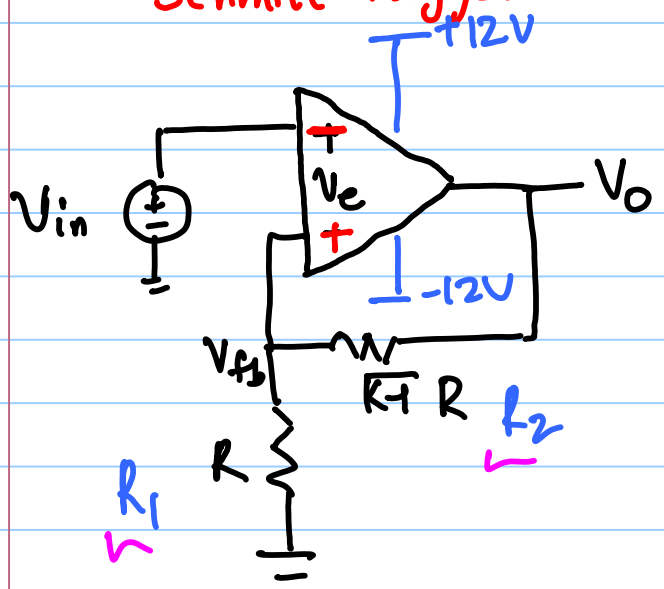
Lecture # 08

Note Title 12-02-2021

"Schmitt Trigger"



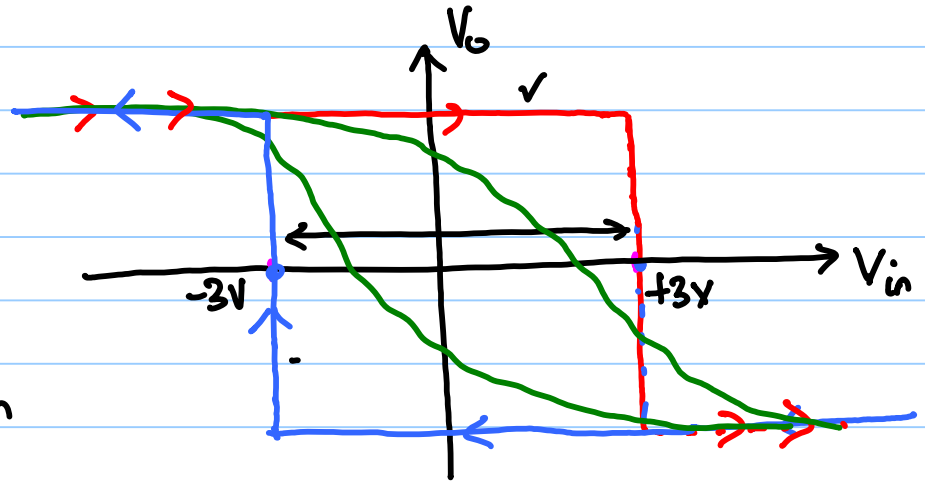
K=4,

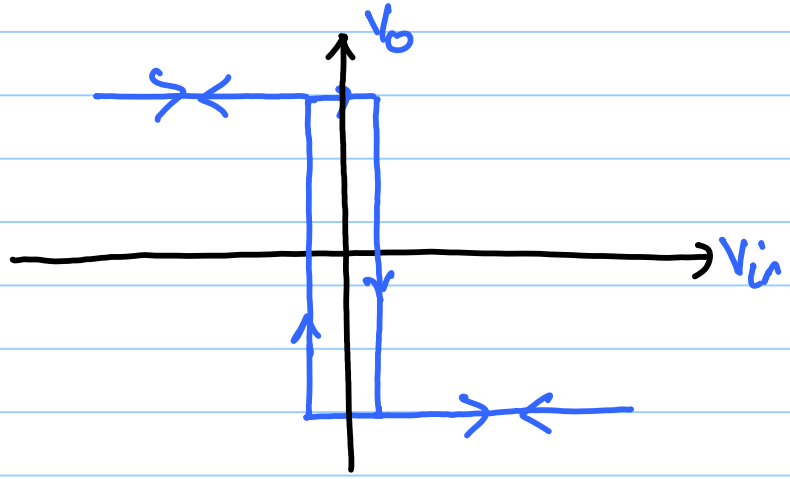
$$V_{fb} = \frac{V_o}{4}$$

$$V_e = V_{fb} - V_{in}$$

$$V_e = \frac{V_o}{4} - V_{in}$$

$$\boxed{V_o = A_o V_e}$$





$$V_e = \frac{-12}{4} - V_{in} \xrightarrow{V_e > 0} -3 - V_{in} > 0$$

$$\Rightarrow V_{in} < -3V$$

$$V_e = \frac{12}{4} - V_{in} \xrightarrow{V_{in} < 0} 3 - V_{in} < 0$$

$$V_{in} > 3$$

$$V_{fb} = \frac{R_1}{R_1+R_2} V_o \Rightarrow V_e = V_{fb} - V_{in} = \frac{R_1}{R_1+R_2} 12 - V_{in} < 0$$

