

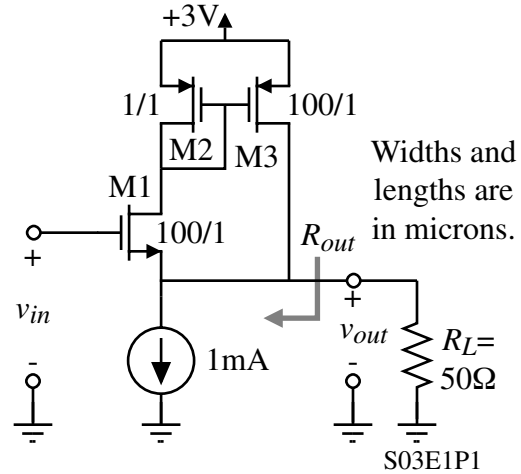
EXAMINATION NO. 1

NAME _____ SCORE _____ /100

INSTRUCTIONS: This exam is closed book with one sheet of notes permitted. The exam consists of 4 questions for a total of 100 points. Please show your work leading to your answers so that maximum partial credit may be given where appropriate. Be sure to turn in your exam with the problems in numerical order, firmly attached together.

Problem 1 - (25 points)

Find an algebraic expression for the voltage gain, v_{out}/v_{in} , and the output resistance, R_{out} , of the source follower shown in terms of the small-signal model parameters, g_m and R_L (ignore r_{ds}). If the bias current is 1mA find the numerical value of the voltage gain and the output resistance. Assume that $K_N' = 110\mu\text{A}/\text{V}^2$, $V_{TN} = 0.7\text{V}$, and $K_P' = 50\mu\text{A}/\text{V}^2$, $V_{TP} = -0.7\text{V}$.



Problem 2 - (25 points)

Problem 3 - (25 points)

Problem 4 - (25 points)

Find the numerical values of all roots and the midband gain of the transfer function v_{out}/v_{in} of the differential amplifier shown. Assume that $K_N' = 110\mu\text{A}/\text{V}^2$, $V_{TN} = 0.7\text{V}$, and $\lambda_N = 0.04\text{V}^{-1}$. The values of $C_{gs} = 0.2\text{pF}$ and $C_{gd} = 20\text{fF}$.

