PART 6 (FIG 9)

$V_{DS_1} = 200mV$

$V_{GS_1} = 700mV \Rightarrow V_{G_3} = 700mV = V_{D_3}$

$V_{DS_1} = 200mV$

$V_{DS_3} = V_{D_3} - V_{DS_1}$

$$\boxed{V_{DS_3} = 500mV}$$

$V_{GS_3} = V_{G_3} - V_{DS_1}$

$$\boxed{V_{GS_3} = 500mV}$$

$I_{REF} = \frac{\beta}{2}\left(\frac{W}{L}\right)_1 V_{OV}^2 \left(1 + \frac{V_{DS_1}}{V_A}\right)$

$\left(\frac{W}{L}\right)_1 = 144.67$

$$\boxed{W_1 = 36.17\mu m, \ L_1 = 0.25\mu m}$$

*TO CALCULATE $\frac{W}{L}$ FOR M3 USING ΔI_{REF} WILL GIVE MUCH DIFFERENT RESULTS THAN M1 SO FOR THIS EXERCISE I WILL SIZE M3 THE SAME AS M1.

$$\boxed{W_3 = 36.17\mu m, \ L_3 = 0.25\mu m}$$

$1.01 \ I_{REF} = \frac{\beta}{2}\left(\frac{W}{L}\right)_2 V_{OV}^2 \left(1 + \frac{V_{DS_2}}{V_A}\right)$

$V_{DS_2} = 1.8 - (1.01 \ I_{REF}) R_L = 1.295$

$\left(\frac{W}{L}\right)_2 = 103.96$

$$\boxed{W_2 = 25.99\mu m, \ L_2 = 0.25\mu m}$$