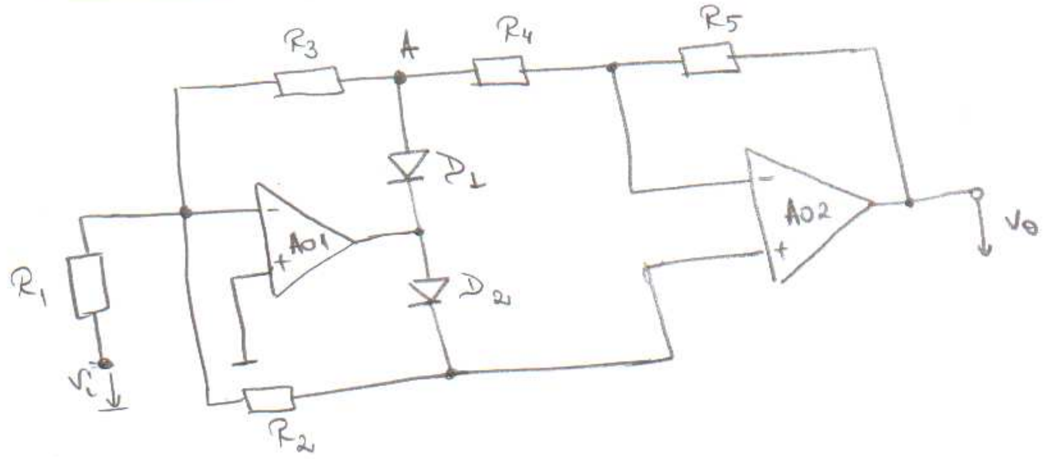
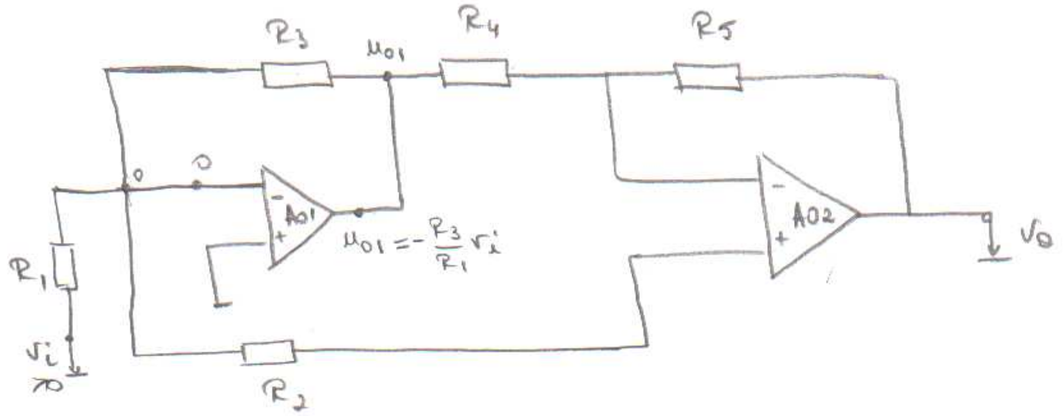
Problema 98

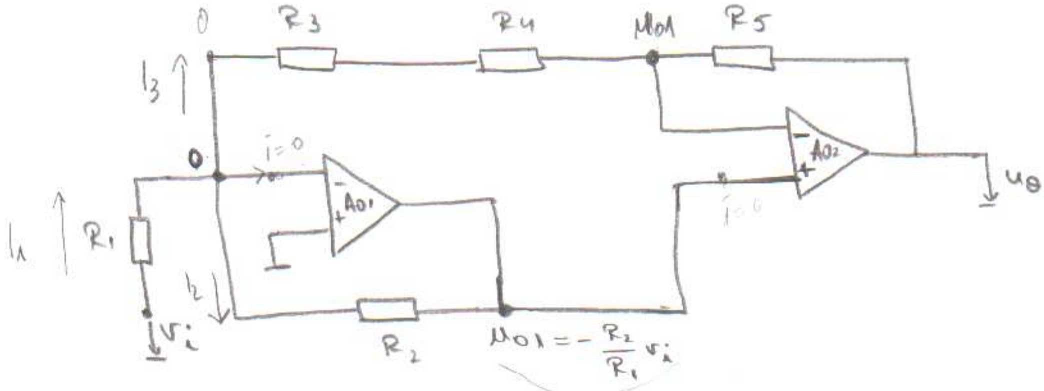


I) $v_i > 0 \Rightarrow u_{01} < 0 \Rightarrow \begin{cases} D_1 & \text{conduce} \\ D_2 & \text{blocată} \end{cases}$



$$u_0 = -\frac{R_5}{R_4} \cdot u_{01} = -\frac{R_5}{R_4} \cdot \left(-\frac{R_3}{R_1}\right) u_i = \frac{R_5 R_3}{R_4 R_1} u_i$$

