EE 421 / ECG 621

Lecture 5

Ch. 2 Storage / diff. CAP

Work Ch. 2 examples

Si $\Rightarrow 10^{22} \frac{\text{Atoms}}{cm^3}$ # v of Si: – 4
v of P – 5
v of B – 3
v of As – 5

$n_i \simeq 1.4 \times 10^{10} \frac{cm^{-3}}{cm^3}$ @ 300K

$p_N = n_i^2$

$10^6 = \frac{n_i^2}{N_A} = N$

$N_A \rightarrow = P$

$N_A = 10^{16} \frac{\text{P Atoms}}{cm^3}$

$p = N_A$
# of holes

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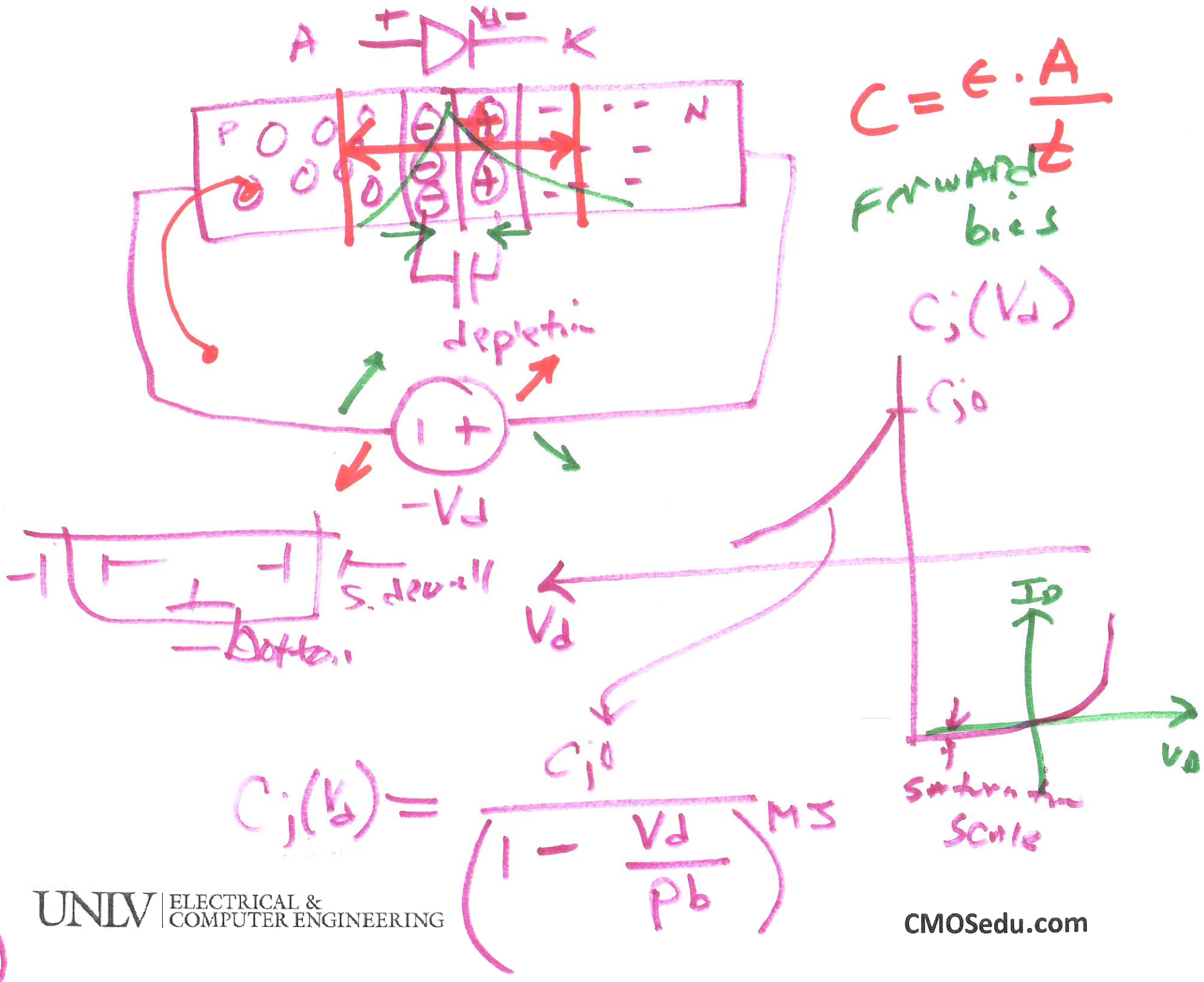
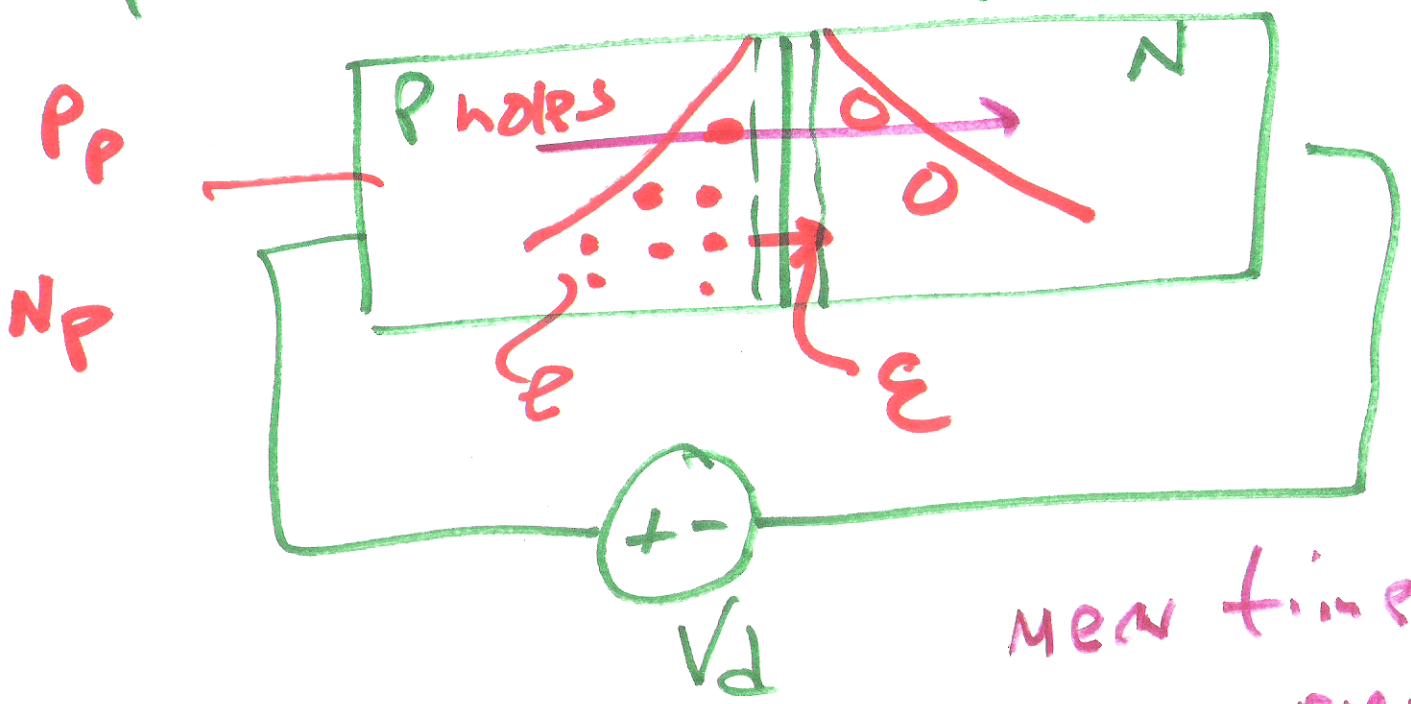
1)


A
K
P
N
depletion
$-V_d$
S. depletion
P. depletion
V_d
$C_j(V_d)$
C_{j0}
I_D
V_d
saturation
scale
$C_j(V_d) = \frac{C_{j0}}{\left(1 - \frac{V_d}{P_b}\right)^{MJ}}$
$C = \epsilon \cdot \frac{A}{t}$
Forward
bias

