

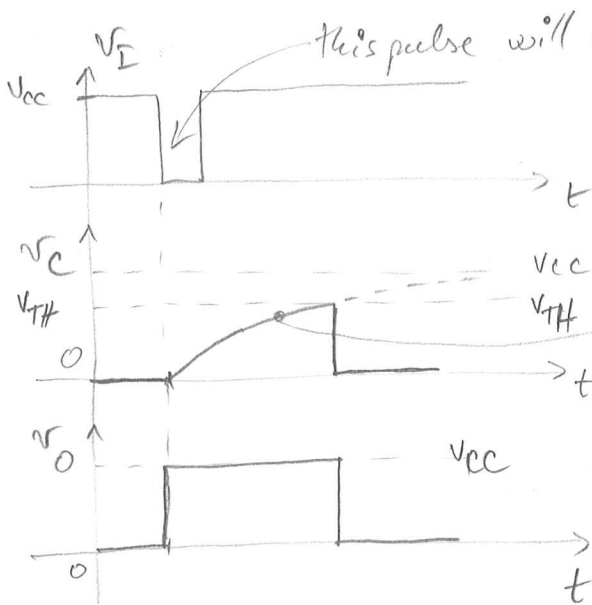
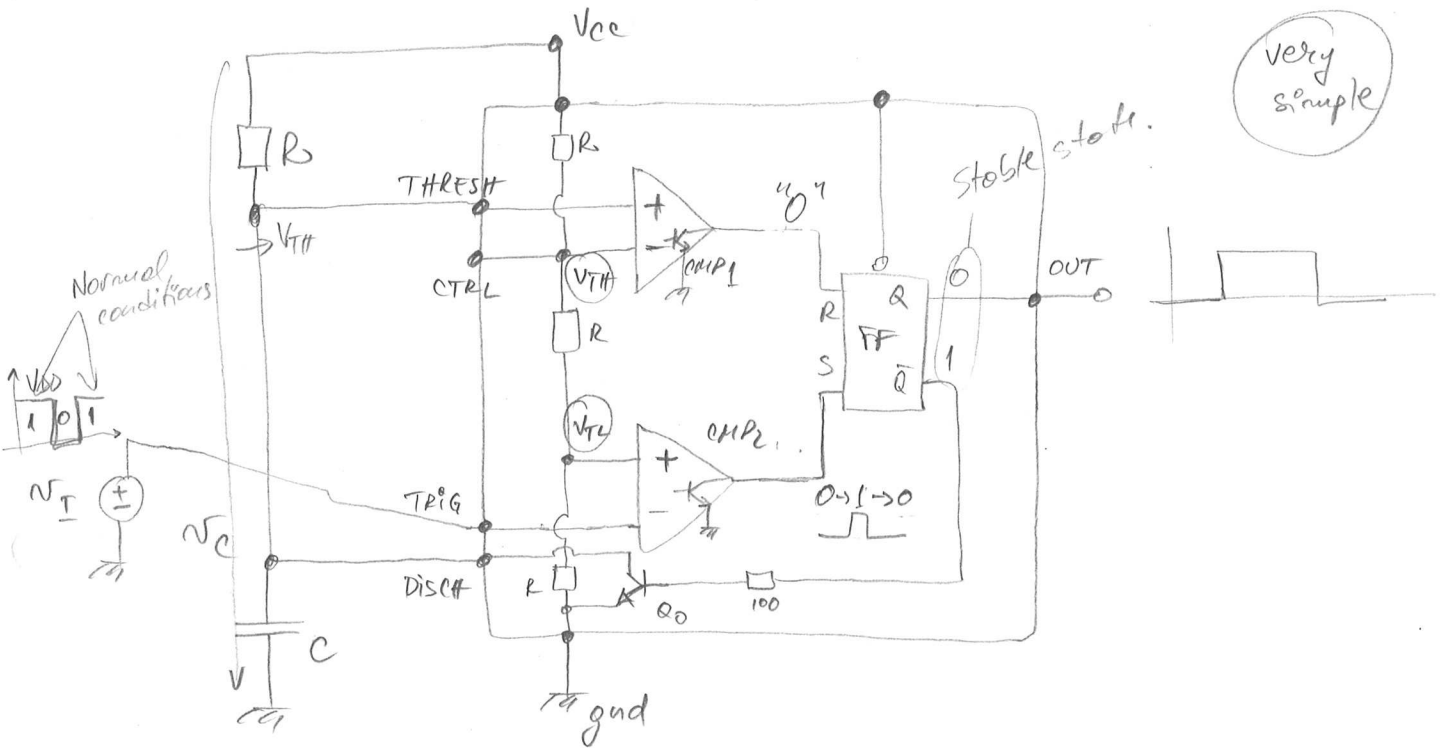
Signal generators