II) $v_i < 0 \Rightarrow u_{01} > 0 \Rightarrow \begin{cases} D_1 & \text{blocată} \\ D_2 & \text{conduce} \end{cases}$



$$u_0 = \left(1 + \frac{R_5}{R_3 + R_4}\right) \cdot u_{01} = -\frac{R_2}{R_1}\left(1 + \frac{R_5}{R_3 + R_4}\right) v_i$$

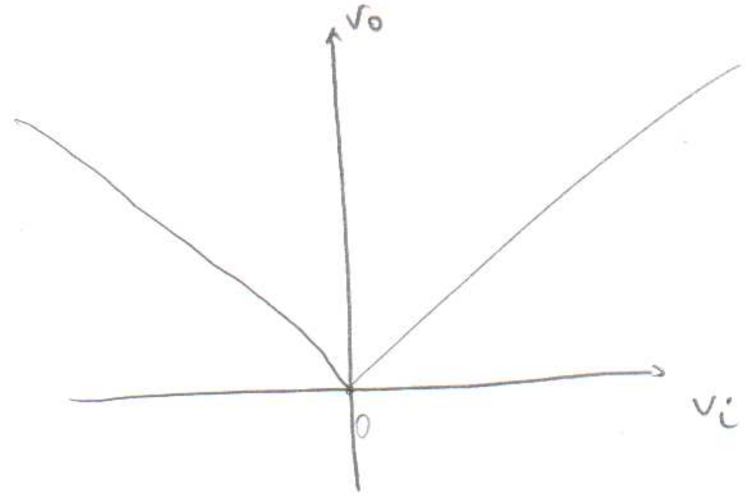
$I_1 = I_2 + I_3$

$I_1 = \frac{V_i}{R_1}$

$I_2 = \frac{-u_{01}}{R_2}$

$I_3 = \frac{+u_{01}}{R_3 + R_4}$

$$V_o = -\frac{R_2}{R_1}\cdot\frac{R_3+R_4+R_4}{R_2+R_3+R_4}\, v_i > 0$$



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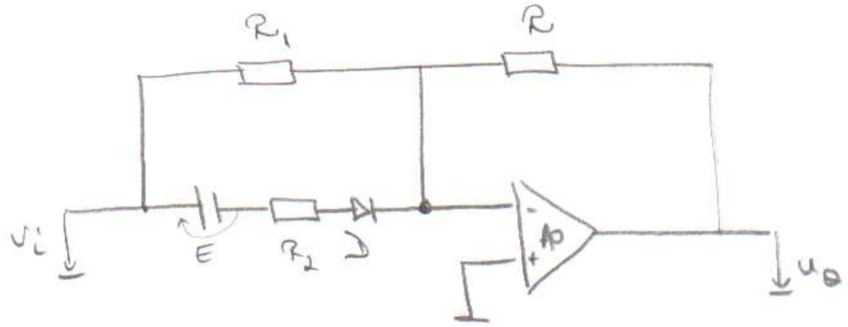


i) $v_i - E < 0 \Rightarrow v_i < E \Rightarrow$ D blocată

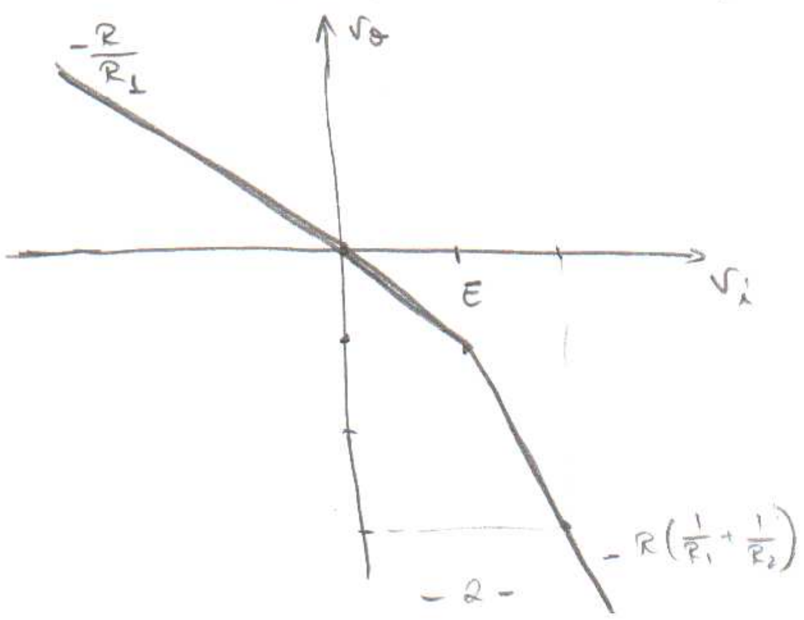
ii) $v_i - E > 0 \Rightarrow v_i > E \Rightarrow$ D deschisă

i) $v_o = -\frac{R}{R_1} v_i$

ii) $0 = \frac{u_o}{R} + \frac{v_i - E}{R_2} + \frac{v_i}{R_1} \Rightarrow v_o = \left(\frac{E - v_i}{R_2} - \frac{v_i}{R_1}\right)R = \frac{E}{R_2}R - v_i R\left(\frac{1}{R_1} + \frac{1}{R_2}\right)$

