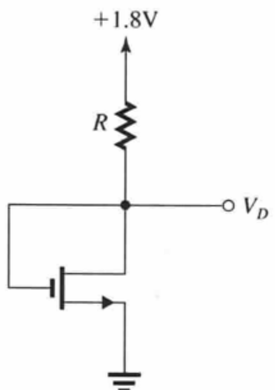
Ex: 5.9



$V_{tn} = 0.5$ V.

$\mu_n C_{ox} = 0.4 \text{ mA} / V^2$

$\frac{W}{L} = \frac{0.72 \ \mu\text{m}}{0.18 \ \mu\text{m}} = 4.0$

$\lambda = 0$

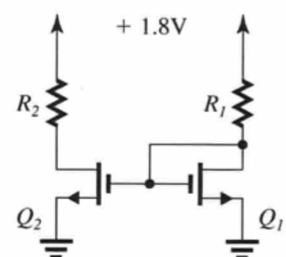
saturation mode $(v_{GD} = 0 < V_{tn})$

$V_D = 0.8$ V. $= 1.8 - I_D R_D$

$I_D = \frac{1}{2}\mu_n C_{ox}\frac{W}{L}(V_D - V_{tn})^2 = 72 \ \mu\text{A}$

$\therefore R = \frac{1.8 - 0.8}{72 \ \mu\text{A}} = 13.9 \text{ k}\Omega$

Ex: 5.10



From Exc. 5.9, $V_{GS} = 0.8$ V, $V_{tn} = 0.5$ V,

$V_{OV} = 0.3$ V.

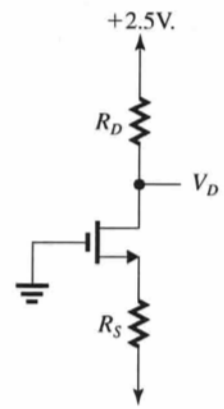
$I_D = 72 \ \mu\text{A}$ (saturation)

At the triode/saturation boundary

$V_D = V_{OV} = 0.3$ V

$\therefore R_2 = \frac{1.8 \text{ V} - 0.3 \text{ V}}{72 \ \mu\text{A}} = 20.8 \text{ k}\Omega$

5.45



$V_t = 1\ \text{V}.\ k_n' = 60\ \mu\text{A}/\text{V}^2$

$L = 3\ \mu\text{m}\ \ W = 100\ \mu\text{m}$

$\lambda \cong 0$

For $I_D = 0.25\ \text{mA},\ V_D = 0,\ R_D = 10\ \text{k}\Omega$

$V_{GD} = 0 \Rightarrow sat.$

$$(V_{GS} - V_t) = \sqrt{\frac{I_D}{\frac{1}{2}k_n'\frac{W}{L}}} = 0.5\ \text{V}.$$

$V_{GS} = 1.5\ \text{V}. = 2.5 - R_S I_D$

$R_S = 4\ \text{k}\Omega$