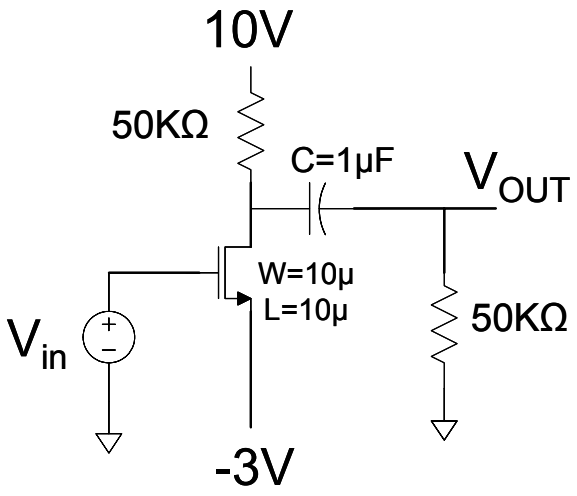
EE 333 Name _____
Exam 2
Summer 2003

Instructions: All problems are worth 14 points except problems 5and 6 which are worth 15 points. Students may use two sheets of paper with any information desired on these two sheets. All work and answers should appear on the exam sheets. Unless specifically stated to the contrary, assume all MOS transistors are from a process with $u_nC_{OX}=100ua/v^2$, $V_{TN}=$ 1V, $V_{TP}=$ - 1V, $u_p=u_n/3$, $\lambda = 0$ and $\gamma = 0$,.

Problem 1 For the following circuit

a) Determine the small signal voltage gain $A_V = \frac{V_{OUT}}{V_{in}}$.

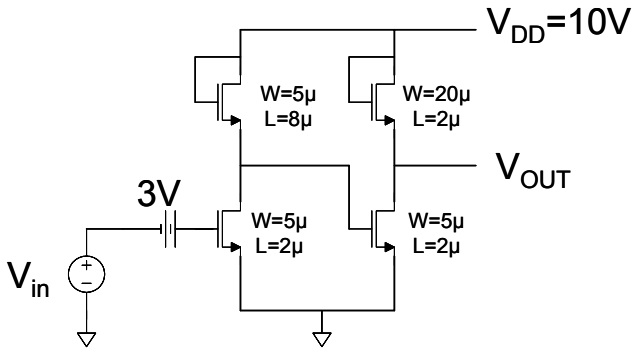
b) Determine the quiescent power dissipation.



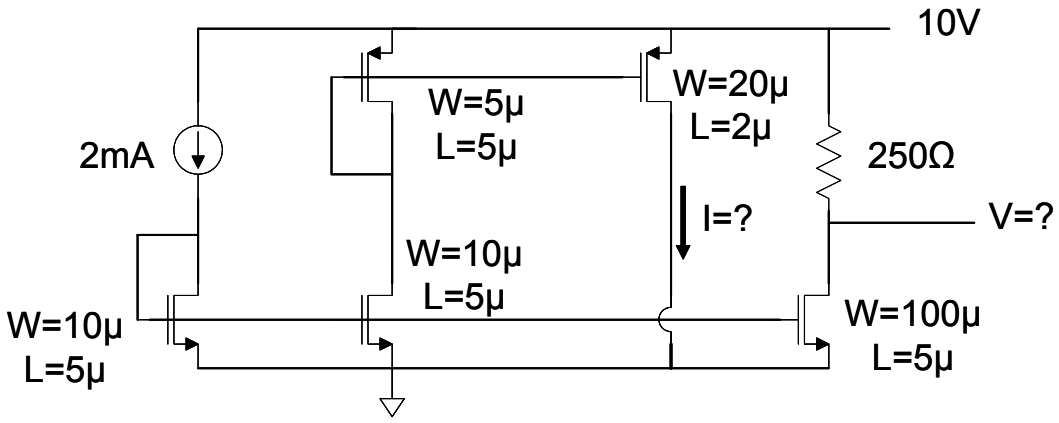
Problem 2 For the amplifier shown, assume that the device dimensions are as indicated.

a) Determine the small signal voltage gain $A_V = \frac{V_{OUT}}{V_{in}}$.

b) Determine the steady state output voltage if V_{in}=.01sin(2000t).



Problem 3 For the circuit shown, determine the variables indicated with a ?.



