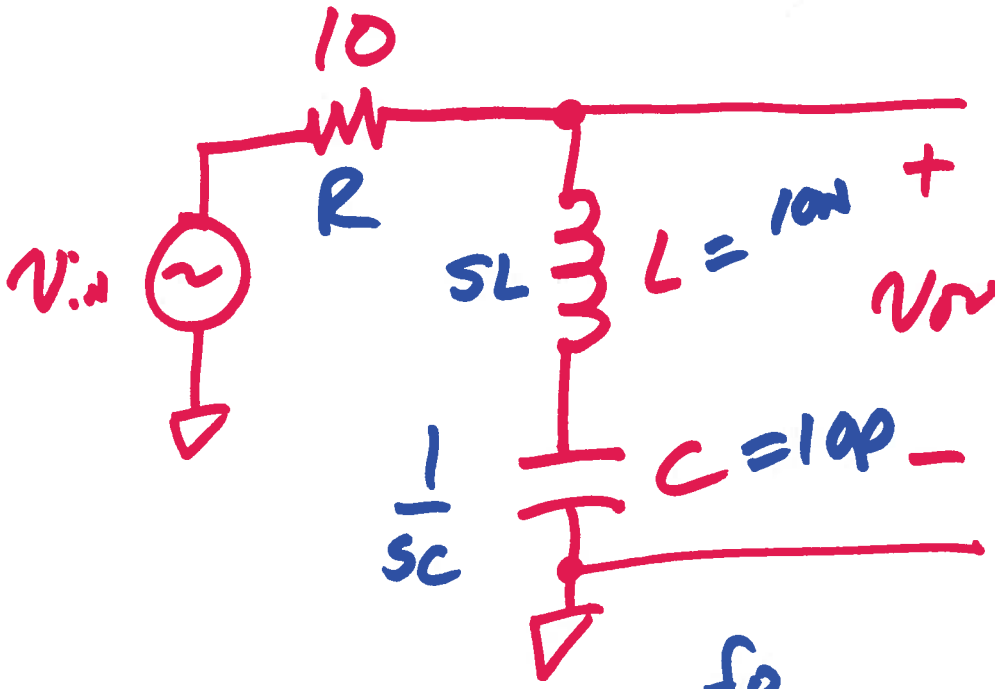
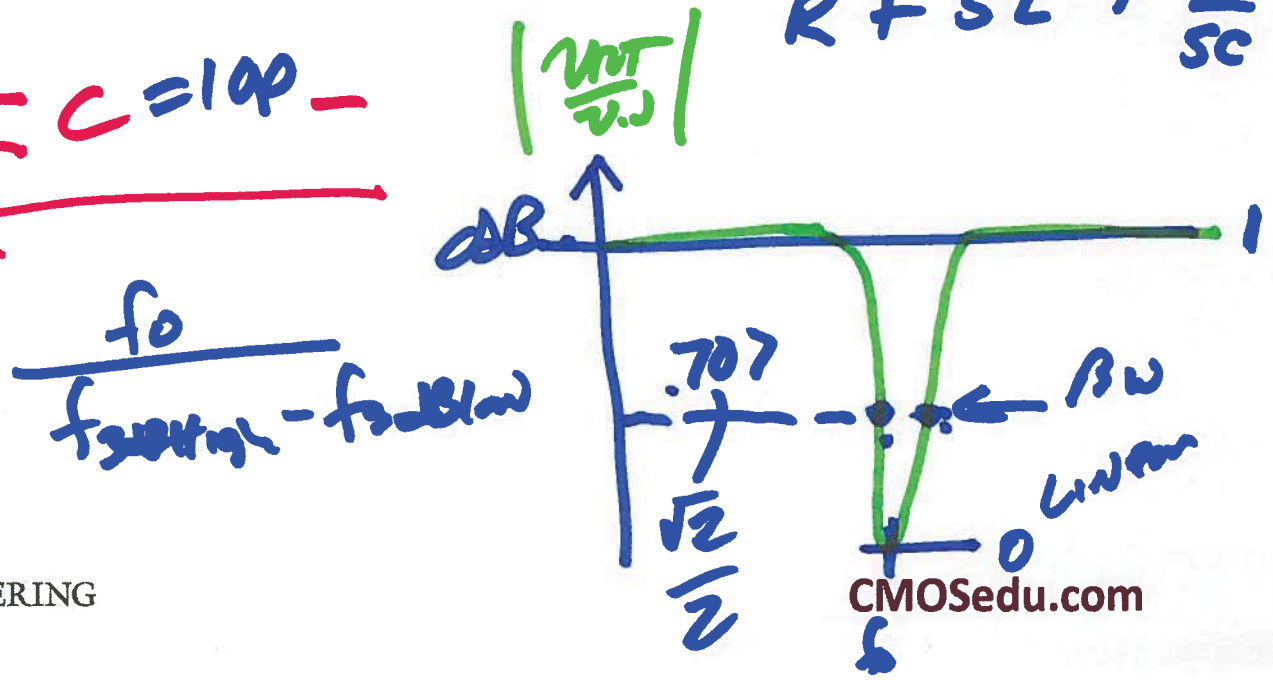
EE 421/ECG 621
Lecture 3
Sept. 5, 2018



