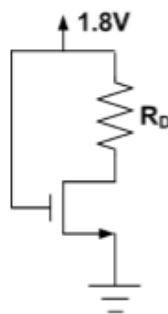
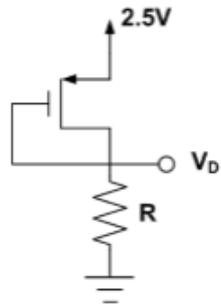


EE 315 Module 4 Practice Problems

1. An NMOS transistor is characterized as follows: $V_{DS}=0.1V$, $V_t=1.5V$, $k'_n= 25 \mu A/V^2$, and $W/L = 10$. Find the drain current for $V_{GS}=0V$, $1V$, $2V$, and $3V$.
2. An NMOS transistor is characterized as follows: $V_{DS}=3.3V$, $V_t=1.V$, $k'_n= 37.5 \mu A/V^2$, and $W/L = 10$. Find the drain current for $V_{GS}=0V$, $1V$, $2V$, and $3V$.
3. Identify the region of operation and the drain current for an NMOS transistor where the $k'_n= 25 \mu A/V^2$, $V_t=1V$ and $W/L = 10$.
 - a. $V_{GS}=5V$ and $V_{DS}=6V$
 - b. $V_{GS}=0V$ and $V_{DS}=6V$
 - c. $V_{GS}=2V$ and $V_{DS}=-0.5V$
4. An NMOS transistor has $V_t=0.8V$, $k'_n= 0.05 \text{ mA}/V^2$, and $W/L = 2$. The device is biased at $V_{GS}=2.5 V$. Calculate the drain current and the resistance r_O for $V_{DS}=2V$ and $10V$ for
 - a. $\lambda=0$
 - b. $\lambda=0.02$
 - c. $V_A=35V$
5. A PMOS transistor has $k'_p= 0.1 \text{ mA}/V^2$, $W/L = 2$, $V_t= -2V$ and $V_{SG}= 3V$. Find the region of operation and the drain current for:
 - a. $V_{SD}=0.5V$
 - b. $V_{SD}=2V$
 - c. $V_{SD}=5V$
6. Consider the following NMOS circuit where $V_t=0.5V$, $k'_n= 0.4 \text{ mA}/V^2$, and $W/L = 5$. If the circuit operates at the edge of saturation with a drain current of $1mA$, find the resistor, R_D .



7. Consider the following PMOS circuit where $V_t=-0.6V$, $k'_p= 250 \mu A/V^2$, and $L = 0.25\mu m$. find the values required for W and R such that the drain current is $0.8mA$ and the drain voltage is $1.5V$.



8. Find the labeled voltages and currents in the following circuit where $V_{tn} = +1V$, $V_{tp} = -1V$, $k'_n = 20 \mu A/V^2$, $k'_p = 8 \mu A/V^2$ and $W/L = 3$ (for both n and p-type transistors).

