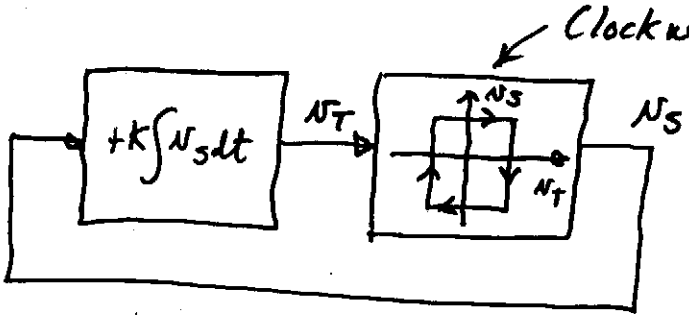
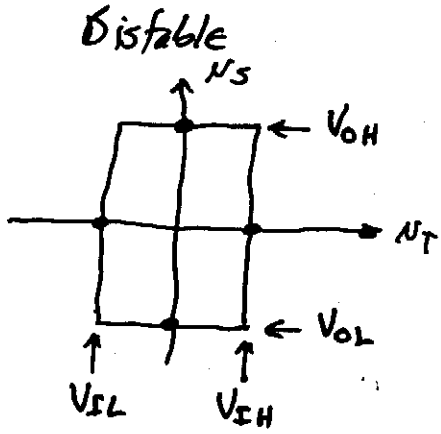
Prob. Session, 7pm Dec. 12th, Thursday

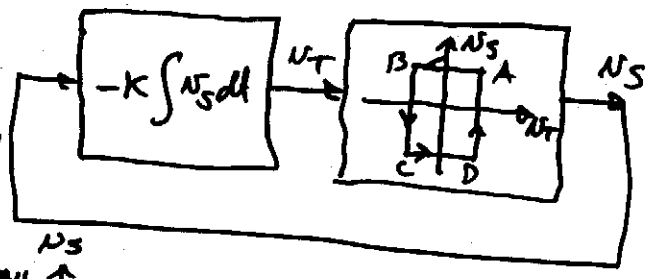
Waveform Generators

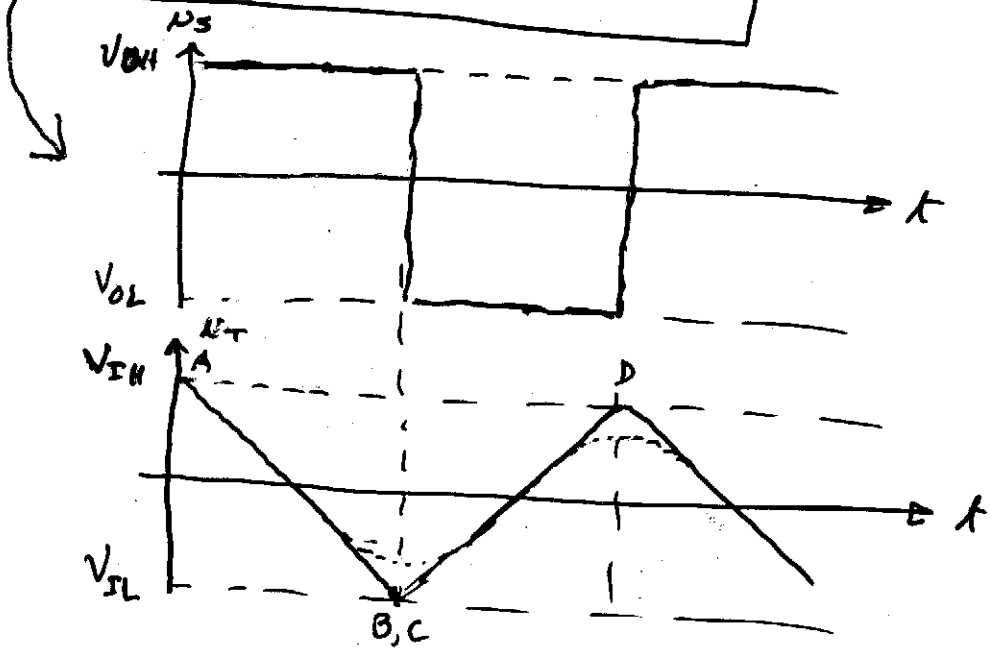
1.)

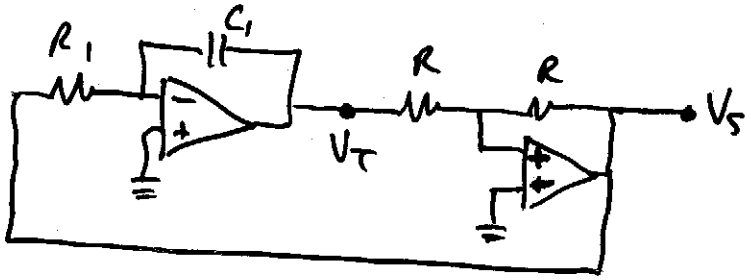




2.)

