SEMINAR 3

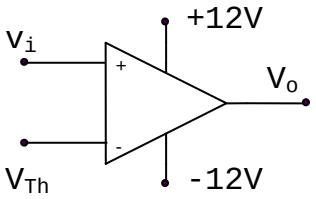
Contents:

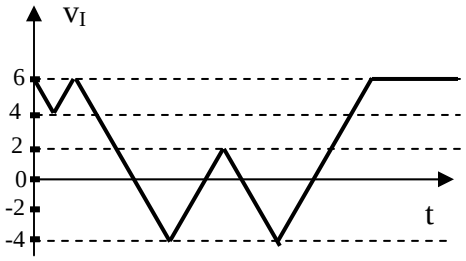
- OA Voltage Comparators - simple, with positive feedback

1.

a) Plot VTC $v_o(v_I)$ for $v_I \in [-12V;12V]$considering $V_{Th}=3V$.

b) Plot vo(t) for $v_I(t)$ in the figure.





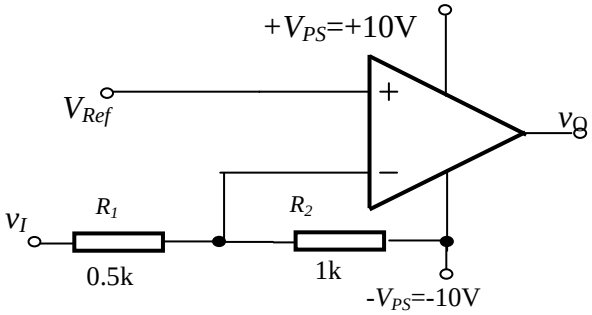
2.

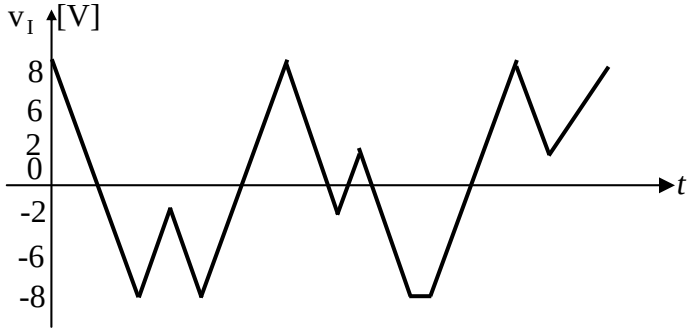
Considering $V_{Ref}=1V$:

a) What is the application of the circuit? Justify the answer.

b) For what value of v_I , vo switches?

c) Plot $v_O(t)$ for $v_I(t)$ in the figure.





3.

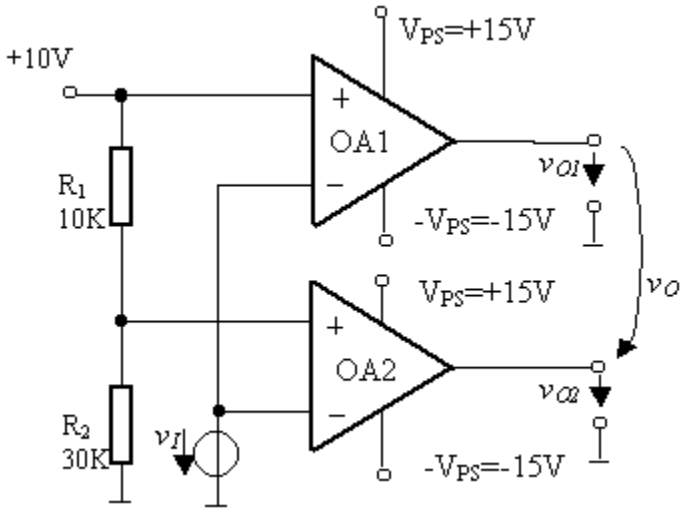
Assume OA_1 , OA_2 ideal.

a) For $v_I \in [-12V;12V]$, find the expression of $v_{O1}(v_I)$ and plot the VTC $v_{O1}(v_I)$. What is the application of the circuit assuming v_{O1} as output?

b) For $v_I \in [-12V;12V]$, find the expression of $v_{O2}(v_I)$ and plot the VTC $v_{O2}(v_I)$. What is the application of the circuit assuming v_{O2} as output?

c) Plot the VTC $v_O(v_I)$ for $v_I \in [-12V;12V]$.

d) Assuming $v_I(t)= 11\sin\omega t[V]$, plot $v_I(t)$ and $v_O(t)$. What is the application of the circuit?