$E - 2v_i$

$E - 4E$



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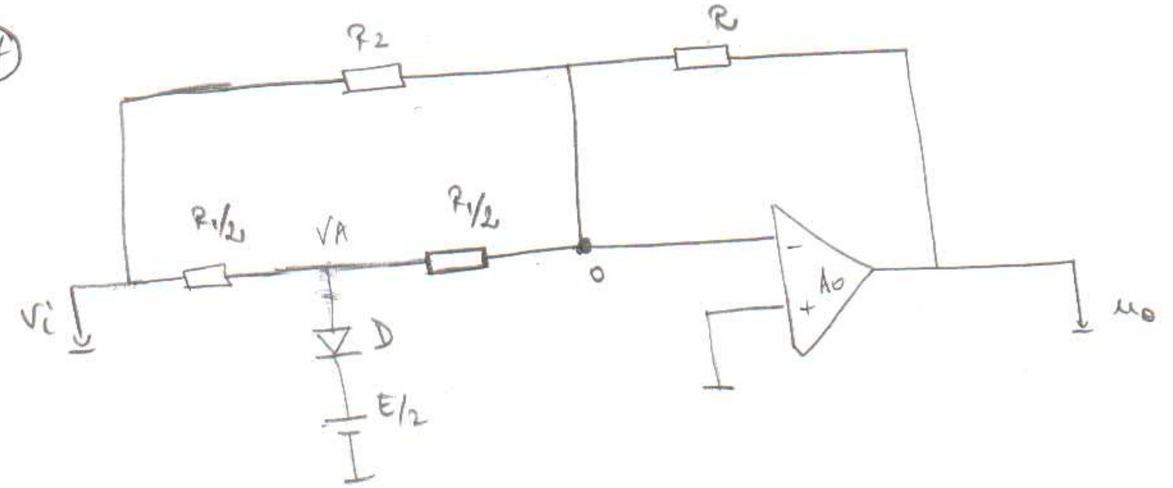


$$V_A = \frac{\frac{V_i}{\frac{R_1}{2}}}{\frac{1}{\frac{R_1}{2}} + \frac{1}{\frac{R_1}{2}}} = \frac{2V_i}{R_1} \cdot \frac{R_1}{4} = \frac{V_i}{2}$$

i) $V_A > \frac{E}{2} \Rightarrow$ D conduce $\left(\frac{V_i}{2} > \frac{E}{2} \Rightarrow V_i > E \right)$

ii) $V_A < \frac{E}{2} \Rightarrow$ D blocată $(V_i < E)$

$\frac{2R}{R_1} \cdot \frac{E}{2}$

$-V_i - E$

i) $V_0 = -\frac{R}{R_2} V_i - \frac{R}{\frac{R_1}{\cancel{2}}} \cdot \frac{E}{\cancel{2}} = -\frac{R}{R_2} V_i - \frac{R}{R_1} E$

