Today - Review Lab Comparator / 555 Circuit
- Review Schmitt-trigger
- Oscillators \{ Square Waves, Sine Waves \} → Midterm #2 up to here

Midterm:
Q1: Short Answers
   ≤ 25 words
Q2: Circuits \( V_a, V_o \)
Q3:
Q4

![Diagram]

\[ if \, V_c > V_D, \, V_e = 0 \]
\[ V_c < V_D, \, V_e = V_c \]

\[ F_{wd} = F \text{ w/ diode} \]
\[ F_{wd} = F \text{ w/o diode} \]

Changes through HPF then returns w/o C
* Diode Conducts if \( V_F > 0.7 + 3 = 3.7 \) V

Neg spikes need b/c 555 chip is negative-edge triggered!

\[ T = (-\ln(\frac{2}{3}))RC = 1.1 \text{ RC} \]

* Photo of the board on the next page!
Changes go through HPF, then returns with time coast 

Diode conducts if 

\[ V_F > 0.7 + 3V = 3.7V \]

\[ T = -\left( \frac{1}{3} \right) RC = 1.1 RC \]
Lab: Schmidt Trigger

Look @ figures in prelab 4A.

Ex. slope = \( \frac{5V}{10ms} = \frac{500V}{s} \)

if \( V_i < V_+ \) \( V_o = +10V \)
V_i > V_+ \( V_o = -10V \)
This was covered in prev. lecture

new:
\[
\Delta U = \frac{0.05V}{0.5V} = 10^{-4}s = 100\mu s
\]

Square wave Oscillators

Assume initial \( V_0 = 0 \), \( V_+ = 10V \)
\( V_+ = \left( \frac{1}{1+9} \right) 10V = 1V \)

if \( V_+ > V_- \) \( V_o = 10V \)
if \( V_+ < V_- \) \( V_o = -10V \)
Calculate $T$
\[
V_f - V_i = (V_p - V_s) e^{-t/T}
\]
\[
-1 - (1) = [-10 - (1)] e^{-t/T}
\]
\[
\frac{2}{11} = e^{-t/T}
\]

$T = -\tau \ln \frac{2}{11} = 1.7 \tau$ \( \text{？} \) Half period

$T_{\text{full}} = 2T = 3.4 \tau$

$\frac{1}{f} = \frac{1}{\text{period}} = \frac{1}{2(1.7\tau)}$

Another Implementation (using 555)

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= Charge

= discharge
Charging

\[ V_f - V_i = (V_\infty - V_i) e^{-t/\tau} \]

\[ T = -\tau \ln \left( \frac{V_\infty - V_i}{V_\infty - V_i} \right) = \tau (-\ln \frac{1}{x}) = (0.69) \tau \]

\[ \tau_C = (R_1 + R_2)C \]

\[ \tau_d = R_2C \]