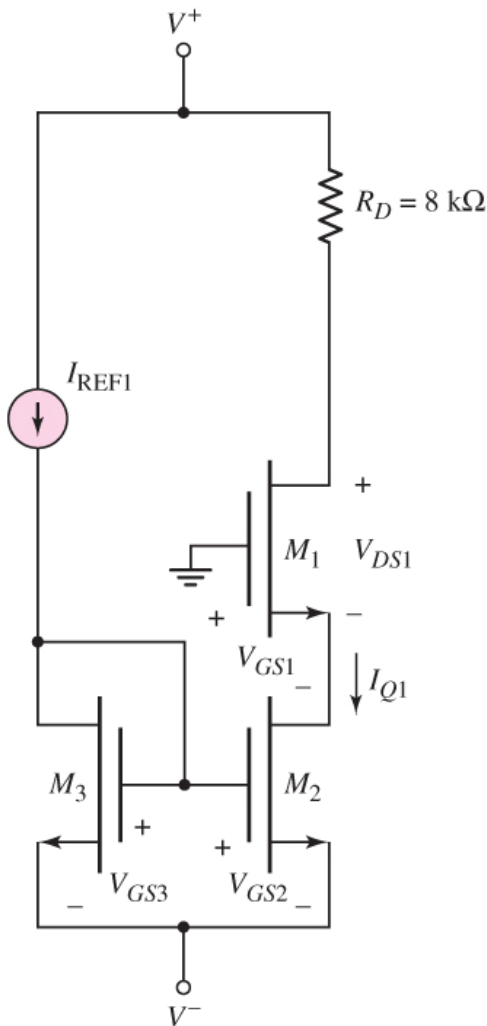


In class “Candy Question” Solution Jan 24th, 2013 (ECE 322)

Note: Please solve this as a part of your team. The first team to correctly solve this on the board will get candies!

Consider the NMOS current mirror circuit shown below. Assuming that $I_{REF1}=120\ \mu\text{A}$, $V^+=3\text{V}$, $V^-=-3\text{V}$ and transistor parameters of $V_{TN}=1\text{V}$ and $\lambda=0$ for all transistors. $K_{n1}=50\mu\text{A}/\text{V}^2$, $K_{n2}=30\mu\text{A}/\text{V}^2$, $K_{n3}=60\mu\text{A}/\text{V}^2$. Determine I_{Q1} , V_{GS1} , V_{GS2} , and V_{GS3} .



SOLUTION

$$V_{GS3} = \sqrt{\frac{I_{REF1}}{K_{n3}}} + V_{TN} = \sqrt{\frac{120}{60}} + 0.4 = 1.814\text{ V}$$

$$V_{GS2} = V_{GS3} = 1.814\text{ V}$$

$$I_{Q1} = K_{n2}(V_{GS2} - V_{TN})^2 = 30(1.814 - 0.4)^2 = 60\ \mu\text{A}$$

$$V_{GS1} = \sqrt{\frac{I_{Q1}}{K_{n1}}} + V_{TN} = \sqrt{\frac{60}{50}} + 0.4 = 1.495\text{ V}$$