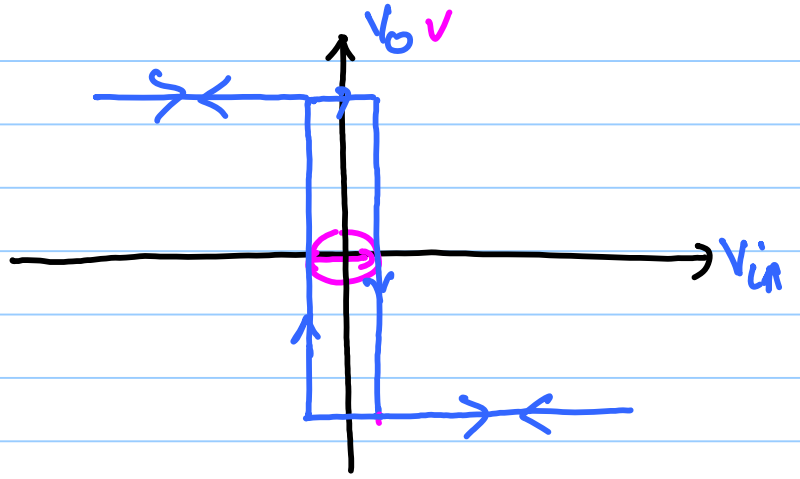
$$\Rightarrow \quad V_{in} > 12 \cdot \frac{R_1}{R_1+R_2}$$

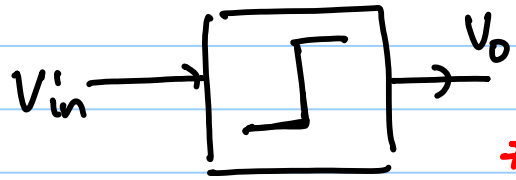
$$V_{in} > \frac{12}{1+\left(\frac{R_2}{R_1}\right)}$$

