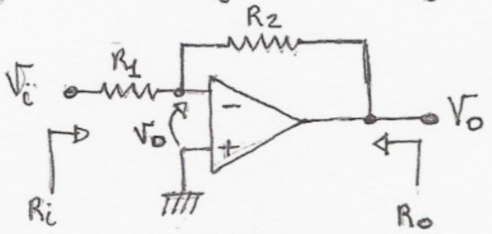
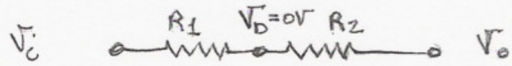
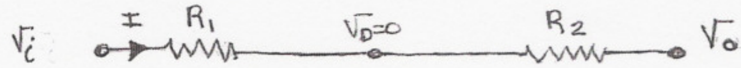
EAN1

1.1 $R_1 = 4{,}7\,K\Omega \quad R_2 = 47\,K\Omega$

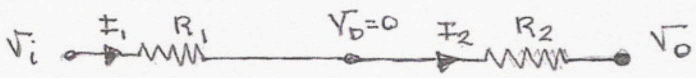
$A_\mu = ? \quad R_i = ? \quad R_o = ?$

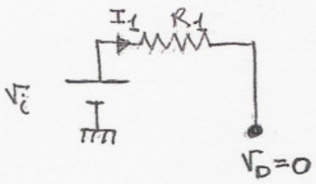


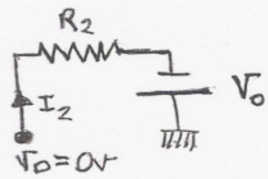




$\Rightarrow$







$$\frac{V_i}{R_1} = -\frac{V_o}{R_2}$$

$$\Rightarrow \quad -V_o = \frac{R_2}{R_1} \cdot V_i$$

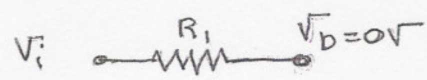
$$V_o = -\frac{R_2}{R_1} \cdot V_i$$

$\therefore$

$A_\mu = ?$

$$A_\mu = \frac{V_o}{V_i} = -\frac{R_2}{R_1} = -\frac{47\,K\Omega}{4{,}7\,K\Omega} = -10$$

$R_i = ?$

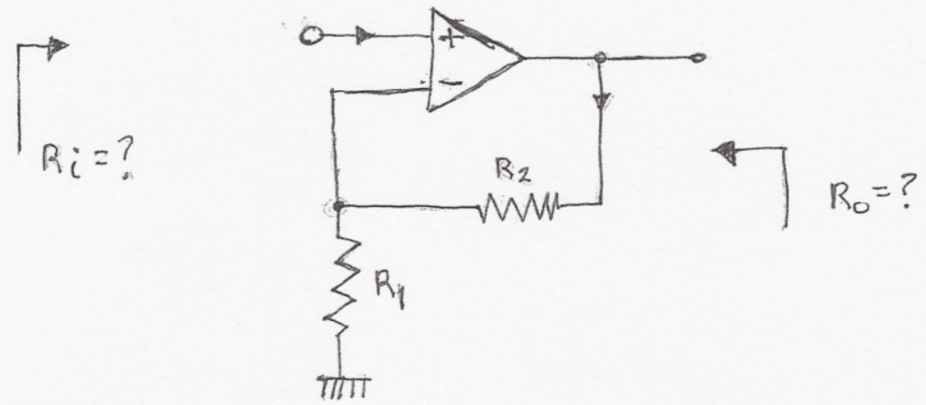


$$R_1 = \frac{V_i}{I_1} \qquad \therefore \quad R_i = R_1$$

$$R_o = 0\,\Omega$$

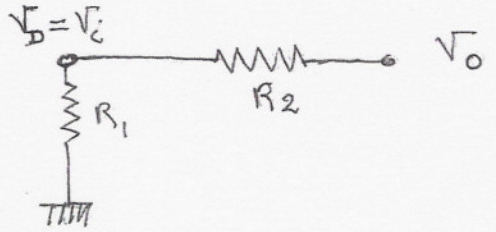
EAN1

1.2) $R_1 = 4{,}7\ k\Omega$ $R_2 = 47\ k\Omega$



$A_\mu = ?$

$R_i = \infty \quad \wedge \quad R_o = 0$



Qual a tensão V_o para que no ponto V_D tenha tensão igual a V_i?

