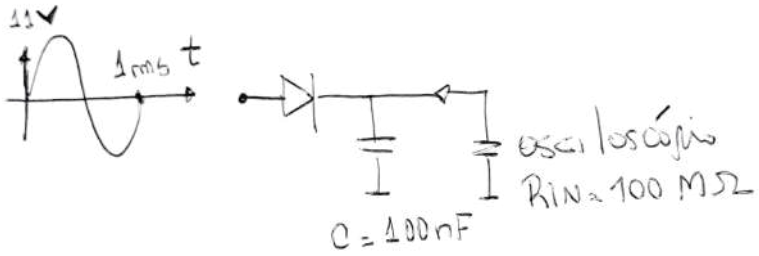
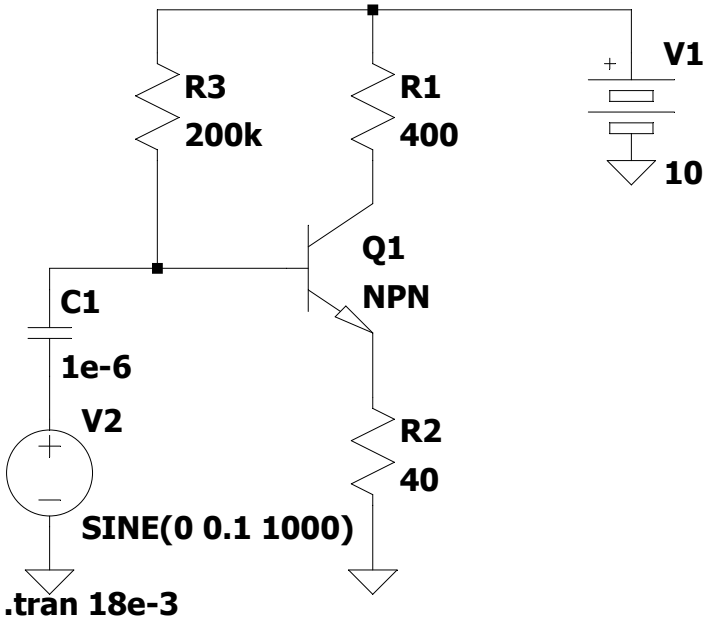
P1 2025.1 Dispositivos Eletrônicos Prof. Marcelo Perotoni Considere vbe e tensão do diodo ON como 0.7

[1] (a) À um diodo conectado a um capacitor de 100 nF e ligado à um osciloscópio com impedância de entrada de 100 MΩ é aplicado um sinal sendoidal conforme a figura. Desenhe a forma de onda observada, com respectivos valores de tensão. **(b)** $\tau = RC$, convenciona-se que o circuito descarregue após 5τ, quanto tempo levará para o sinal cair a zero no instrumento após desligar a fonte de sinal AC?

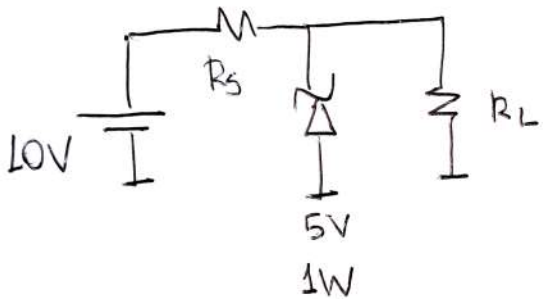


[2] (a) Calcule a corrente de coletor e a tensão de coletor Vc ($\beta = 100$).**(b) (b)** Sabendo que o ganho da configuração é $A_v = -R_C/(R_E + r_e)$ onde $r_e = 26mV/I_{CQ}$. **(c)** Desenhe a forma de onda completa observada no coletor do transistor, sabendo que o sinal input tem 0.1 Vpp. DICA: Leve em consideração ambos itens anteriores.

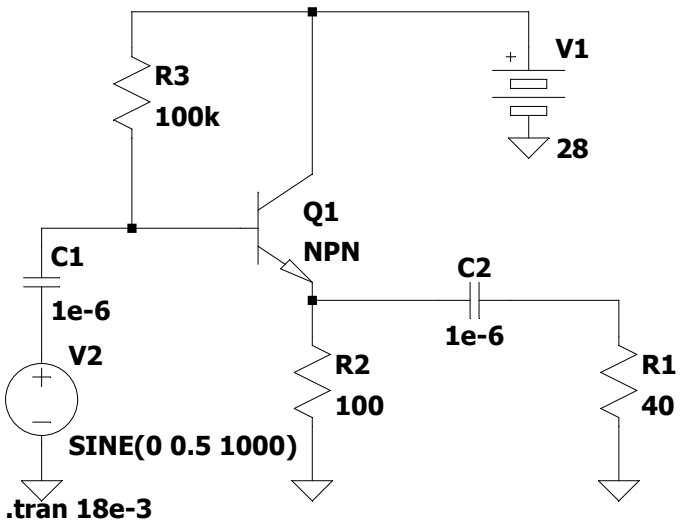


--- C:\Users\m_per\.qucs\2025_p1.asc ---

[3] **(a)** O resistor de carga R_L varia entre um valor máximo infinito a um valor mínimo de 100 Ω. Calcule o valor de R_S. **(b)** Calcule a corrente máxima que circula no zener e diga se ele queima.



[4] **(a)** Calcule a corrente de coletor e V_{CE} quiescentes. **(b)** Desenhe o modelo de pequenos sinais e calcule o ganho observado no resistor de 40 Ω, considerando $\beta = 100$.

