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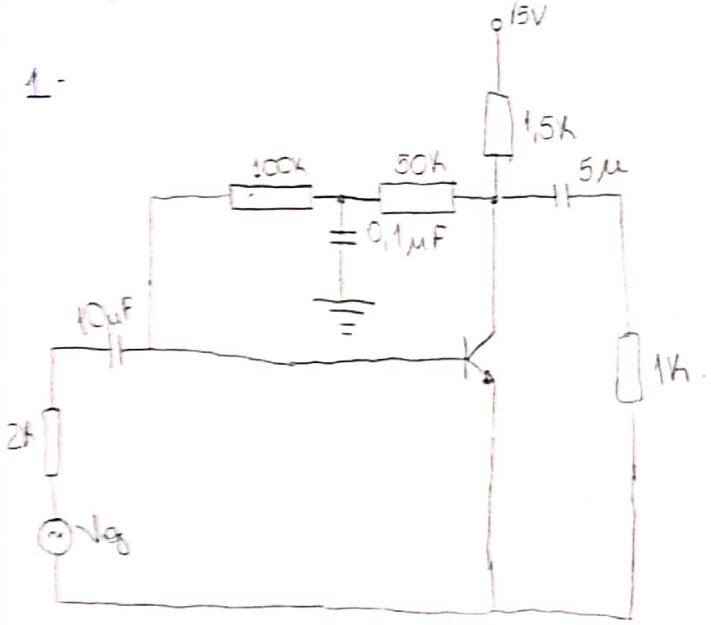
P2 - Eletrônica B