$$V_D = V_i = R1 \cdot I_1$$

$\wedge$

$$V_o = R_2 I_2 + R_1 I_1 \qquad \wedge\ I_1 = I_2$$

$$V_o = (R_2 + R_1)\, I$$

$$A_\mu = \frac{V_o}{V_i} = \frac{(R_2 + R_1)\cancel{I}}{R_1 \cancel{I}} = \frac{R_2 + R_1}{R_1} = \frac{R2}{R_1} + \frac{\cancel{R_1}}{\cancel{R_1}} = 1 + \frac{R2}{R_1}$$

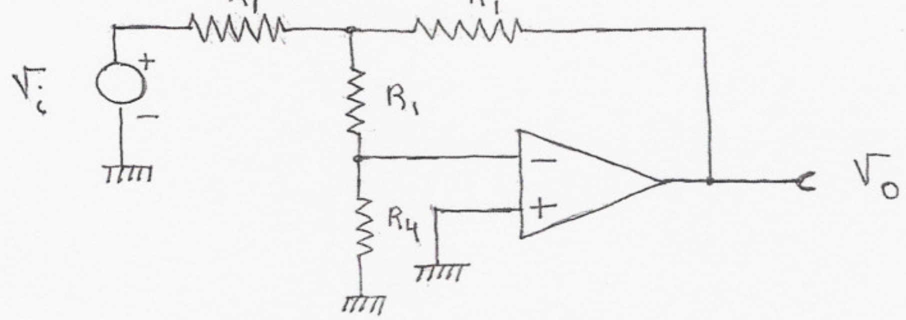
$$\therefore A_\mu = 1 + \frac{47}{4{,}7} = 11$$

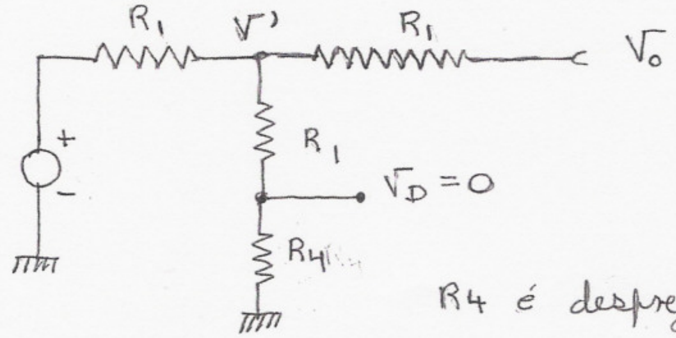
Mr.

EAN1

1.3) $R_i >> R_4$ e que $R_1 >> R_4$

mostre que $V_o = -V_i$





R_4 é desprezavel $V_{R4} = 0V$

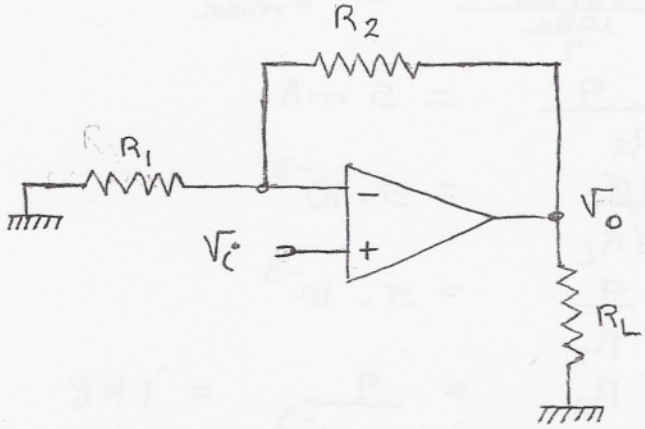
para $V_D = 0 \Rightarrow V' = 0$

$\therefore$ porque $R_1 = R_1$

$\Rightarrow \quad V_o = -V_i$

EAN1

1.4)



