| SANTA CLARA UNIVERSITY | ELEN 115 – Spring 2023 | S. Krishnan |
|---|---|---|
| **Homework #8** | | |

1. Assume the MOS transistor in Figure 1 has $V_{TN}$= 2 V, $V_{TP}$= -2 V, $\lambda = 0$.
   Given $k_n' = 40\mu A/V^2$ and $k_p' = 20\mu A/V^2$. All device dimensions are in μm
   Find the value of labeled currents and voltages. [10]
   What is the region of operation of the transistor? [10]
   Clearly show how you arrive at your answer.
   If the value of the resistor is halved will it change the mode of operation of M1 ? [5]
   If the value of the resistor is doubled will it change the mode of operation of M1 ? [5]

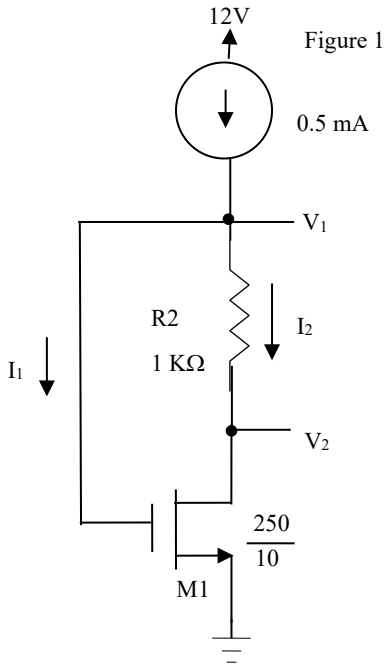

Figure 1

2. The DC biasing circuit in Figure 2 has MOS transistors with
   $V_{TN} = 1.3$ V, $V_{TP} = -1.5$ V, $\lambda = 0$, $k_n' = 25\mu A/V^2$ and $k_p' = 15\mu A/V^2$.
   All device dimensions are in μm.

(a) Find the value of the DC voltages $V_1$, $V_2$, and $V_3$ [20]
Find the value of the DC currents $I_1$, $I_2$, $I_3$ and $I_4$ [20]
Clearly identify DC biasing topologies in this circuit [10]
Justify any assumptions you make. [10]
*Clearly show how you arrive at your answers.*

(b) Determine the region of operation of M8? Explain how you arrive at your answer. Clearly show your work. [10]

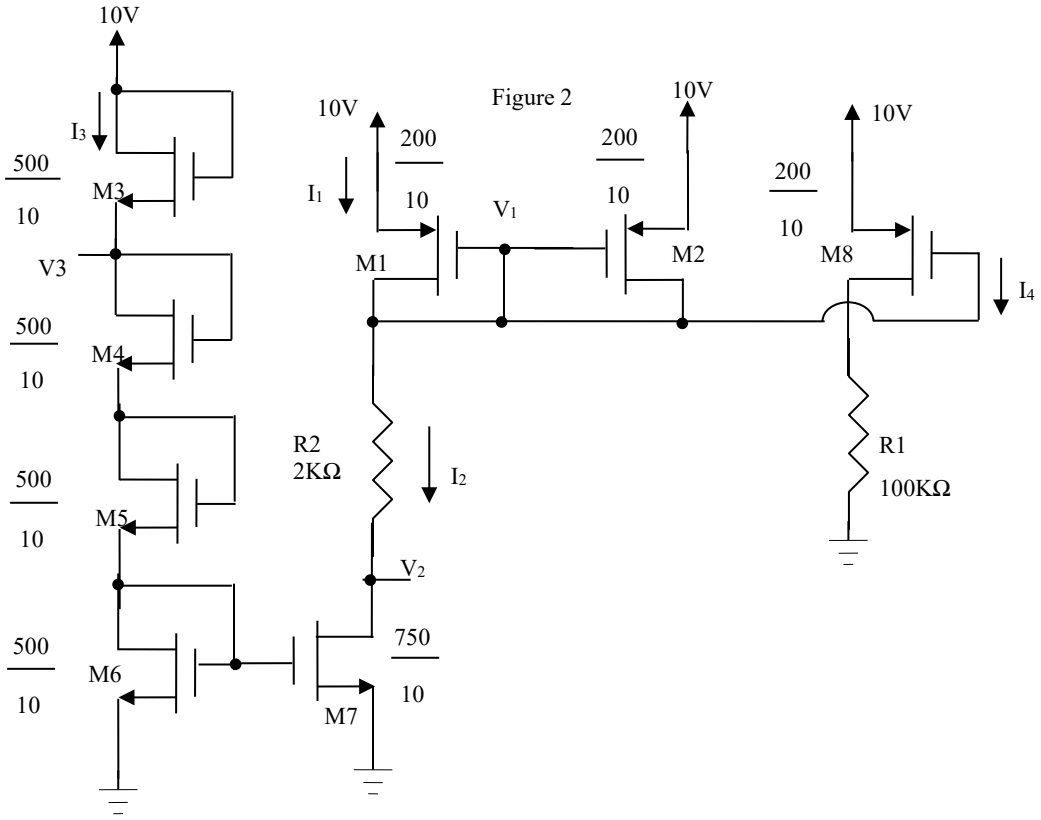

Figure 2