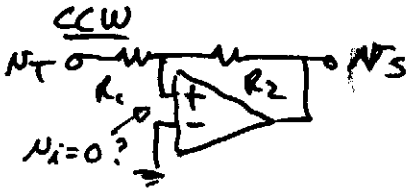


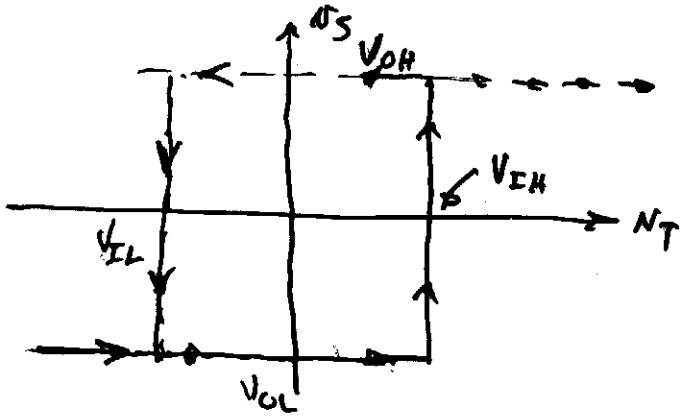




Bistable Circuits

CCW





1.) Assume the $N_T << 0$

2.) $N_i < 0 \rightarrow N_{out} = V_{OL}$

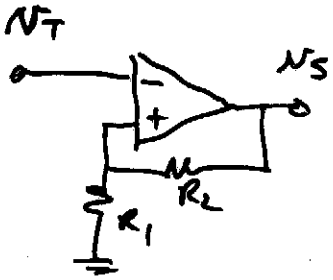
3.) $N_i = ? = \frac{V_{OL} R_1}{R_1+R_2} + \frac{N_T R_2}{R_1+R_2} \rightarrow 0 = \frac{V_{OL} R_1}{R_1+R_2} + \frac{V_{IH} R_2}{R_1+R_2}$

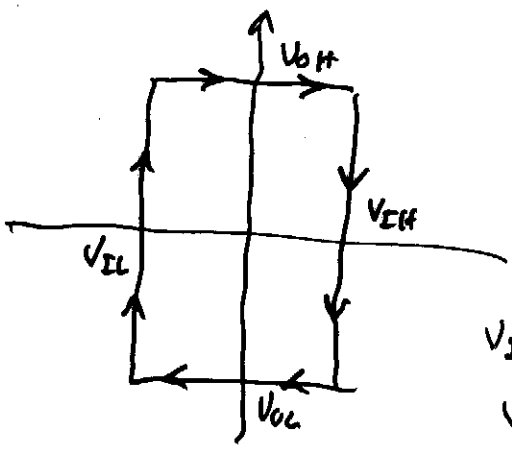
$\therefore \boxed{V_{IH} = -\frac{R_1}{R_2} V_{OL}} \rightarrow V_S = V_{OH}$

4.) Decrease V_T until $N_i = 0$ again

$N_i = 0 = \frac{V_{OH} R_1}{R_1+R_2} + \frac{V_{IL} R_2}{R_1+R_2} \rightarrow \boxed{V_{IL} = -\frac{R_1}{R_2} V_{OH}}$

CW Bistable –

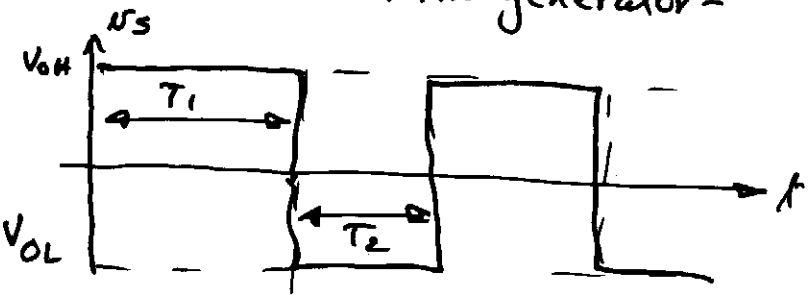


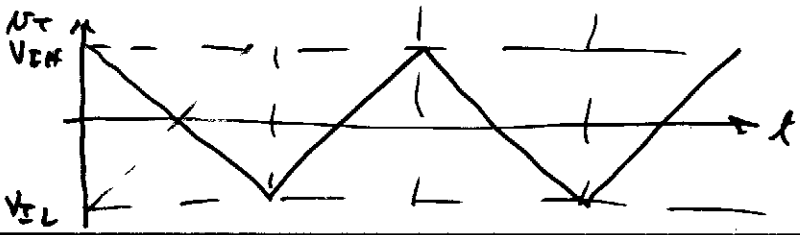


$V_{IH} = \frac{R_1}{R_1+R_2} V_{OH}$

$V_{IL} = \frac{R_1}{R_1+R_2} V_{OL}$

Back to the waveform generator –





Find $T = T_1 + T_2$

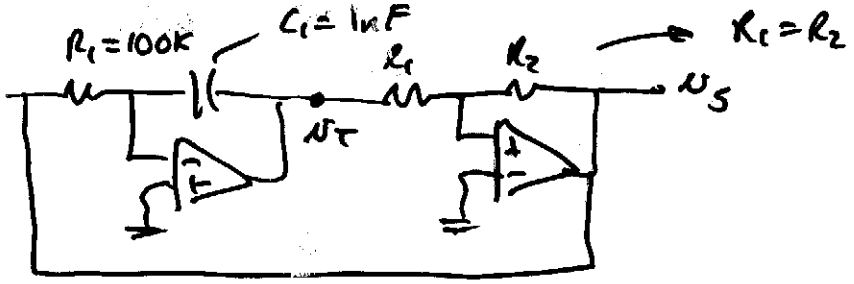
$f_{osc} = \frac{1}{T}$

General result-

$$T = T_1 + T_2 = \frac{V_{IH} - V_{IL}}{K}\left[\frac{1}{V_{OH}} - \frac{1}{V_{OL}}\right]$$

If $V_{OL} = -V_{OH}$ then $V_{IL} = -V_{IH}$

$$T = \frac{4\,V_{IH}}{K\,V_{OL}}$$



$$T = \frac{4}{K} = 4R_1C_1 \longrightarrow f_{osc} = \frac{1}{4R_1C_1} = 2500\,Hz$$