Qual a relação entre as resistências R_1 e R_2 do circuito da figura para que o circuito amplificador não inversor tenha ganho 10 ?

$$V_D = V_i = R_1 I$$
$$V_o = (R_1 + R_2) I$$

$$A_u = \frac{V_o}{V_i} = 1 + \frac{R_2}{R_1}$$

$$\Rightarrow \quad \frac{R_2}{R_1} = 9$$

ou seja $R_2 = 9 \cdot R_1$

Qual o menor valor das resistências R_1 e R_2 que podem ser usadas neste circuito sabendo que a corrente maxima de saída do ampop é $\pm 10\,mA$ e a tensão maxima de saída do ampop é $\pm 10\,V$ sendo a carga $R_L = 2\,K\Omega$.

Se R_L é $2\,K\Omega \Rightarrow I_L = 5\,mA$

$\Rightarrow$ I_f, ou seja, corrente de realimentação terá de ser $5\,mA_{max}$.

para o ganho de 10, isto é $R_2 = 9R_1$

$$R_1 = \frac{R_2}{9}$$

$$R_T = R_2 + \frac{R_2}{9}$$

$$R_T = R_2 + \frac{R_2}{9} = \frac{9R_2}{9} + \frac{R_2}{9}$$

$$= \frac{10R_2}{9}$$

$$\therefore \quad \frac{V_{o\,max}}{\frac{10R_2}{9}} = I_{max}$$

$$\frac{10 \cdot 9}{10R_2} = 5\ mA$$

$$\frac{9\cancel{0}}{1\cancel{0}R_2} = 5 \cdot 10^{-3}$$

$$\frac{9}{R_2} = 5 \cdot 10^{-3}$$

$$R_2 = \frac{9}{5 \cdot 10^{-3}} = 1K8$$

Se $R_2 = 1K8$

$$R_1 = \frac{R_2}{9} = \frac{1K8}{9} = 200\ \Omega$$

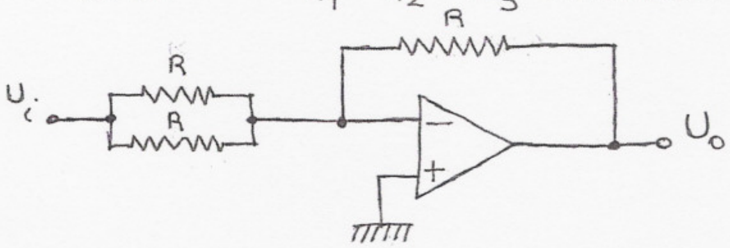
C.S $\quad \frac{10}{1800 + 200} = 5\ mA$ √

EAN1

1.5)

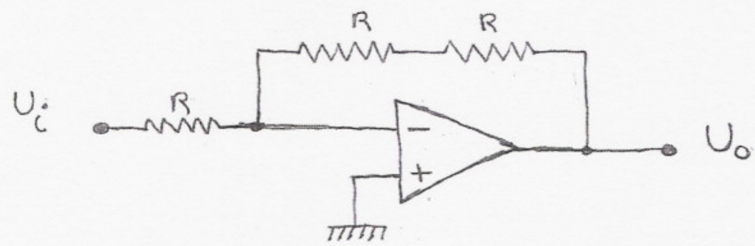
$$A_\mu = -2$$

com $R_1 = R_2 = R_3 = 100\,k\Omega$.