$$= V_{in} \cdot \frac{S^2LC + 1}{S^2LC + SCR + 1}$$

$$V_{out} = V_{in} \cdot \frac{SL + \frac{1}{SC}}{R + SL + \frac{1}{SC}}$$



$$\frac{v_{NT}}{v_N} = \frac{s^2 + \frac{1}{LC}}{s^2 + s\frac{R}{L} + \frac{1}{LC}}$$

@ f_0 $\frac{v_{NT}}{v_N} = 0 = \left| \frac{s^2 + \frac{1}{LC}}{s^2 + s\frac{R}{L} + \frac{1}{LC}} \right|$

$$\frac{1}{2\pi\sqrt{LC}} = f_0$$

$$s \to j \cdot 2\pi \cdot \frac{1}{\sqrt{LC} \cdot 2\pi}$$

f_0

$$\frac{\pm\sqrt{-4\frac{1}{LC}}}{2} = \pm\frac{j}{\sqrt{LC}}$$

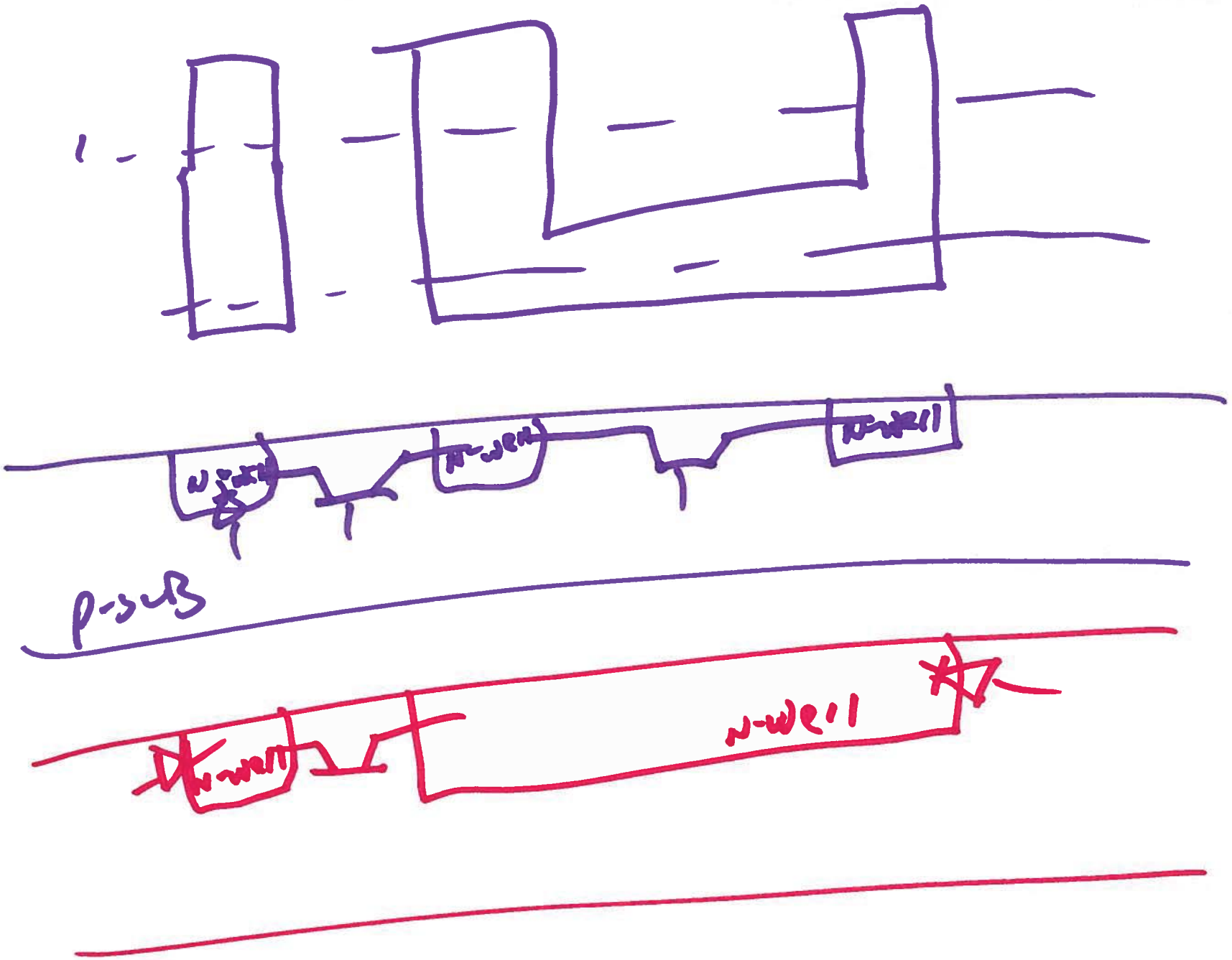
$$.707 = \left| \frac{s_{3dB}^2 + \frac{1}{LC}}{s_{3dB}^2 + s_{3dB}\frac{R}{L} + \frac{1}{LC}} \right|$$

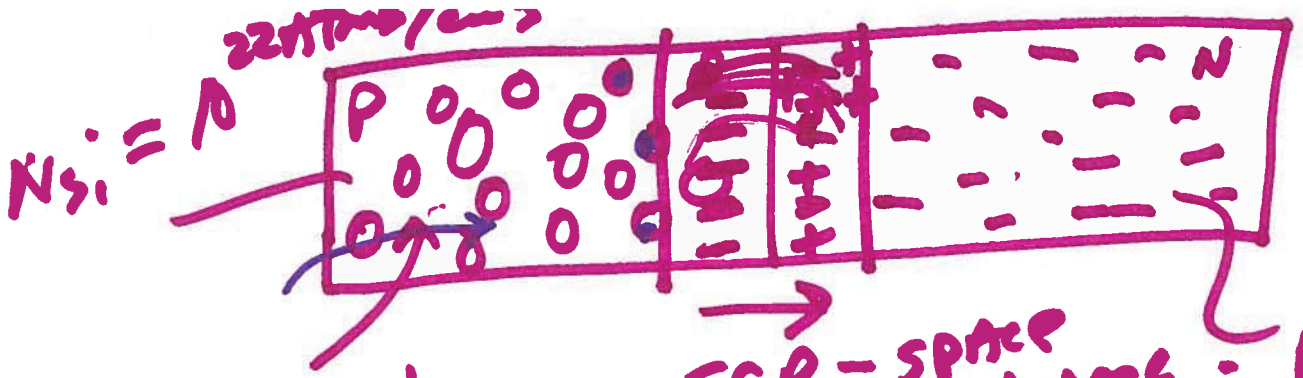
$$.707 = \left| \frac{\left(s_{3dB} + \frac{j}{\sqrt{LC}}\right)\left(s_{3dB} - \frac{j}{\sqrt{LC}}\right)}{} \right.$$

