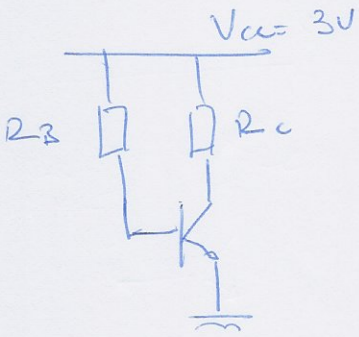
→ Lembrando do início da aula:



Iterações

$$I_{BO} = \frac{3 - V_{BEO}}{R_B} \simeq 2{,}017\,mA$$

$$V_{BEO} = V_T \ln\left(\frac{\beta I_{BO}}{I_S}\right) \simeq 0{,}714V$$

$$I_{CO} = \beta I_B$$

$$= 500 \cdot 2\times10^{-3} \simeq 1\,mA$$

$$I_{CO} = 10^{-3}\left(1 + \frac{V_{CE}}{V_A}\right) \quad \Big| \quad V_{CE} = V_{cc} - I_{CO}R_c$$

← Mas agora devemos usar o termo corretivo (tensão de Early)

$$I_{CO} = 10^{-3}\left(1 + \frac{V_{cc}}{V_A} - \frac{I_{CO}R_c}{V_A}\right)$$

$$I_{CO}\left(1 + \frac{10^{-3}R_c}{V_A}\right) = 10^{-3}\left(1 + \frac{V_{cc}}{V_A}\right) \Rightarrow \boxed{I_{CO} = \frac{10^{-3}\left(1 + \frac{V_{cc}}{V_A}\right)}{\left(1 + \frac{R_c \cdot 10^{-3}}{V_A}\right)}}$$

Substituindo:

$V_{cc} = 3\,V$
$V_A = 15\,V$
$R_c = 1.5\,K\Omega$

→ $I_{CO} = 1{,}09\,mA$

$I_{CO} = 1{,}028\,mA$ @ $R_c = 2.5\,K\Omega$

$I_{CO} = 1{,}161\,mA$ @ $R_c = 0{,}5\,K\Omega$

→ Calculando os parâmetros de pequenos sinais, temos que: $\} R_c = 2.5\,K\Omega$

$$g_m = \frac{1{,}028\times10^{-3}}{0{,}025864} = 39{,}746\,mS$$

$$r_o = \frac{15}{1{,}028\times10^{-3}} = 14.591\,K\Omega$$

$$|A_v| = g_m (R_c \| r_o)$$

$$|A_v| = 39{,}746\cdot10^{-3}(2{,}5\,K \| 14.59K)$$

$$\boxed{|A_v| = 84{,}836\ V/V}$$