$$A_\mu = \frac{U_o}{U_i} = \frac{-R}{\frac{1}{2}.R} = -2.$$

ou



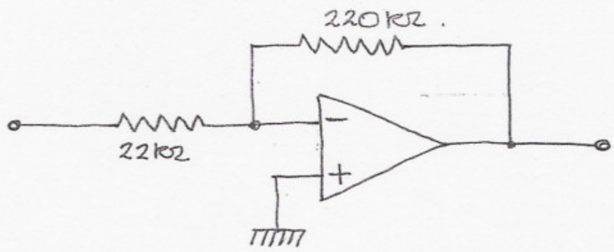
$$A_\mu = \frac{U_o}{U_i} = \frac{-2\cancel{R}}{\cancel{R}} = -2$$

EAN 1

1.6) $A_u = -10$

circuito inversor

com $R_1 = 220K$ e $R_2 < 1M\Omega$



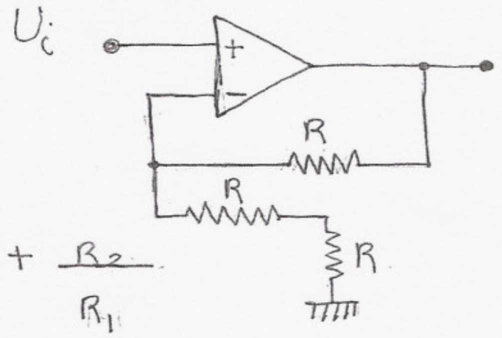
EAN 1

1.7)

