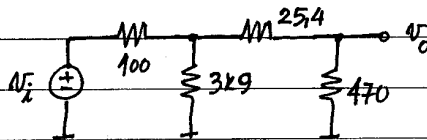


Resolução (compacta):

1. Em c.c.  $I_D = \frac{5-0,7}{3k9+470} \cong 0,98 \text{ mA} \quad \therefore V_0 = 470 I_D \cong 0,46 \text{ V}$

$$r_d = \frac{d}{d i_D} \left( V_T \ln \frac{i_D}{I_S} \right) \Big|_{i_D = I_D} = \frac{V_T}{I_D} \cong 25,4 \Omega$$

Para sinais:

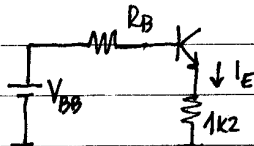


$$v_o = \frac{470}{495} \cdot \frac{3k9 // 495}{100 + 3k9 // 495} v_i =$$

$$\cong 0,77 v_i$$

donde  $v_o \cong 462 + 77 \text{ sen}(2000\pi t) \text{ mV}$

2a.

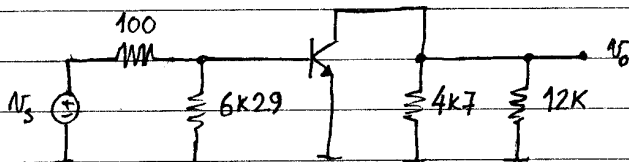


$$R_B = 7k5 // 39k = 6,29 \text{ k}\Omega$$

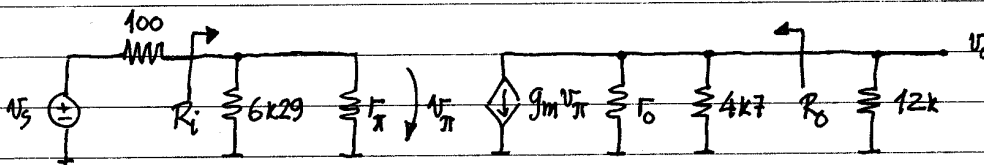
$$V_{BB} = \frac{7,5}{7,5+39} \times 12 = 1,94 \text{ V} \quad \therefore I_E = \frac{V_{BB} - 0,7}{\frac{R_B}{\beta+1} + 1k2} \cong 0,98 \text{ mA}$$

$$V_E = 1k2 I_E \cong 1,17 \text{ V} \quad V_B = V_E + 0,7 \cong 1,87 \text{ V} \quad I_C = \alpha I_E \cong 0,97 \text{ mA}$$

$$V_C = 12 - 4k7 I_C \cong 7,45 \text{ V} \quad I_B = I_C / \beta \cong 9,7 \mu\text{A}$$



2b.



e da Fig. 3 conclui-se que  $A_{vr} = \frac{v_o}{v_i} \Big|_{R_L \rightarrow \infty} \cong \frac{v_o}{v_{\pi}} \Big|_{R_L \rightarrow \infty}$  em que  $R_L = 12 \text{ k}\Omega$

$$g_m = \frac{I_C}{V_T} = 100 \text{ mA/V} \quad r_{\pi} = \frac{\beta}{g_m} = 1 \text{ k}\Omega \quad r_o = \frac{V_A}{I_C} = 40 \text{ k}\Omega$$

$$R_i = 6k29 // r_{\pi} \cong 863 \Omega \quad R_o = r_o // 4k7 \cong 4,2 \text{ k}\Omega$$

$$A_{vr} = -g_m (r_o // 4k7) \cong -421 \text{ V/V}$$