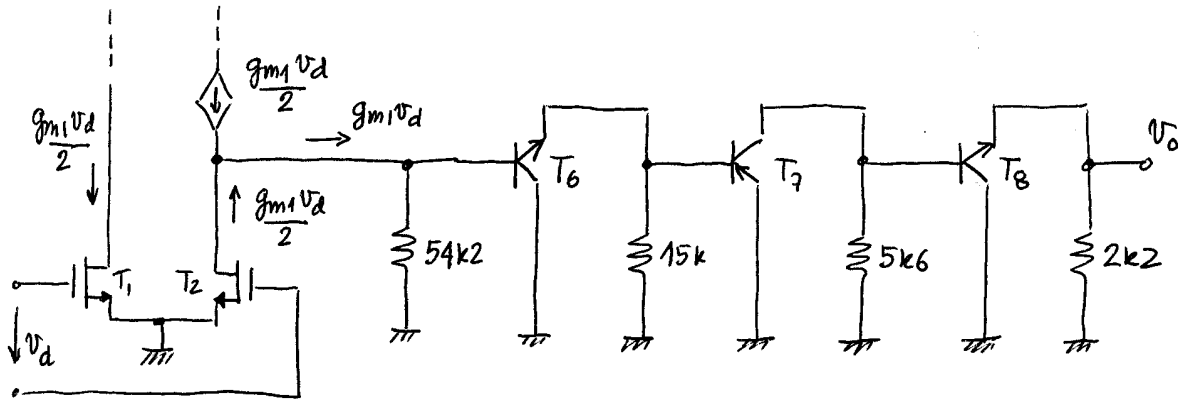


Resolução (compacta):

$$\begin{aligned}
 a) \quad I_5 &= \frac{4,27 - 0,7}{\frac{32k}{201} + 3k3} = 1,03 \text{ mA} & I_1 = I_2 = \frac{I_5}{2} \cong 0,5 \text{ mA} \cong I_3 = I_4 \\
 0,5 &= 0,5(V_{GS} - 1)^2 \Rightarrow V_{GS} = 2 \text{ V} \Rightarrow V_{G1} = V_{G2} = 0 \wedge V_{S1} = V_{S2} = -2 \text{ V} \\
 V_{D1} = V_{D3} = V_{G3} = V_{G4} &= 10 \text{ V} & V_{D4} = V_{D2} = V_{B6} \cong 3,87 \text{ V} \\
 V_{B7} = V_{E6} = 3,17 \text{ V} \Rightarrow I_6 &= 1,01 \text{ mA} & V_{E7} = 3,87 \text{ V} \Rightarrow I_7 = 2,09 \text{ mA} \\
 V_{B8} = V_{C7} = -0,32 \text{ V} \Rightarrow V_{E8} &= -1,02 \text{ V} \Rightarrow I_8 = 4,99 \text{ mA}
 \end{aligned}$$

b)



$$\begin{aligned}
 A_8 &\cong 1 & R_{i8} &= 443 \text{ k}\Omega & R_{C7} &= 5k6 \parallel R_{i8} \cong 5,6 \text{ k}\Omega \\
 A_7 &= -g_{m7} R_{C7} = -448 \text{ V/V} & R_{i7} &= r_{\pi 7} = 2,5 \text{ k}\Omega \\
 R_{L6} &= 15k \parallel 2k5 = 2k14 \Omega & A_6 &\cong 1 & R_{i6} &= 436 \text{ k}\Omega \\
 R_{L1} &= 54k2 \parallel 436k = 48,2 \text{ k}\Omega & A_1 &= g_{m1} R_{L1} = 48,2 \\
 g_{m1} &= 2\sqrt{0,5 \times 0,5} = 1 \text{ mA/V} & A_d &\cong -21600 \text{ V/V}
 \end{aligned}$$

$$\begin{aligned}
 c) \quad R_{id} &\rightarrow \infty & R_o = R_{O8} &= 2k2 \parallel \frac{5k6 + r_{\pi 8}}{201} \cong 32 \Omega \\
 & & r_{\pi 8} &= 1 \text{ k}\Omega
 \end{aligned}$$

$$\begin{aligned}
 \text{alínea a)} &\rightarrow \Delta V_o = -1,02 \text{ V} \\
 \text{alínea b)} &\rightarrow A_d = -21600 \Rightarrow V_{os} = \frac{\Delta V_o}{A_d} = 47 \mu\text{V}
 \end{aligned}$$