Exam 2 in ECE-125!

12:1 pm

10.3 Monolithic Timers

- The 555 timer.
- Exercise! - The 555 as an Astable Multivibrator
- The 555 as a monostable multivibrator



This pulse will make CMP₂'s output to go 0 → 1 → 0 which sets the FF's output to "1" ⇒ C starts being charged

C is charged via R and when it voltage reaches V_{TH} ⇒ ⇒ CMP₁ goes to "1", which resets FF!

Use eq. (10.3) with $V_0 = 0, V_{\infty} = V_{cc}, V_1 = V_{TH} \Rightarrow$

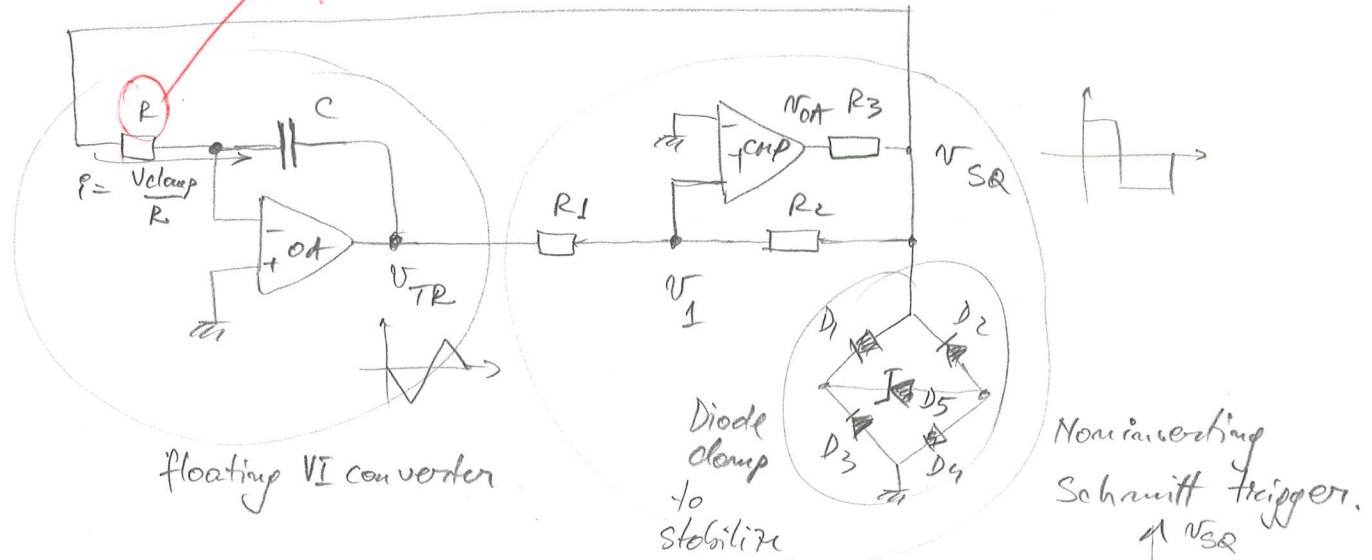
$$\Rightarrow T = RC \cdot \ln \frac{V_{cc}}{V_{cc} - V_{TH}} \Rightarrow f_0 = \frac{1}{T}$$

Exercise! { Voltage control (via CONTROL of 555)
 { Timer/Counter Circuits

10.4 Triangular wave generators

Generated by alternately charging and discharging a capacitor with a constant current.