$i_1 = -\frac{V_0}{R}$

$i_2 = \frac{V_i}{R_2}$

ii) $V_0 = -\frac{R}{R_2 \parallel R_1} \cdot V_i$

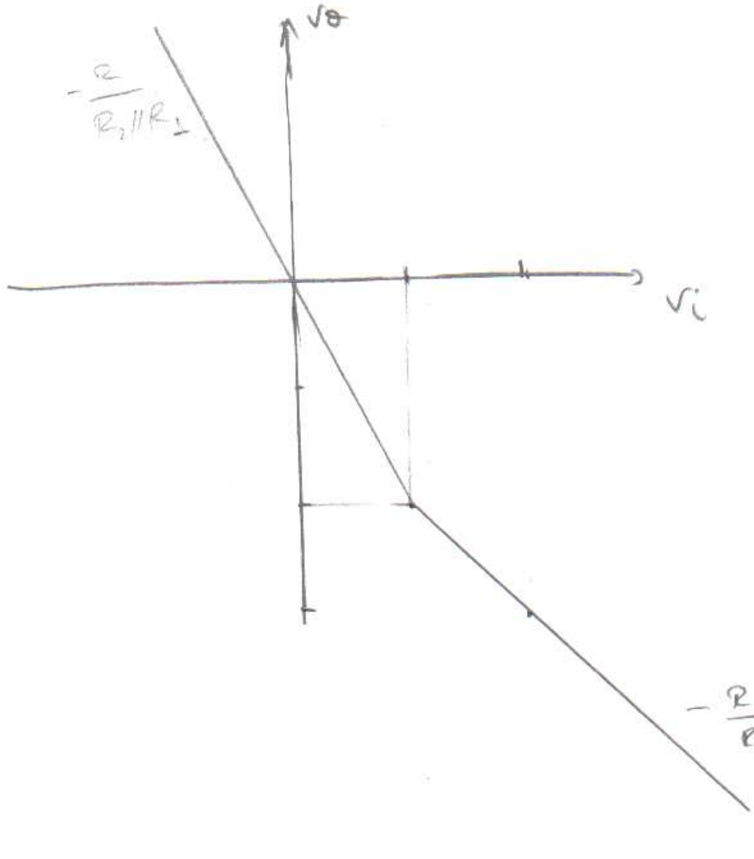
$i_3 = V_i$

$V_i - 0 = i_3 R_1 + \frac{E}{2} \Rightarrow$

$i_3 = \frac{V_i}{R_1} - \frac{E}{2R_1}$

$V_0 = -R\left(\frac{V_i}{R_2} + \frac{V_i}{R_1} - \frac{E}{2R_1} \right) =$

$-\frac{R}{R_2} V_i$



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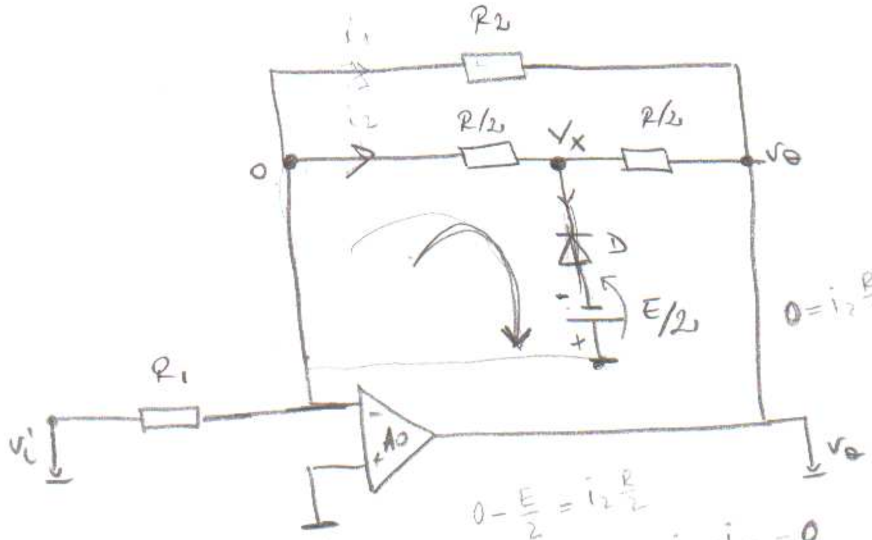

$i_1 = -\frac{v_0}{R_2}$

$i_2 =$

$0 = i_2\frac{R}{2} + \frac{E}{2} \quad 0 = i_2\frac{R}{2} + \frac{E}{2} \Rightarrow i_2 = -\frac{E}{R}$

$i_1 = -i_2 \Rightarrow \frac{v_0}{R_2} = -\frac{E}{R}$

$v_0 = -\frac{R_2}{R}E.$

$0 - \frac{E}{2} = i_2\frac{R}{2}$

$i_1 + i_2 = 0$

$\frac{E}{2} = i_2\frac{R}{2}$

$$V_x = \frac{\frac{v_0}{\frac{R}{2}}}{\frac{1}{\frac{R}{2}} + \frac{1}{\frac{R}{2}}} = \frac{2v_0}{R}\cdot\frac{R}{4} = \frac{v_0}{2} = -\frac{R_2}{R_1}\cdot\frac{1}{2}\cdot v_i$$

i) $-\frac{R_2}{2R_1}\cdot v_i < -E \iff \frac{R_2}{2R_1}v_i > E \Rightarrow v_i > \frac{2R_1}{R_2}E \Rightarrow$ D conduce

ii) $v_i < \frac{2R_1}{R_2}E \Rightarrow$ D blocată.

D blocată $\Rightarrow \quad u_0 = -\frac{R_2 \parallel R}{R_1}v_i$

$$V_x > -E \Rightarrow -\frac{R_2 \parallel R}{2R_1}v_i > -E$$

$$v_0 = -\frac{R_2}{R_1}v_i + \frac{R_2}{R}E$$