não inversor

$A_u = 1{,}5$

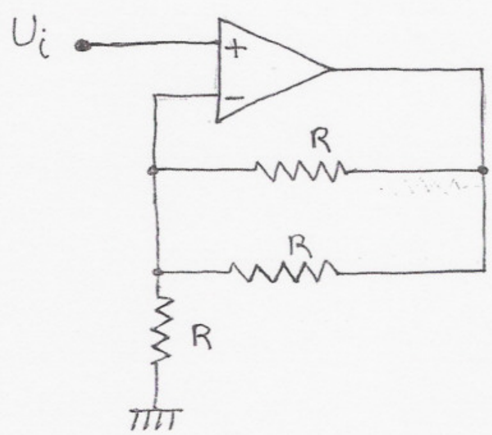
com $R_1 = R_2 = R_3 = 1K\Omega$



$$A_u = 1 + \frac{R_2}{R_1}$$

$$\frac{R_2}{R_1} = \frac{1}{2} \Rightarrow R_1 = 2R_2$$

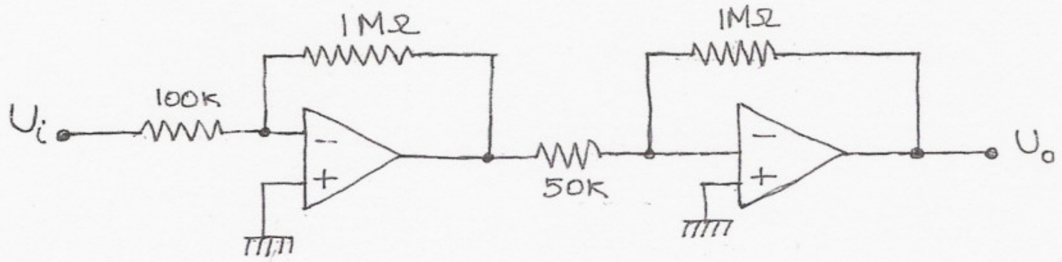
V



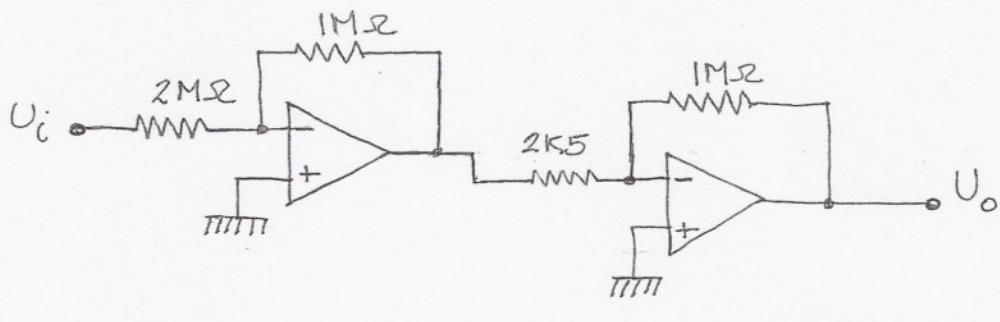
EAN1

1.8) $A_\mu = 200\ v/v$

$R_i = 100k\Omega$ usando 2 ampops.
e $R < 1M\Omega$.

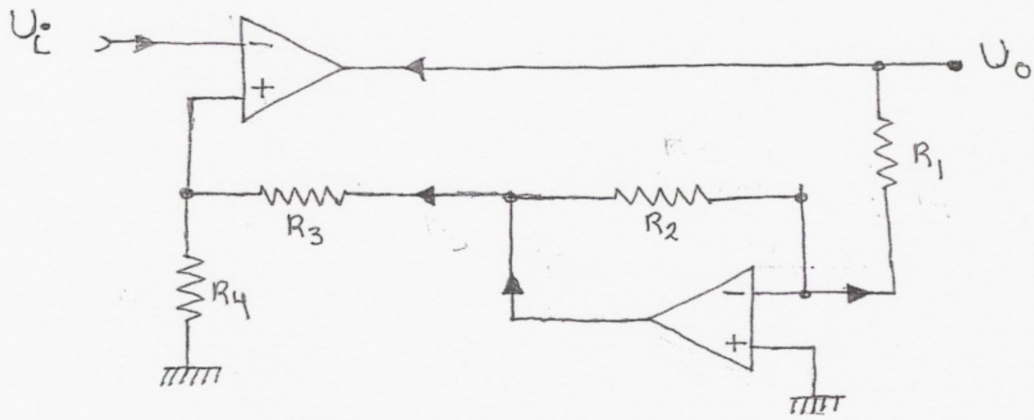


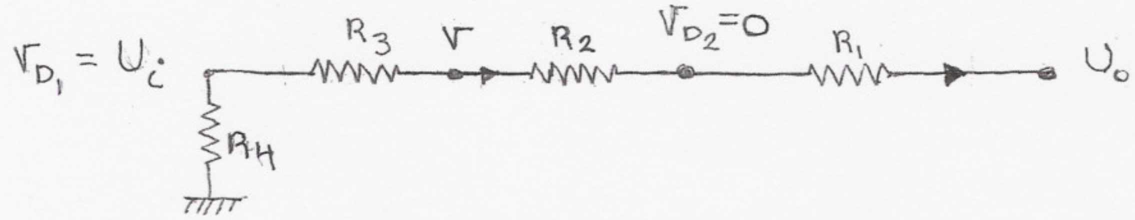
1.9) agora com $R_i = 2M\Omega$.



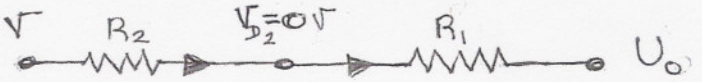
EAN1

1.10) Determine o valor de U_o/U_i para o circuito da figura 1.5.





