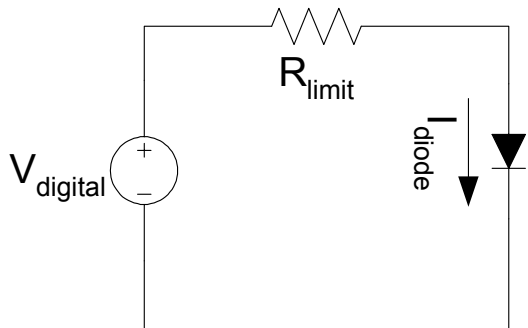


EE 42

Homework #5

Due Monday, April 12, 2004 at 4pm in drop box

Problem 1:



Suppose I have a voltage, V_{digital} , that is the output of some digital circuit.

When V_{digital} is high (digital circuit output is "1") I want the diode shown to "light up" (be forward biased and carry current).

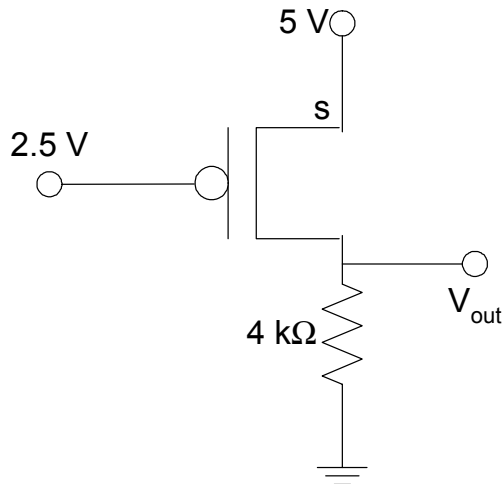
To light up, I_{diode} must be at least 20 mA.

But, the diode will burn if the current is 100mA or above.

Find the range of values for the resistor R_{limit} that will keep I_{diode} within the range 20 mA to 100 mA when V_{digital} is in the range 4 V to 5 V.

Use the large-signal model for the diode, with $V_F = 2 \text{ V}$.

Problem 2:



Parameters for the PMOS transistor shown are:

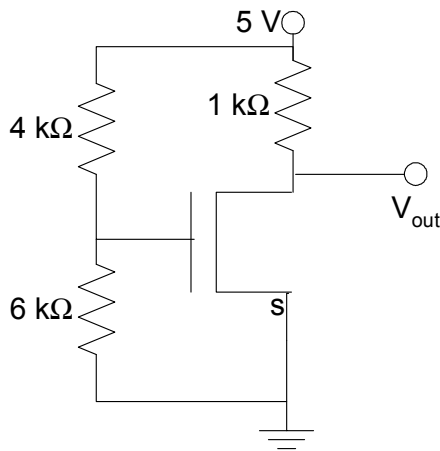
$$V_{\text{TH}(p)} = -1 \text{ V}$$

$$W/L \mu_p C_{\text{ox}} = 1 \text{ mA/V}^2$$

$$\lambda_p = 0 \text{ V}^{-1}$$

Find V_{out} .

Problem 3:



Parameters for the NMOS transistor shown are:

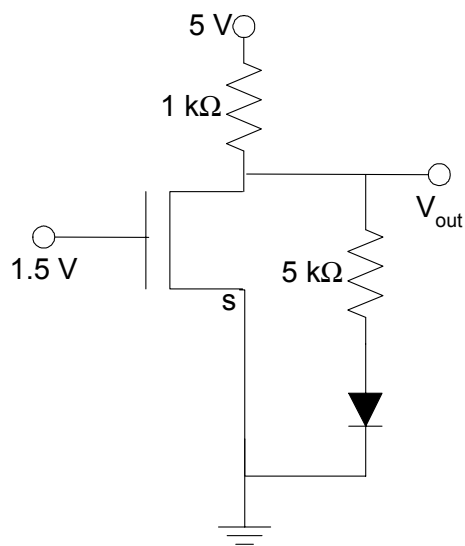
$$V_{TH(n)} = 1 \text{ V}$$

$$W/L \mu_n C_{ox} = 1 \text{ mA/V}^2$$

$$\lambda_n = 0 \text{ V}^{-1}$$

Find V_{out} .

Problem 4:



Parameters for the NMOS transistor shown are:

$$V_{TH(n)} = 1 \text{ V}$$

$$W/L \mu_n C_{ox} = 1 \text{ mA/V}^2$$

$$\lambda_n = 0 \text{ V}^{-1}$$

Find V_{out} .

Use the large-signal model for the diode with $V_F = 2 \text{ V}$.