

Homework Assignment No. 12

Due Monday, April 24, 2006 in class

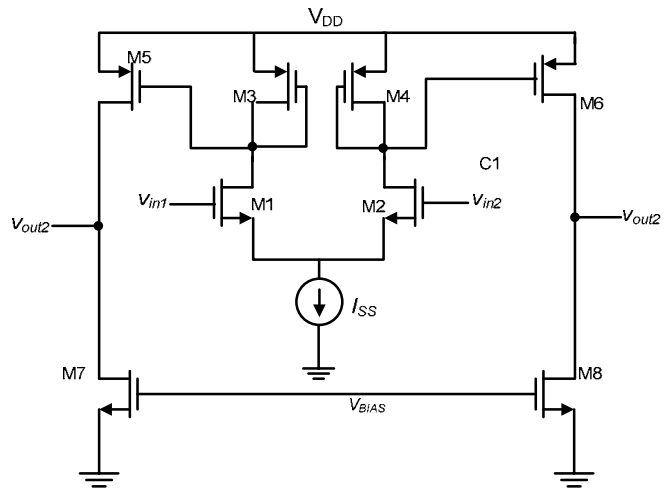
Problem 1 – (10 points)

Problem 7.5-5 of Allen and Holberg 2nd edition

Problem 2 – (10 points)

A two-stage MOS amplifier is shown below. Note that the first stage incorporates diode-connected rather than current source loads.

- Assuming that all transistors are operating in saturation and $(W/L)_{1,2}=50/0.6$, $(W/L)_{3,4}=10/0.6$, $(W/L)_{5,6}=20/0.6$ and $(W/L)_{7,8}=56/0.6$,
- Calculate the input referred noise voltage if $\mu_n C_{ox} = 75 \mu\text{A}/\text{V}^2$ and $\mu_p C_{ox} = 30 \mu\text{A}/\text{V}^2$. ($I_{SS}=0.5\text{mA}$)
- How would this value change if the transistor flicker noise is considered? Use $K_{fp} = 0.3 \times 10^{-25} \text{V}^2\text{F}$ and $K_{fn} = 1 \times 10^{-25} \text{V}^2\text{F}$.
- Calculate the flicker noise corner frequency of the op-amp.



Problem 3 – (10 points)

Trade-off between output voltage swing and noise in a MOS folded cascode: In a folded cascode MOS amplifier, how much does the dynamic range (DR) change (at the output) if the overdrive voltage of the transistors ($V_{OD}=V_{GS}-V_{TH}$) are reduced by 25% each? Assume the total DC current available and the supply voltage are constant. Only consider the shot noise of the drain current in your calculation.

$$\text{Dynamic range} = \frac{\text{linear output swing}}{\text{total output noise}}$$

Problem 4 – (10 points)

Problem 7.6-1 of Allen and Holberg 2nd edition

Problem 5 – (10 points)

Problem 7.4-3 of Allen and Holberg 2nd edition