am I good or what



$$-\frac{U_o}{R_1} = \frac{V}{R_2}$$

$$V = \frac{(-U_o)}{R_1} \cdot R_2$$

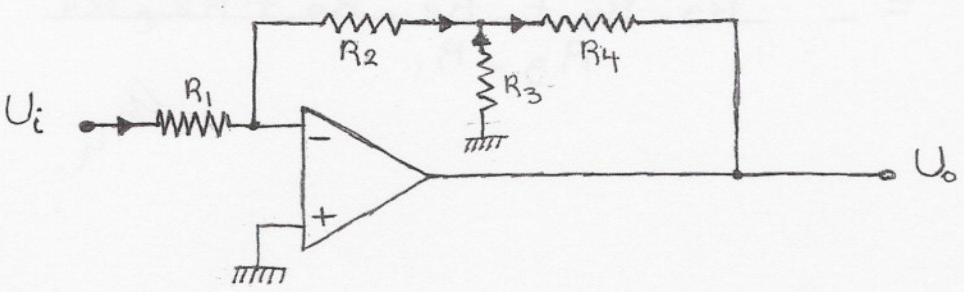
$$U_i = \frac{R_4}{R_3+R_4} \cdot V$$

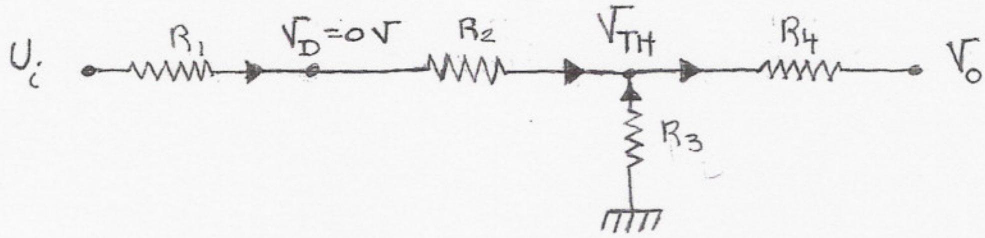
$$= \frac{R_4}{(R_3+R_4)} \cdot \frac{(-U_o)}{R_1} \cdot R_2$$

$$= \frac{R_4.(-U_o)R_2}{(R_3+R_4) \cdot R_1} \Rightarrow \frac{U_o}{U_i} = \frac{-R_1(R_3+R_4)}{R_1 \cdot R_4}$$

EAN1

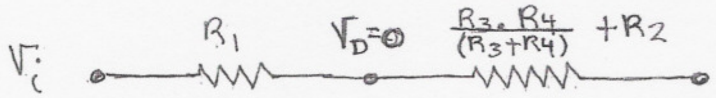
1.11) $U_o / U_i = ?$





$$V_{TH} = \frac{R_3}{R_3 + R_4} \cdot -V_o$$

$$R_{TH} = R_3 \,//\, R_4 = \frac{R_3 \cdot R_4}{(R_3 + R_4)}$$



$$-V_o \cdot \frac{R_3}{(R_3+R_4)}$$

$$\frac{V_i}{R_1} = \frac{-V_o \times \frac{R_3}{(R_3+R_4)}}{\frac{R_3 \cdot R_4}{(R_3+R_4)} + R_2}$$

$$= \frac{-\frac{V_o R_3}{(R_3+R_4)}}{\frac{R_3 \cdot R_4}{(R_3+R_4)} + \frac{R_2 (R_3+R_4)}{(R_3+R_4)}}$$

$$= \frac{-\frac{V_o R_3}{(R_3+R_4)}}{\frac{R_3 \cdot R_4 + R_2 (R_3+R_4)}{(R_3+R_4)}}$$

$$= -\frac{V_o R_3 \,(R_3+R_4)}{(R_3+R_4)\,(R_3 \cdot R_4 + R_2 (R_3+R_4))}$$

$$V_i = -\frac{V_o R_3 \,(R_3+R_4) \cdot R_1}{(R_3+R_4)\,(R_3 \cdot R_4 + R_2 (R_3+R_4))}$$

$$\frac{V_o}{V_i} = -\frac{\cancel{(R_3+R_4)}\left(R_3 \cdot R_4 + R_2\,(R_3+R_4)\right)}{R_3 \cdot R_1\,\cancel{(R_3+R_4)}}$$

$$= -\frac{\left(R_3 \cdot R_4 + R_2\,(R_3+R_4)\right)}{R_3 \cdot R_1}$$

$$= -\frac{R_3 \cdot R_4 + R_2 \cdot R_3 + R_2 \cdot R_4}{R_3 \cdot R_1}$$

EAN1

1.12)