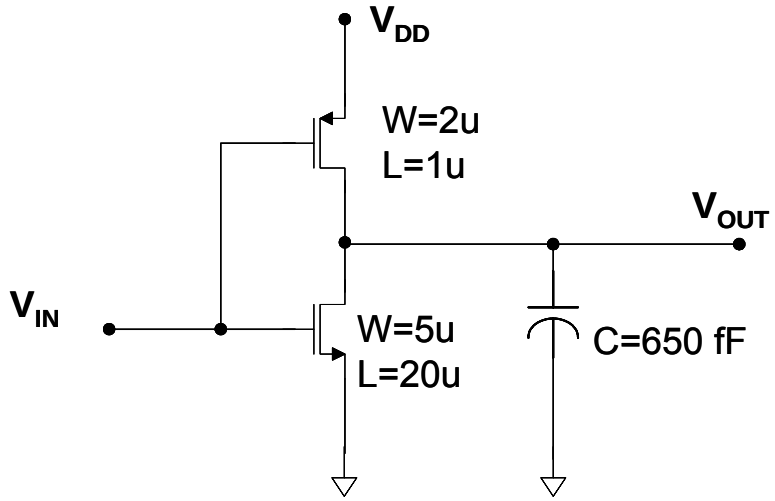
Problem 4 Assume a 2-port network is characterized by the equations

$$I_1 = 2V_1^2 V_2$$
$$I_2 = V_1 + 5e^{\frac{V_2}{4}}$$

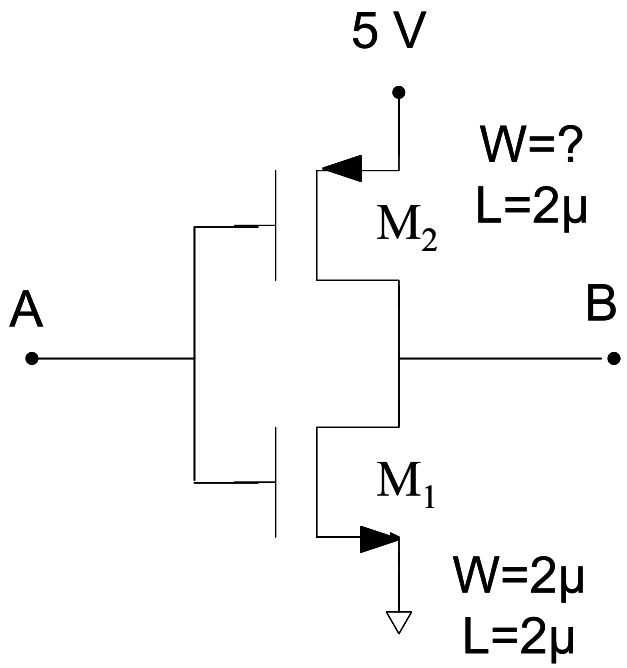
a) Determine a small-signal equivalent circuit at the operating point $V_{1Q}=3$, $V_{2Q}=1$

b) Determine the quiescent currents I_{1Q} and I_{2Q} at the operating point given in a)

Problem 5 Using the definition for t_{HL} and t_{LH} given in class, obtain t_{HL} and t_{LH} at the output for the following circuit.

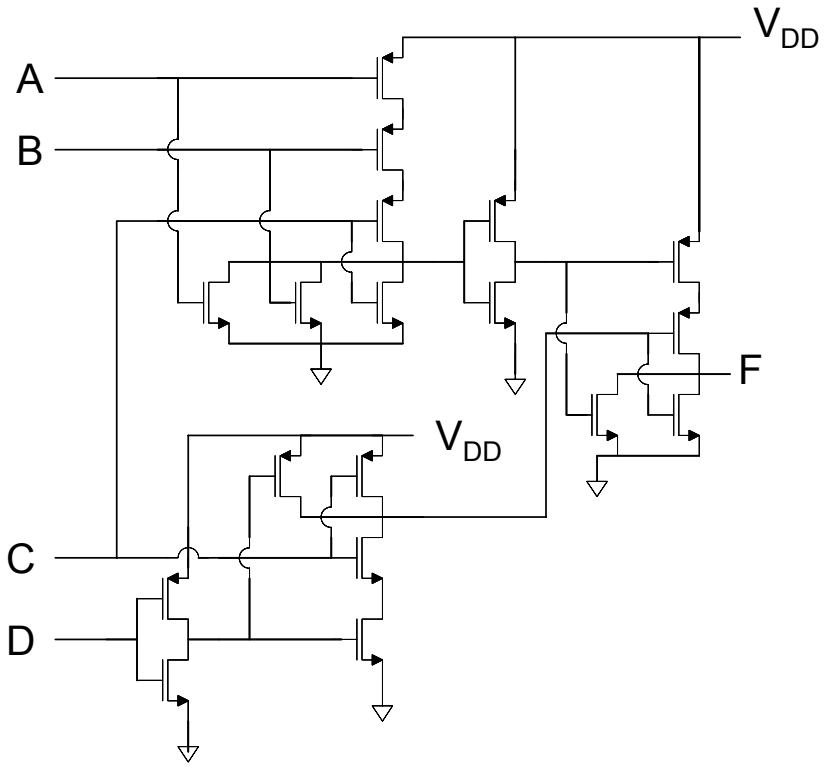


Problem 6 Determine W of the p-channel transistor so that the trip point of the following inverter is at 1.5V.



Problem 7

a) Obtain the Boolean expression for the output variable F



b) Using static CMOS, design a circuit at the transistor level that implements the following Boolean function. Assume only the Boolean inputs A,B and C are available. You need not size the devices.

$$F = \overline{(A \bullet B) + C}$$