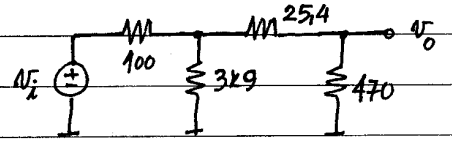
Resolução (compacta):

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

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

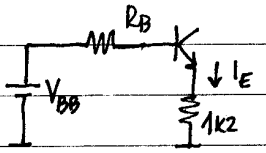
Para sinais:



$$v_o = \frac{470}{495} \cdot \frac{3k9 \,//\, 495}{100 + 3k9 \,//\, 495} v_i = \cong 0,77\, v_i$$

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

2a.

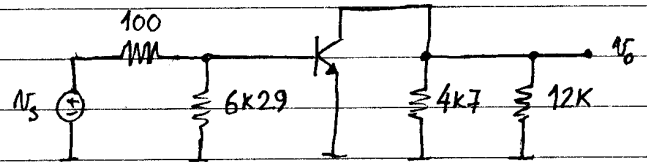


$R_B = 7k5 \,//\, 39K = 6,29\ k\Omega$

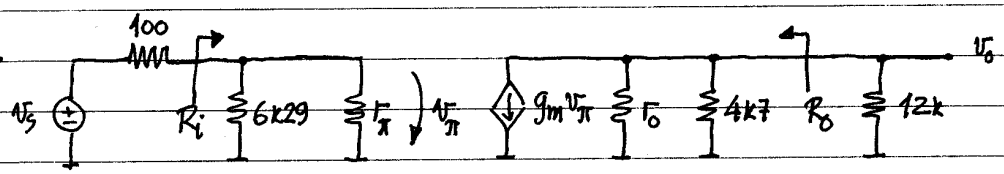
$V_{BB} = \frac{7,5}{7,5+39} \times 12 = 1,94V \quad \therefore I_E = \frac{V_{BB} - 0,7}{\frac{R_B}{\beta+1} + 1k2} \cong 0,98mA$

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

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



2b.



e da fig. 3 conclui-se que $A_v = \frac{v_o}{v_i}\Big|_{R_L\to\infty} \equiv \frac{v_o}{v_\pi}\Big|_{R_L\to\infty}$ em que $R_L = 12\ k\Omega$

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

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

$A_v = -g_m (r_o \,//\, 4k7) \cong -421\ V/V$