1 -

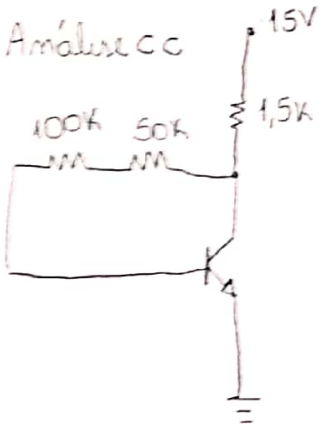


$\beta = 120$

$R_O = 42K$

$V_{be} = 0,55V$

1°) Análise cc



malha base-emissor

$$-15 + 1,5K(I_b + I_c) + 150K\, I_b + V_{be} = 0$$

$$-0,55 + 15 = 151,5K I_b + 1,5K \cdot I_c$$

$$14,45 = 151,5K I_b + 180K I_b$$

$$\frac{14,45}{331,5K} = I_b = 43,590\mu A$$

$$I_c = \beta I_b = 5,231mA$$

$$I_e = 5,274mA$$

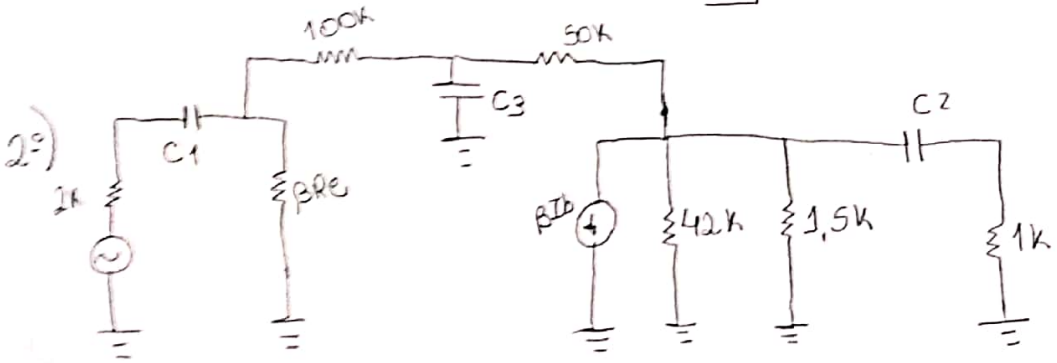
$$R_e = \frac{26m}{I_e} = 4,930\Omega$$

malha coletor-emissor

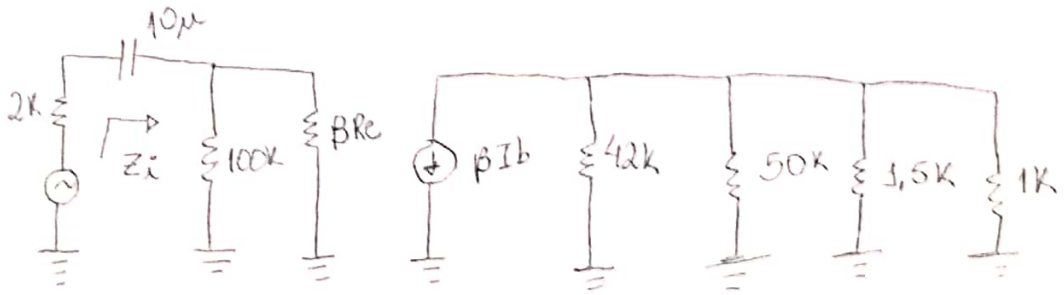
$$-15 + 1,5K(I_b + I_c) + V_{ce} = 0$$

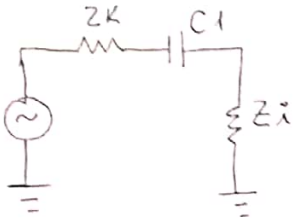
$$V_{ce} = 7,058V$$

2°)



Fazendo análise do C1 (C2 e C3 em curto)

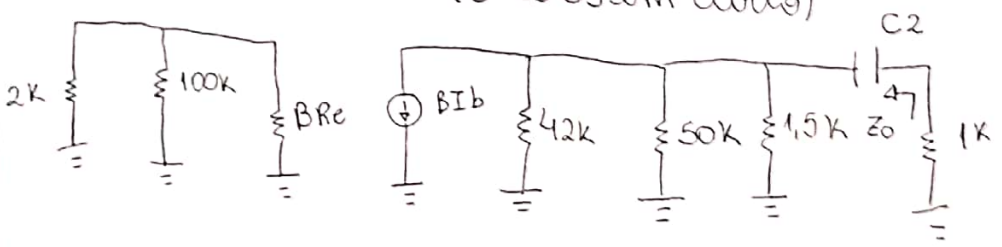




$$f_{C1} = \frac{1}{2\pi(2K+Zi)C1} = 6,149Hz$$

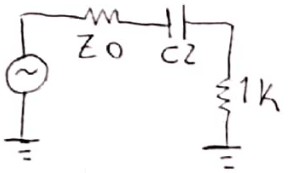
$$Zi = 100K // \beta Re = 588,121\Omega$$

Fazendo análise do C2 (C1 e C3 em curto)



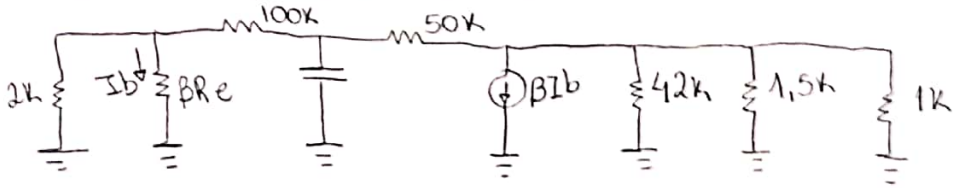
$$Zo = 1,5K // 50K // 42K$$

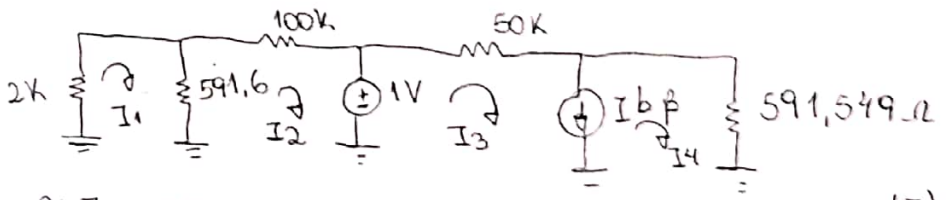
$$Zo = 1,408K\Omega$$



$$f_{C2} = \frac{1}{2\pi(1K+Zo).C2} = 13,219Hz$$

Fazendo análise do C3 (C1 e C2 em curto)





$$\begin{cases} I_1 = -2,272\mu A \\ I_2 = -9,955\mu A \\ I_3 = 30,545\mu A \\ I_4 = -0,891mA \end{cases}$$