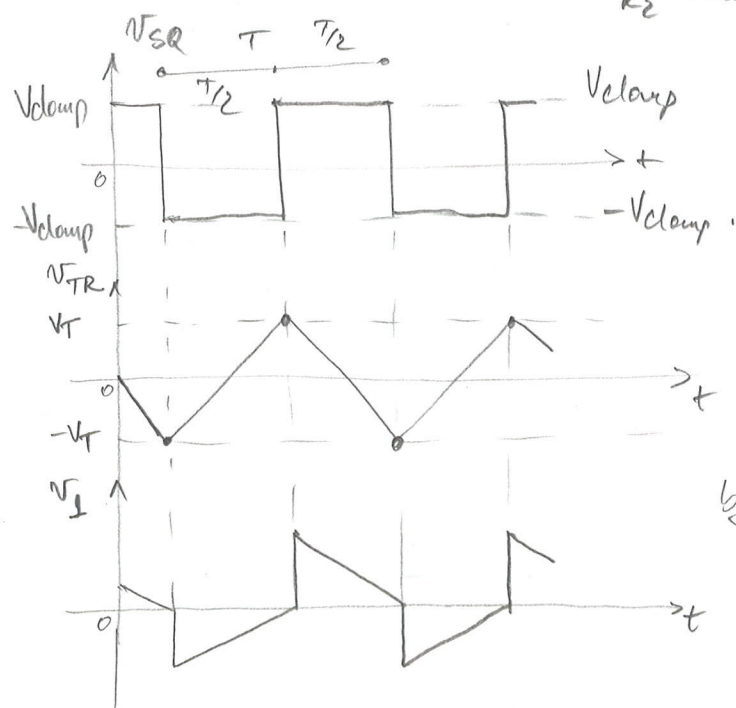
charge it like in Fig 10-20 and achieve symmetric waves! ideal is the same as in amplitude stabilization!



Diode clamp to stabilize V_{SR} at $\pm V_{clamp} = \pm (V_{Z5} + 2V_{D(on)})$

Noninverting Schmitt trigger. Sets the amplitude!

$$\Rightarrow \begin{cases} V_{TR} = - \frac{R_1}{R_2} V_{clamp} = -V_T \\ V_{TH} = + \frac{R_1}{R_2} V_{clamp} = +V_T \end{cases}$$



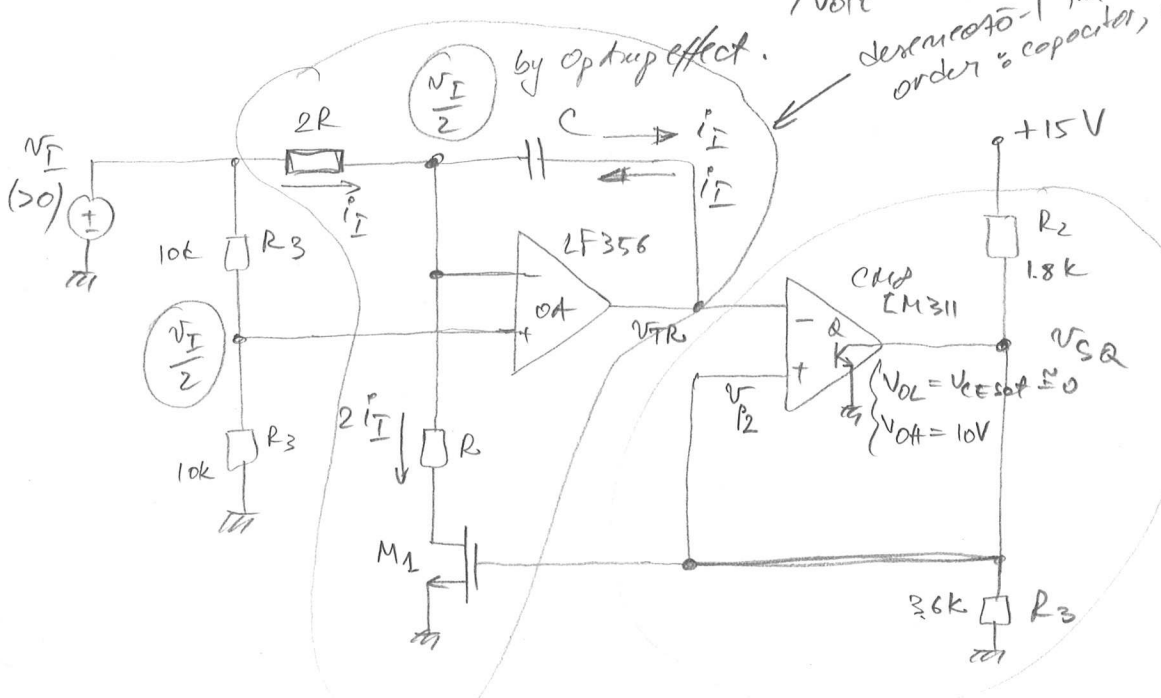
Use Eq. (10.2) \Rightarrow
 $\Delta t = T/2, I = \frac{V_{clamp}}{R}, \Delta V = 2V_T$
 $\Rightarrow f_0 = \frac{R_2/R_1}{4RC}$