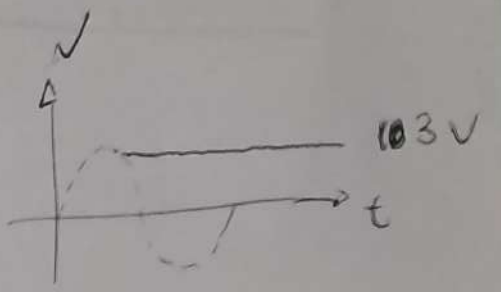


--- C:\Users\m_per\.qucs\2025_p1.asc ---

P1 DISPOSITIVOS 2025.1

(1) (a) $11V - 0.7V \simeq 10.3\ V$

Sinal fica com o valor máximo

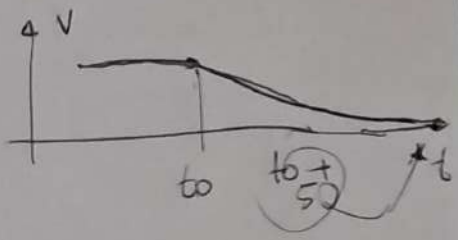


(b) $\tau = RC = 100E6 \times 100E{-}9$

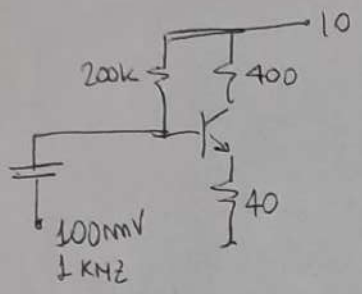
$= 1E8 \times 1E{-}7 = 10\ s$

$\Delta T = 50 secs.$

Levará ≈ 50 segundos até cair



(2)



(a)

$10 - 0.7 = 200k\, I_B + \beta I_B \cdot 40$

$I_B = 9.3 / 204\ mA \simeq 45.6\ \mu A$

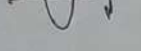
$I_C = \beta I_B = 4.56\ mA$ //

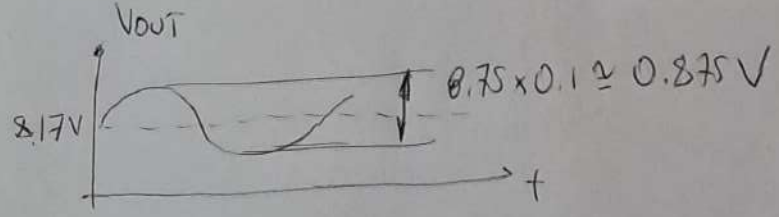
$V_C = 10 - 400 \cdot I_C = 10 - 400 \cdot 4.56E{-}3 = 8.17V$ //

(b) $r_E = \frac{26}{4.56} \simeq 5.7\ \Omega$

$Av = -\frac{R_C}{R_E + r_e} \simeq -\frac{400}{5.7 + 40} = -8.75$ //

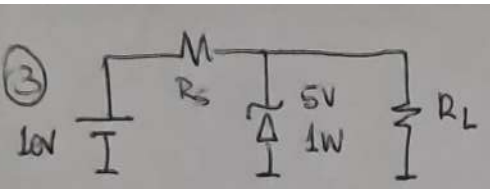
(c) INPUT: 0.1V





$V_C = 8.17 - 0.875 \sin(\omega t)$ //

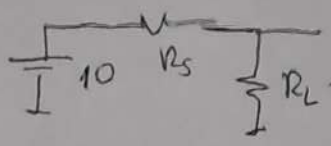
③



$\begin{cases} R_{L\,MIN} = 100 \\ R_{L\,MAX} = \infty \end{cases}$

(a)

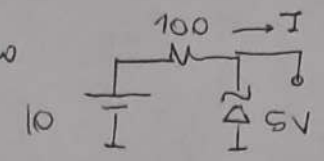
dodo liga? R_L - MINIMO



P/ dar 5V
$R_S = 100\,\Omega$

(b)

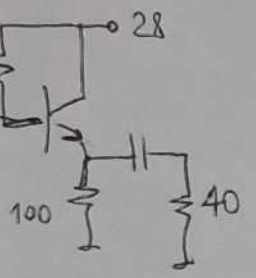
dodo queima? R_L MÁXIMO



$I = \frac{10-5}{100} = 50\,mA$

$P_{zener} = 5V \times 50\,mA = 250\,mW$ Não queima

④ (a)



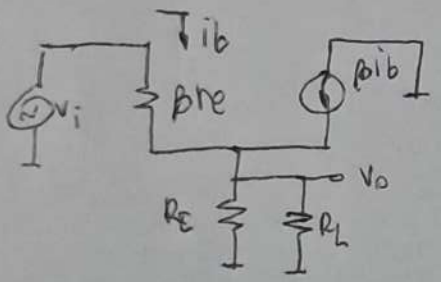
$28 - 0.7 = 100E3\, I_B + 100\, I_B \cdot 100$

$I_B = 27.3/(100E3 + 1E4) = 284.18\,\mu A$

$I_C = \beta I_B = 28\,mA$

$V_{CE} = 28 - R_E I_E = 28 - 28E{-}3 \cdot 100 = 25.2V$

(b)



$V_o = (R_E // R_L)(\beta+1) i_b$

$V_i = i_b \beta r_e + (\beta+1) i_b (R_E // R_L)$ $\beta r_1 \simeq \beta$

$A_V = \frac{V_o}{V_i} = \frac{R_E // R_L}{r_e + R_E // R_L} = 0.96$