$$s + \frac{j}{\sqrt{LC}} = j \cdot 2\pi f + \frac{j}{\sqrt{LC}}$$

$$= j\left(2\pi f + \frac{1}{\sqrt{LC}}\right)$$

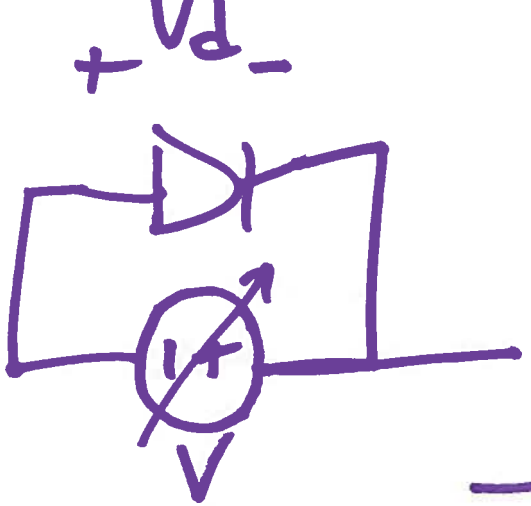
$$f_{3dB} \pm \frac{1}{\sqrt{LC}} \cdot 2\pi$$

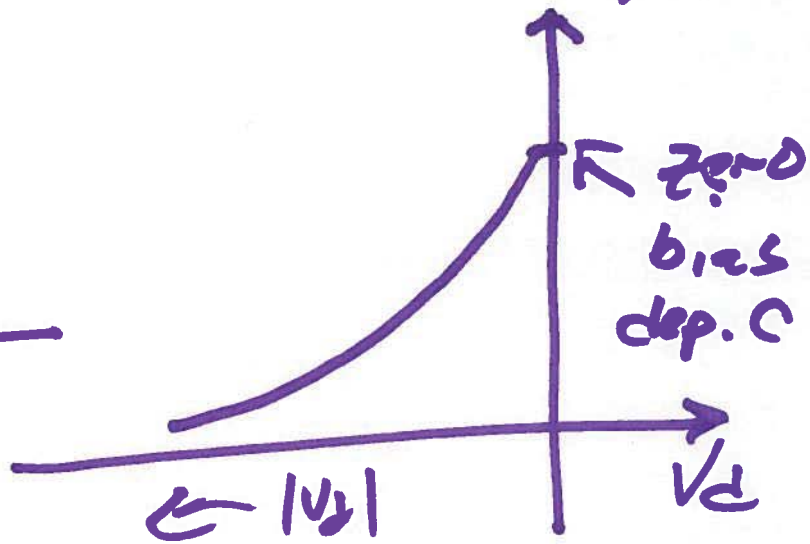

