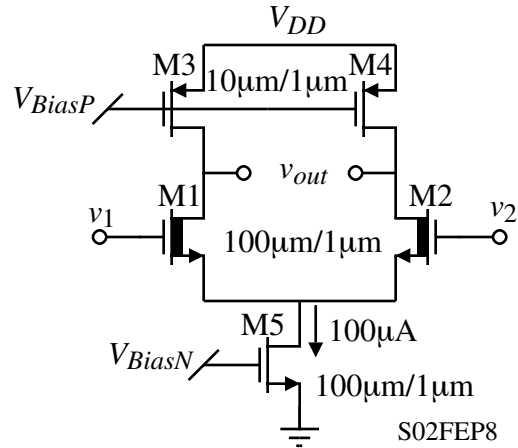


Homework Assignment No. 13

Due Friday, April 18, 2003 in class

Problem 1 - (10 points)

A differential CMOS amplifier using depletion mode input devices is shown. Assume that the normal MOSFETs parameters are $K_N' = 110\text{V}/\mu\text{A}^2$, $V_{TN} = 0.7\text{V}$, $\lambda_N = 0.04\text{V}^{-1}$ and for the PMOS transistors are $K_P' = 50\text{V}/\mu\text{A}^2$, $V_{TP} = -0.7\text{V}$, $\lambda_P = 0.05\text{V}^{-1}$. For the depletion mode NMOS transistors, the parameters are the same as the normal NMOS except that $V_{TN} = -0.5\text{V}$. (a.) What is the maximum input common-mode voltage, $V_{icm}^+(\text{max})$? (b.) What is the minimum input common-mode voltage, $V_{icm}^-(\text{min})$? (c.) What value of V_{DD} gives an $ICMR = 0.5V_{DD}$?



Problem 2 - (10 points)

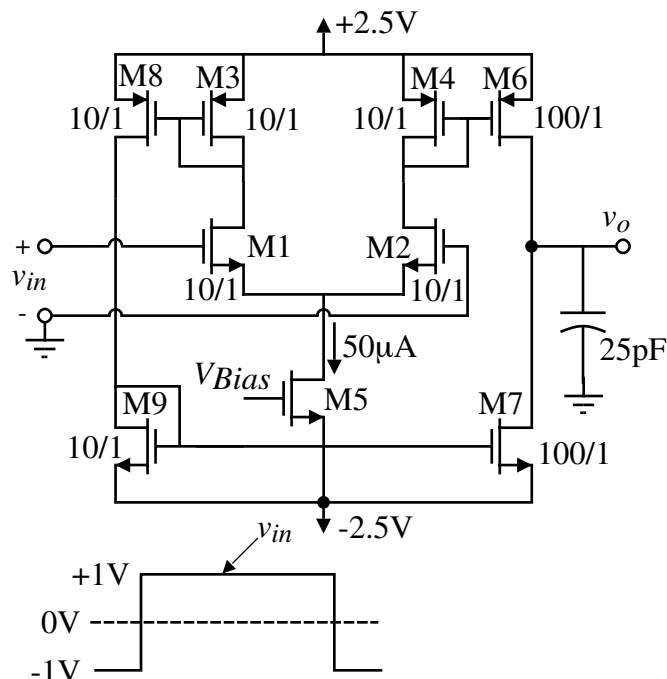
Problem 8.2-2 of Allen and Holberg, 2nd edition

Problem 3 - (10 points)

Problem 8.2-8 of Allen and Holberg, 2nd edition.

Problem 4 - (10 points)

The comparator shown has an input applied as shown. Assuming the pulse width is wide enough, calculate the propagation delay time for this comparator. Assume that the trip point of the output is at 0V.



Problem 5

If the folded-cascode op amp shown having a small-signal voltage gain of 7464V/V is used as a comparator, find the dominant pole if $C_L = 5\text{pF}$. If the input step is 10mV , determine whether the response is linear or slewing and find the propagation delay time. Assume the parameters of the NMOS transistors are $K_N' = 110\text{V}/\mu\text{A}^2$, $V_{TN} = 0.7\text{V}$, $\lambda_N = 0.04\text{V}^{-1}$ and for the PMOS transistors are $K_P' = 50\text{V}/\mu\text{A}^2$, $V_{TP} = -0.7\text{V}$, $\lambda_P = 0.05\text{V}^{-1}$.

