

Resolução (compacta):

a)
$$I_5 = \frac{4,27 - 0,7}{\frac{32k}{201} + 3k3} = 1,03 \text{ mA} \quad I_1 = I_2 = \frac{I_5}{2} \cong 0,5 \text{ mA} \cong I_3 = I_4$$

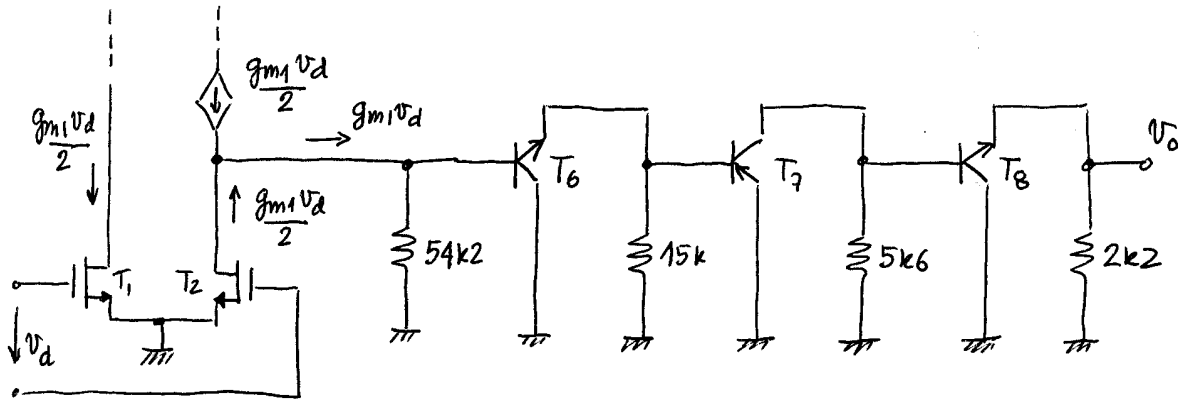
$$0,5 = 0,5(V_{GS} - 1)^2 \Rightarrow V_{GS} = 2 \text{ V} \Rightarrow V_{G1} = V_{G2} = 0 \wedge V_{S1} = V_{S2} = -2 \text{ V}$$

$$V_{D1} = V_{D3} = V_{G3} = V_{G4} = 10 \text{ V} \quad V_{D4} = V_{D2} = V_{B6} \cong 3,87 \text{ V}$$

$$V_{B7} = V_{E6} = 3,17 \text{ V} \Rightarrow I_6 = 1,01 \text{ mA} \quad V_{E7} = 3,87 \text{ V} \Rightarrow I_7 = 2,09 \text{ mA}$$

$$V_{B8} = V_{C7} = -0,32 \text{ V} \Rightarrow V_{E8} = -1,02 \text{ V} \Rightarrow I_8 = 4,99 \text{ mA}$$

b)



$$A_8 \cong 1 \quad R_{i8} = 443 \text{ k}\Omega \quad R_{C7} = 5k6 \parallel R_{i8} \cong 5,6 \text{ k}\Omega$$

$$A_7 = -g_{m7} R_{C7} = -448 \text{ V/V} \quad R_{i7} = r_{\pi7} = 2,5 \text{ k}\Omega$$

$$R_{L6} = 15k \parallel 2k5 = 2k14 \text{ }\Omega \quad A_6 \cong 1 \quad R_{i6} = 436 \text{ k}\Omega$$

$$R_{L1} = 54k2 \parallel 436k = 48,2 \text{ k}\Omega \quad A_1 = g_{m1} R_{L1} = 48,2$$

$$g_{m1} = 2\sqrt{0,5 \times 0,5} = 1 \text{ mA/V} \quad A_d \cong -21600 \text{ V/V}$$

c)
$$R_{id} \rightarrow \infty \quad R_o = R_{O8} = 2k2 \parallel \frac{5k6 + r_{\pi8}}{201} \cong 32 \text{ }\Omega$$

$$r_{\pi8} = 1 \text{ k}\Omega$$

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

alínea b) $\rightarrow A_d = -21600$