p-sub
n-well

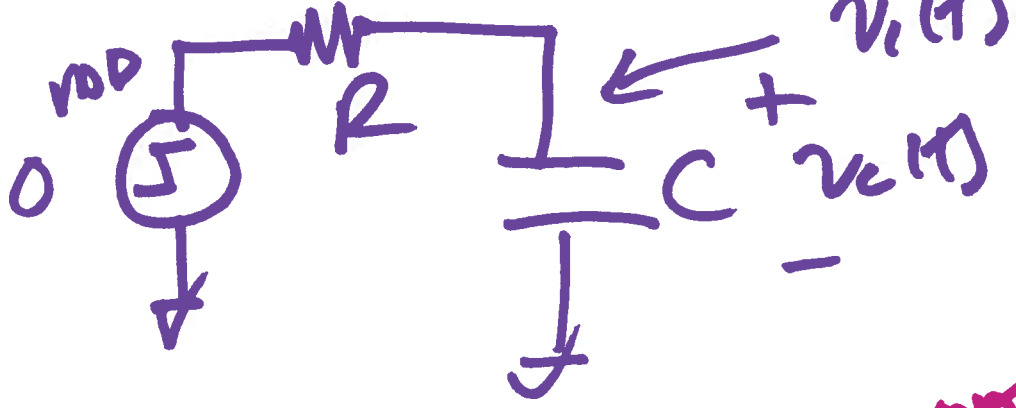


$N_A|_P$ = p = # of holes

$$C = \epsilon \cdot \frac{A}{t}$$







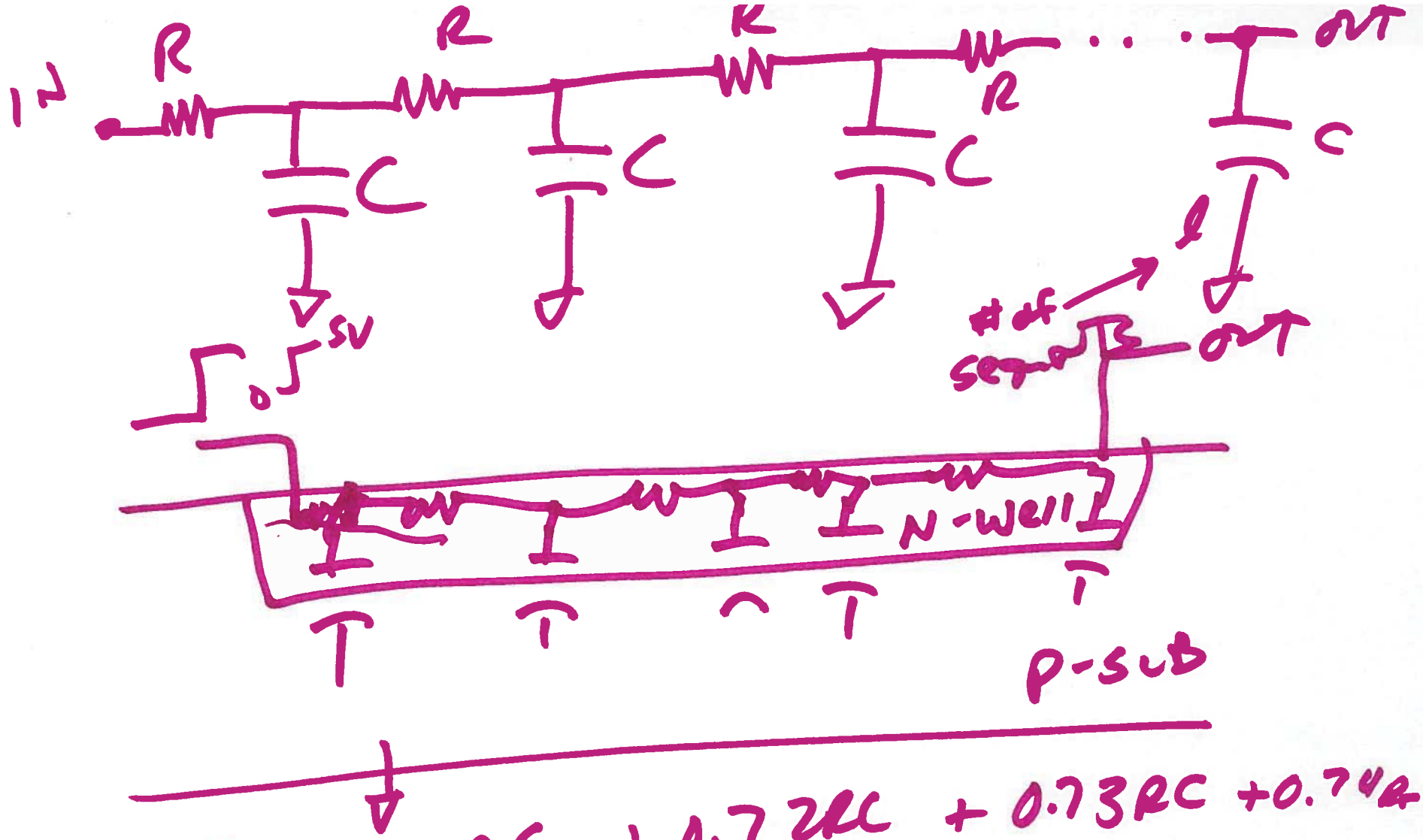
$$v_c(t) = VDD\left(1 - e^{-t/RC}\right)$$

