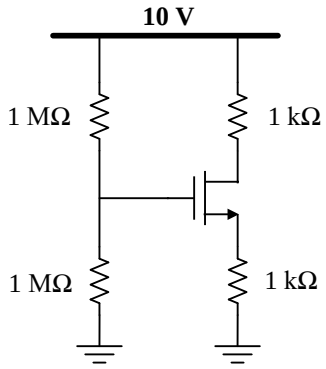
In the name of God, The compassionate, the merciful

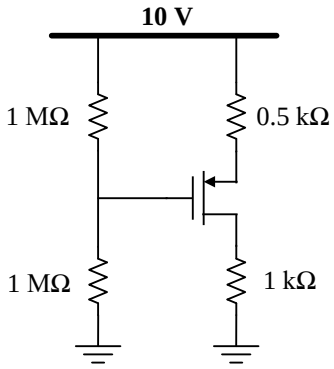
Electronics 2, Assignment #2, DC analysis of MOSFET transistors.

Shahrood University of Technology

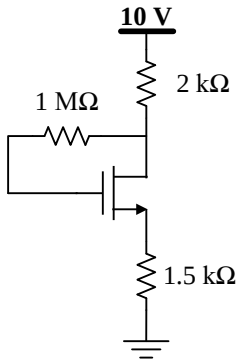
1- In the following circuits, determine the bias points of the transistors.



$$\begin{cases} V_{TH} = 2V \\ \mu_n C_{OX} \dfrac{W}{L} = 0.5 \dfrac{mA}{V^2} \end{cases}$$

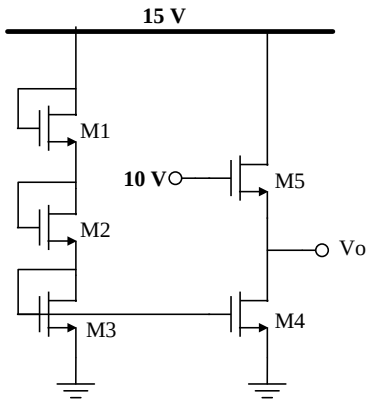


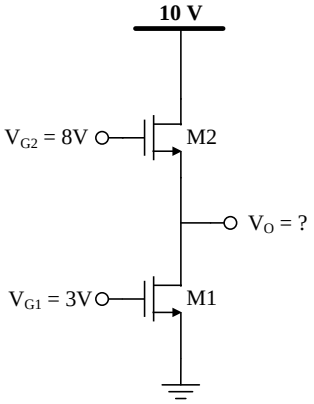
$$\begin{cases} V_{TH} = -1V \\ \mu_p C_{OX} \dfrac{W}{L} = 2 \dfrac{mA}{V^2} \end{cases}$$



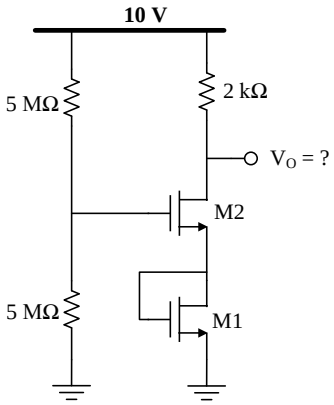
$$\begin{cases} V_{TH} = 1V \\ \mu_n C_{OX} \dfrac{W}{L} = 1 \dfrac{mA}{V^2} \end{cases}$$

2- In the circuits shown below, all of the transistors are the same and operate in the saturation region. Calculate the output voltage.

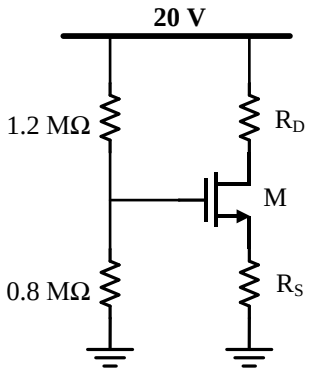




3- In the following circuit, the transistors are the same and operate in saturation. Calculate the output voltage. Assume $\beta = 0.5\,mA/V^2, V_{TH} = 0.5V$.

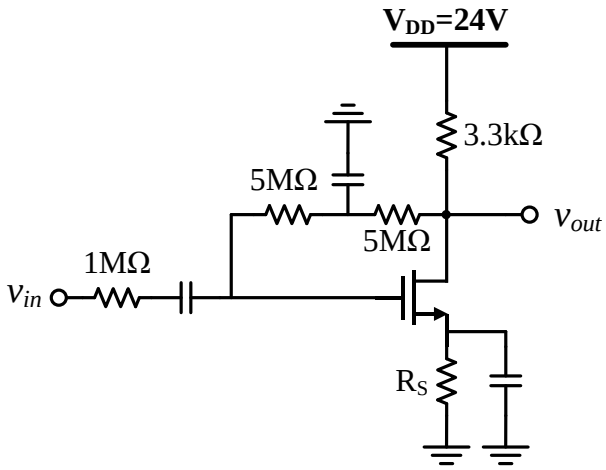


4- Specify R_D and R_S so that the transistor operates in saturation and I_D =1 mA.



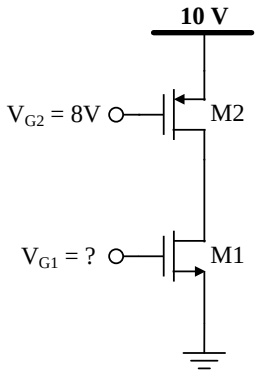
$$\begin{cases} V_{TH} = 2V \\ \mu_n C_{OX} \dfrac{W}{L} = 0.5 \dfrac{mA}{V^2} \end{cases}$$

5- Specify the source resistance such that the bias point current will be equal to 2.5 mA.

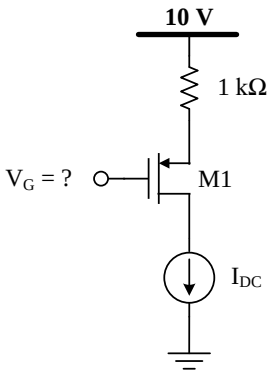


$$\begin{cases} \beta = 0.25 \dfrac{mA}{V^2} \\ |V_{TH}| = 3V \end{cases}$$

6- Determine the requested parameters. Assume that the transistors are in saturation.



$$\begin{cases} \mu_n C_{ox} = 400\,\mu A/V^2 \\ \mu_p C_{ox} = 100\,\mu A/V^2 \\ \left(\dfrac{W}{L}\right)_{n,p} = \dfrac{1\,\mu m}{0.1\,\mu m} \\ |V_{TH}| = 1V \end{cases}$$



$$\begin{cases} I_{DC} = 1mA \\ \mu_p C_{ox} = 400\,\mu A/V^2 \\ \dfrac{W}{L} = \dfrac{2\,\mu m}{0.1\,\mu m} \\ V_{TH} = 0.5V \end{cases}$$

Good Luck- M.R. Ashraf