$$I_x = I_3 - I_2$$

$$Z_3 = \frac{1}{I_3 - I_2} = 24,691K\Omega$$

$(Ib = I_1 - I_2)$

$* \; 2K I_1 + 591,6 I_1 - 591,6 I_2 = 0$

$** \; 591,6 I_2 - 591,6 I_1 + 100K I_2 + 1 = 0$

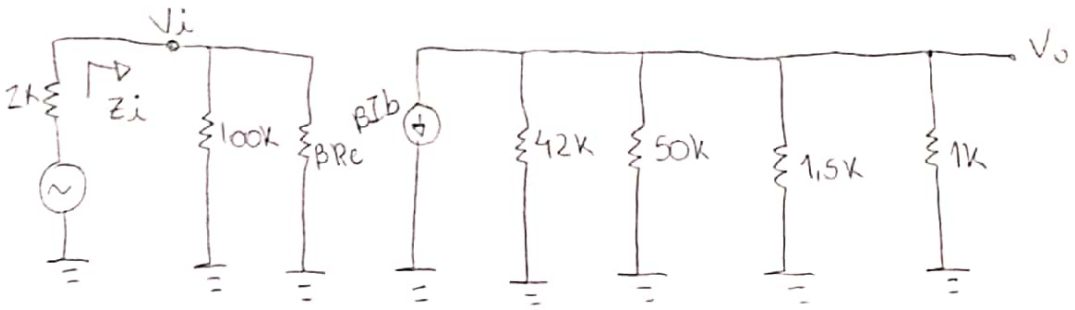
$*** = -1 + 50K I_3 + 591,549 . I_4 = 0$

$*** = S.M$

$I_3 - I_4 = \beta Ib$

$-\beta I_1 + \beta I_2 + I_3 - I_4 = 0$

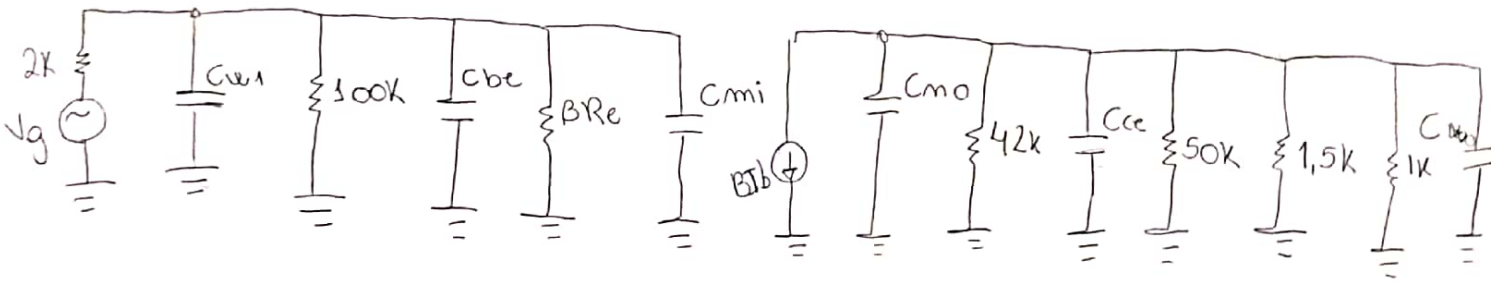
$f_{C3} = \frac{1}{2\pi \cdot 24{,}691K \cdot 0{,}1\mu} = 64{,}458Hz$ → frequência inferior



$Zi = 588{,}121\Omega$

$Zo = 1{,}408K\Omega$

$\Delta V = \frac{Vo}{Vi} = \frac{-\beta Ib \cdot [Zo // 1K]}{\beta Re \cdot Ib} = -\frac{[Zo // 1K]}{Re} = -118{,}604$



$Cmi = (1 - \Delta V) \cdot Cbc = (1 + 118{,}604) \cdot 3p = 358{,}812pF$

$Cmo = \left(1 - \frac{1}{\Delta V}\right) Cbc = 3{,}025pF$

$Ci = Cwi + Cbe + Cmi = 378{,}812pF$

$Co = Cwo + Cce + Cmo = 12{,}025pF$

Com Ci:

$Ri = Zi // 2K = 454{,}477\Omega$

$Fci = \frac{1}{2\pi \cdot 454{,}477 \cdot 378{,}812pF} = 924{,}452KHz$ → frequência superior

Com Co:

$Ro = Zo // 1K = 584{,}718$

$Fco = \frac{1}{2\pi \cdot 584{,}718 \cdot 12{,}025p} = 22{,}635MHz$