by superposition is combination of V_{SR} and V_{TR} .

- Voltage-Controlled Oscillator (VCO)

designed to give $f_0 = k V_I$, $V_I > 0$.
 k in Hz/Volt

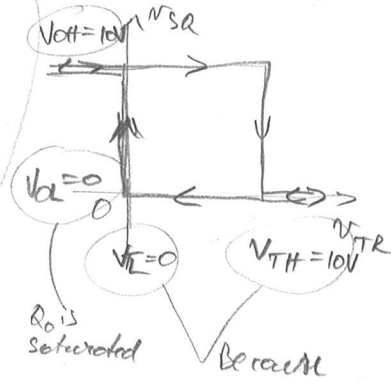
project! to implement practically.



degenerates -1 in order of capacitor, opamp, etc!

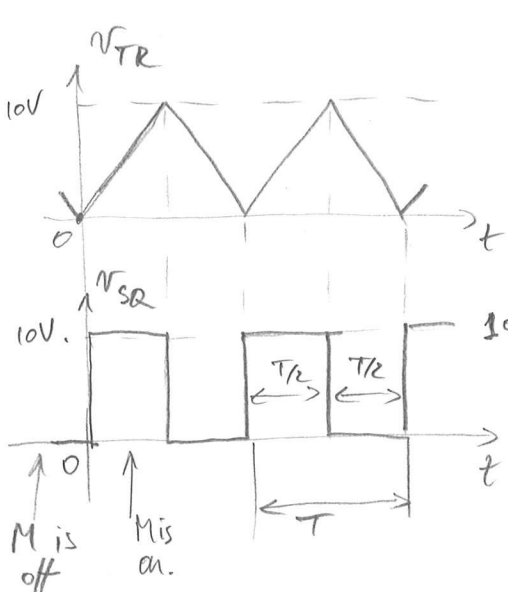
by op amp effect.

inverting Schmitt trigger.



V_I converter.

forces C to conduct a current $i_I = \pm \frac{V_I}{4R}$ to charge / discharge it.



10V due to R₂, R₃ voltage divider

Use again (10.2) : $\Delta t = \frac{T}{2}$, $i_I = \frac{V_I}{4R}$, $\Delta V = V_{TH} - V_{TL}$

$$f_0 = \frac{V_I}{8RC \cdot (V_{TH} - V_{TL})}$$

$$V_I \in [0mV; 10V] \Rightarrow f_0 \in [10Hz; 10kHz]$$

Veri versa! for a sketch

- Triangular - sine converter

Exercise!

4

10.5 Sawtooth wave generator.

10.6 Monolithic waveform generators.

- Grounded - capacitor VCO's

- ICL-8038 - Emitter coupled VCO's.

- XR-2206 function generator.

10.7 VF and FV converters.

{ Wide sweep multivibrator (VFCs)
{ Charge balancing (VFCs)
{ FV converters. (FVCs)

include here Sawtooth generator!