4.

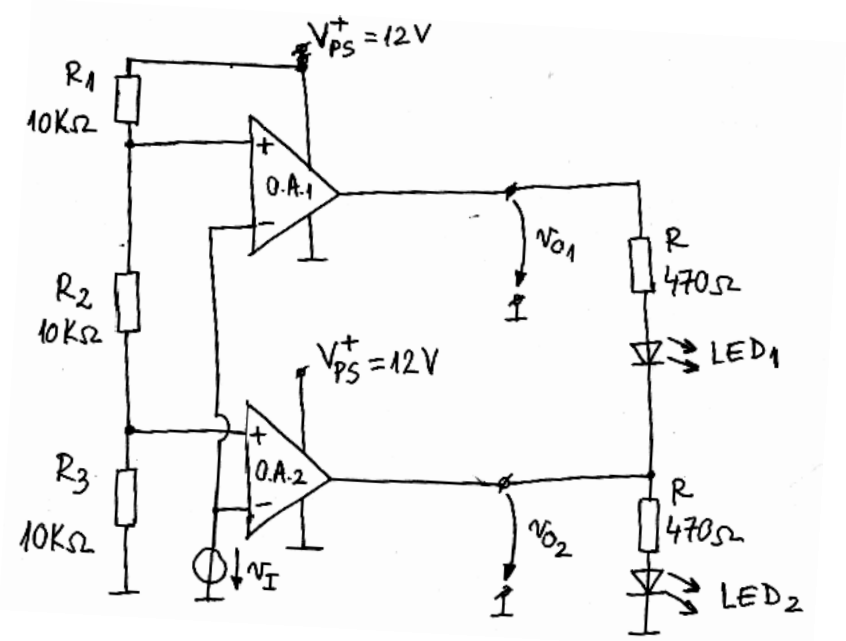
OA_1, OA_2 – ideal

a) What is the expression $v_{O1}(v_I)$ for $v_I \in [0V; 10V]$? Plot the VTC $v_{O1}(v_I)$. What is the application of the circuit with the output v_{O1}?

b) What is the expression $v_{O2}(v_I)$ for $v_I \in [0V; 10V]$? Plot the VTC $v_{O2}(v_I)$. What is the application of the circuit with the output v_{O2}?

c) Fill in the table of states (on/off) of the two LEDs below:

v_I range	State of LED_1 (on/off)	State of LED_2 (on/off)



5.

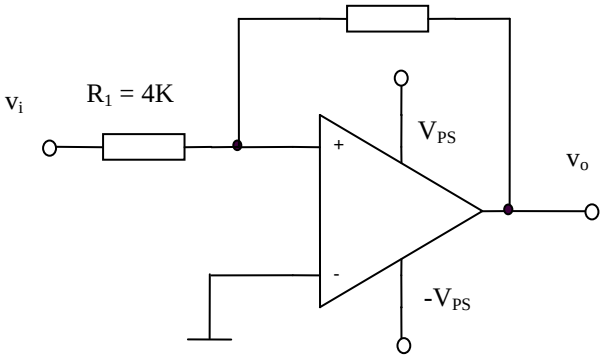
The supply voltages for this voltage comparator are $V^+ = +15V$ and $V^- = -15V$.

a) What are the values of the threshold voltages?

b) How does the voltage transfer characteristic $v_O(v_I)$ look like? Show numerical values on the axes.

c) Show the waveforms of $v_O(t)$ and $v_I(t)$ for $v_I(t)$ sine wave with 10V amplitude.

d) Show the waveforms of $v_O(t)$ and $v_I(t)$ for $v_I(t)$ sine wave with 5V amplitude.



6.

Assume OA – ideal, rail-to-rail.

a) Draw, qualitatively, the VTC $v_O(v_I)$ of the circuit. What is the function of the circuit?

b) Find the expressions and values of the following parameters from VTC: V_{OH}; V_{OL}; $V_{Th,H}$; $V_{Th,L}$. Redraw the VTC $v_O(v_I)$ according to the numerical values obtained.

c) Assume $v_I(t)$ is a triangular wave, with no dc component, of 8V amplitude. Plot $v_I(t)$ and $v_O(t)$. How does $v_O(t)$ change if the amplitude of v_I reduces to 4V?

d) How does VTC change if in the circuit appear an interruption between points M and N and what is the function of the new circuit?