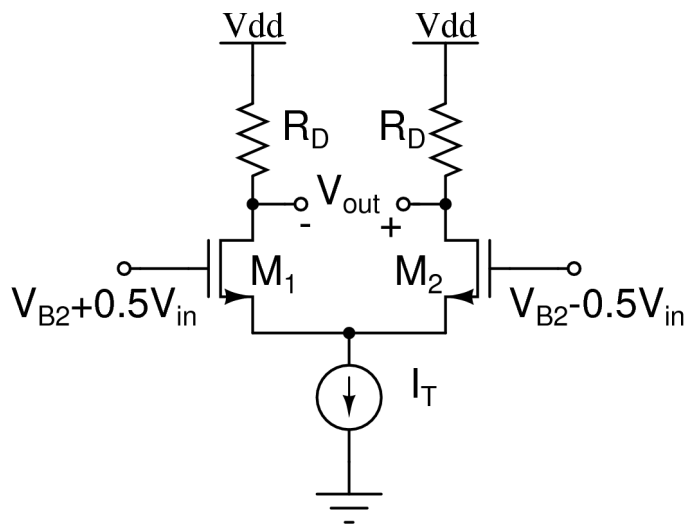


Fig. 1(b) Differential Amplifier

2) Calculate the IIP3 of the circuits shown in fig 2(a), (b) and (c). To simplify things, express your answer in terms of tank Q, wherever applicable.

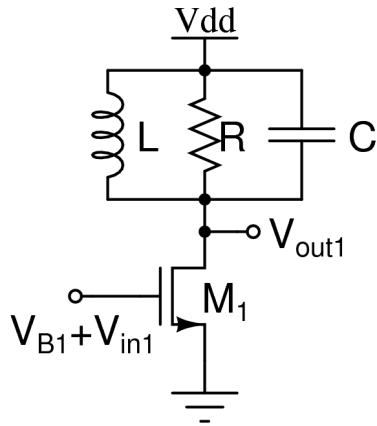


Fig. 2(a)

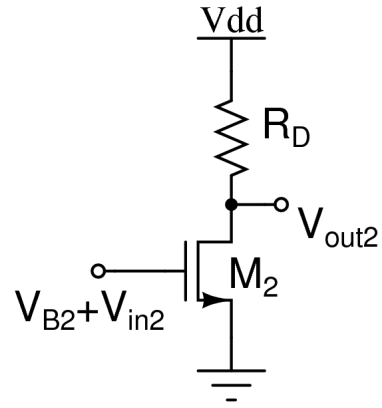


Fig. 2(b)

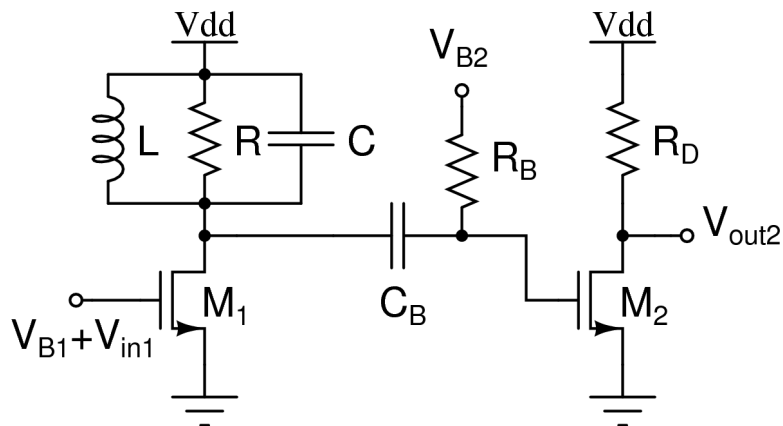


Fig. 2(c)