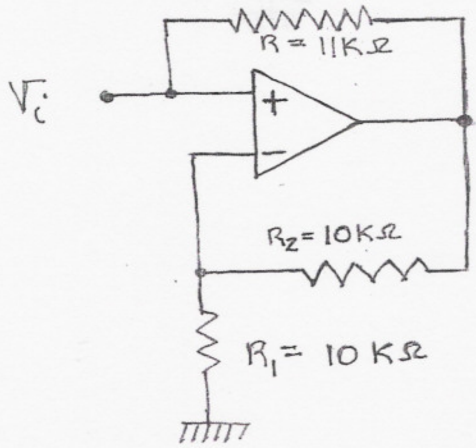
$R_1 = 10K\Omega$

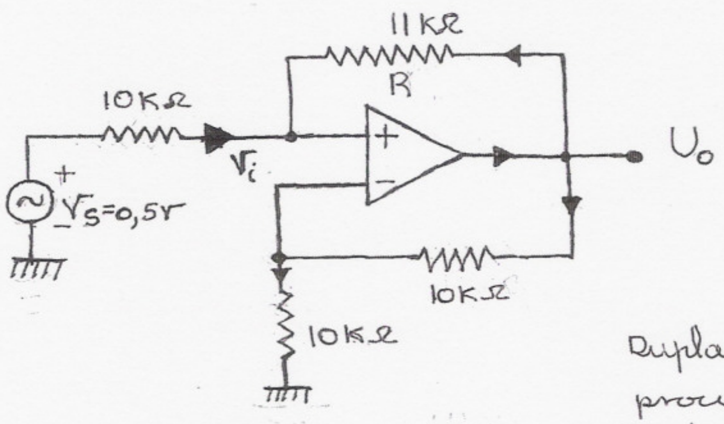
$R_2 = 10K\Omega$

$R = 11K\Omega$

$V_S \quad R_S = 10K\Omega \qquad V_i = ? \quad V_o = ?$

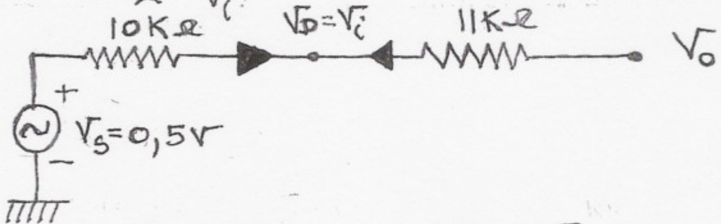
para $V_S = 0,5V$





Dupla realimentação procura equilíbrio, influenciando V_i poo

$$V_o = \left(1 + \frac{R_2}{R_1}\right) V_i$$
$$= 2\ V_i$$



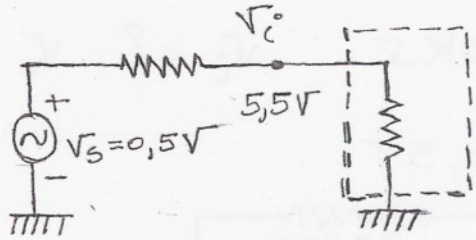
$$\frac{V_S - V_i}{10K\Omega} = \frac{V_i - V_o}{11K\Omega}$$

$$\frac{0,5 - V_i}{10K\Omega} = \frac{V_i - V_o}{11K\Omega} \qquad V_o = 2V_i$$

$$\therefore \quad \frac{0,5 - V_i}{10K} = \frac{V_i - 2V_i}{11K}$$

$$\Rightarrow \quad V_i = 5,5\,V$$

$$V_o = 11\,V$$



$V_o = 11V$