$$\frac{VDD}{2} = VDD\left(1 - e^{-t_d/RC}\right)$$

$$-\frac{1}{2} = -e^{-t_d/RC}$$

$$RC\left(-\ln\frac{1}{2}\right) = t_d$$

$$\boxed{t_d = 0.7RC}$$



$$t_d = 0.7RC + 0.72RC + 0.73RC + 0.74R$$

$$+ 0.7QR \cdot C = 0.7RC(1+2+3$$

$$= 0.7RC \cdot \left(\frac{Q+1}{2}\right)^2 \approx 0.7RC\frac{Q^2}{2} + \ldots$$

$$\approx 0.35RCQ^2$$

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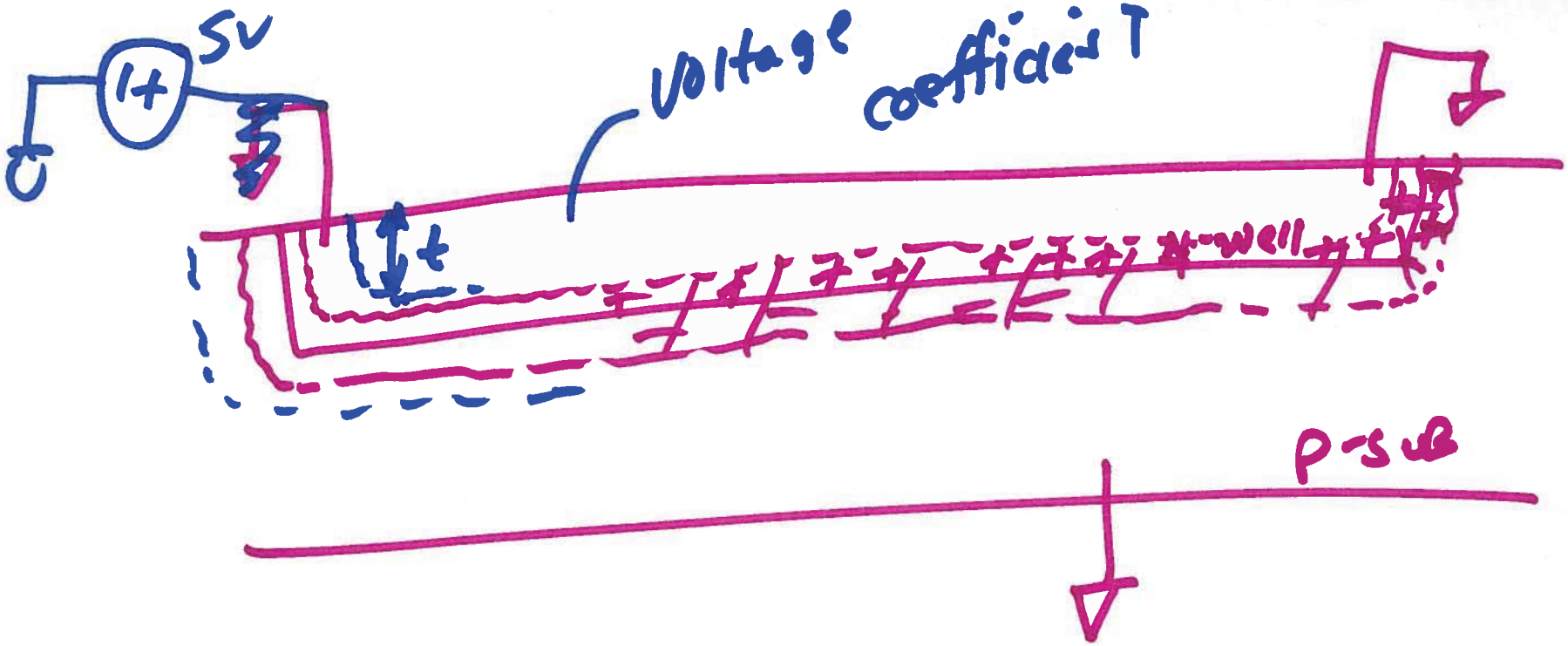
5V
Voltage coefficient
t
N-well
P-sub