$V_o = -12V$, $V_i \geq 0$

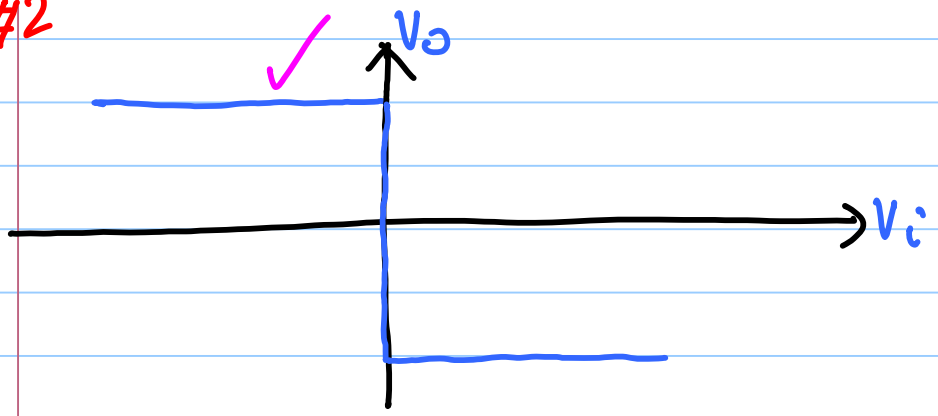
$+12V$, $V_i < 0$

#1





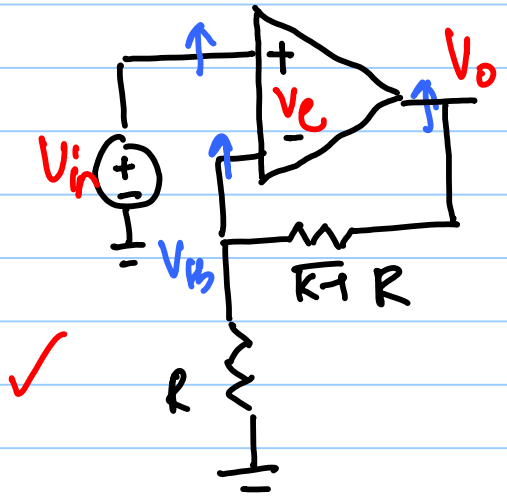
#2

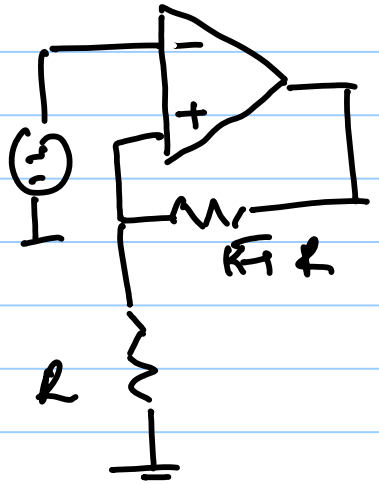


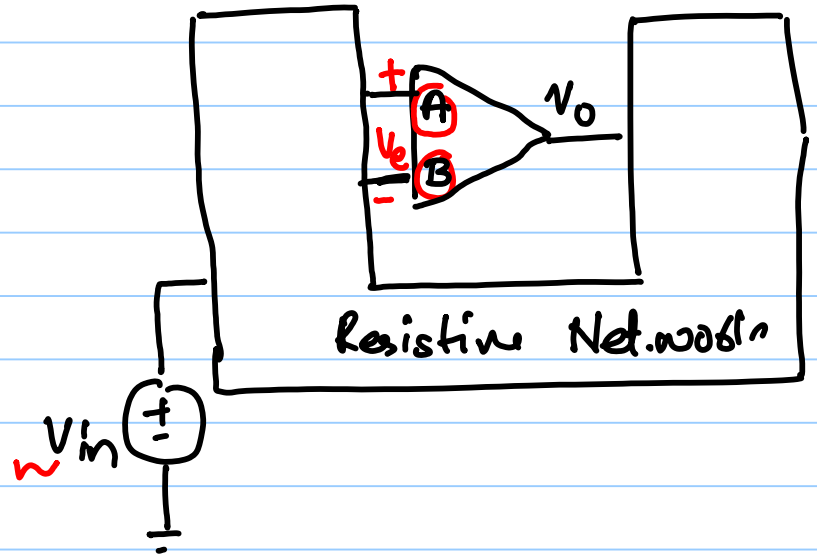
#1

#2

$V_o = A V_e \quad ; A \to \infty$







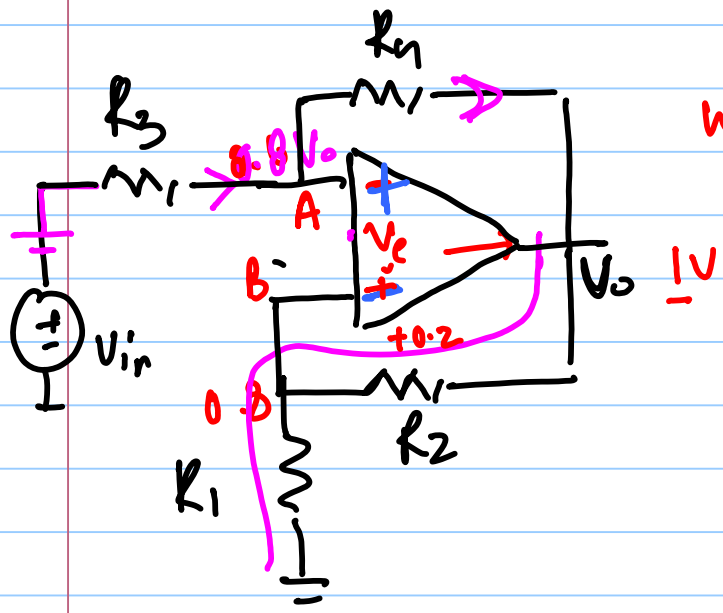
$$V_e = \frac{V_o}{k} + V_{in}$$

$$V_e = \beta V_o + \alpha V_{in}$$

$\beta < 0$ neg. feedback

$\beta > 0$ positive feedback

$\Rightarrow V_e = 0.2 V_o$



$V_o = A V_e$.

where $A \to \infty$

$$V_e = \beta V_o$$

$$= V_A - V_B$$

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

$V_B = 0.8 V_o$

$$\frac{V_{in} - 0.8V_o}{R_3} = \frac{0.8V_o - V_o}{R_4}$$

$$V_e = V_o \underbrace{\left(\frac{R_3}{R_3 + R_4} - \frac{R_1}{R_1 + R_2} \right)}_{\beta}$$

$$\Rightarrow \frac{R_3}{R_3 + R_4} < \frac{R_1}{R_1 + R_2}$$ Neg. feed back.

$0.6 \qquad 0.8$