Forward bias $\pm DV_d$



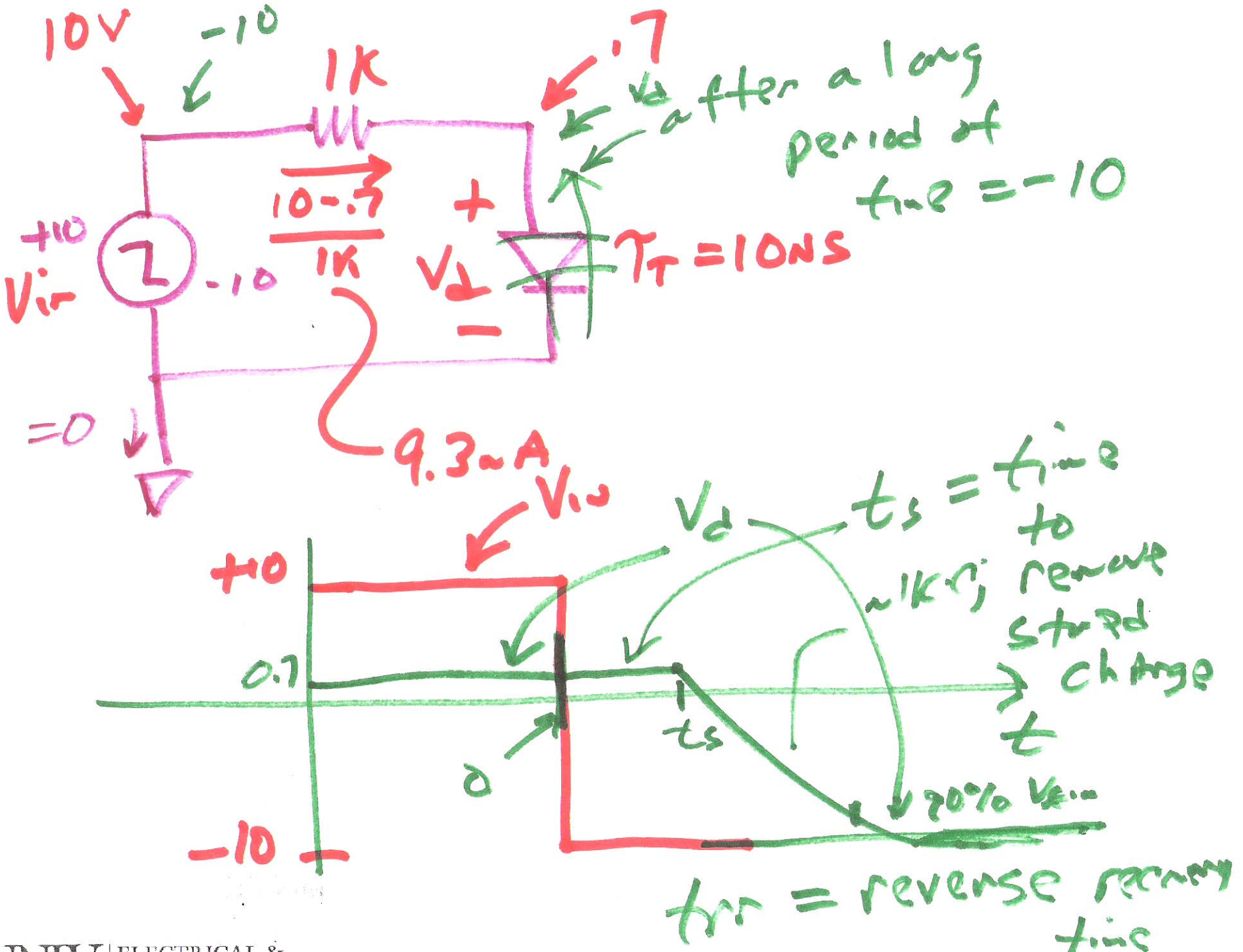
Mean time for a carrier to recombine = τ_T

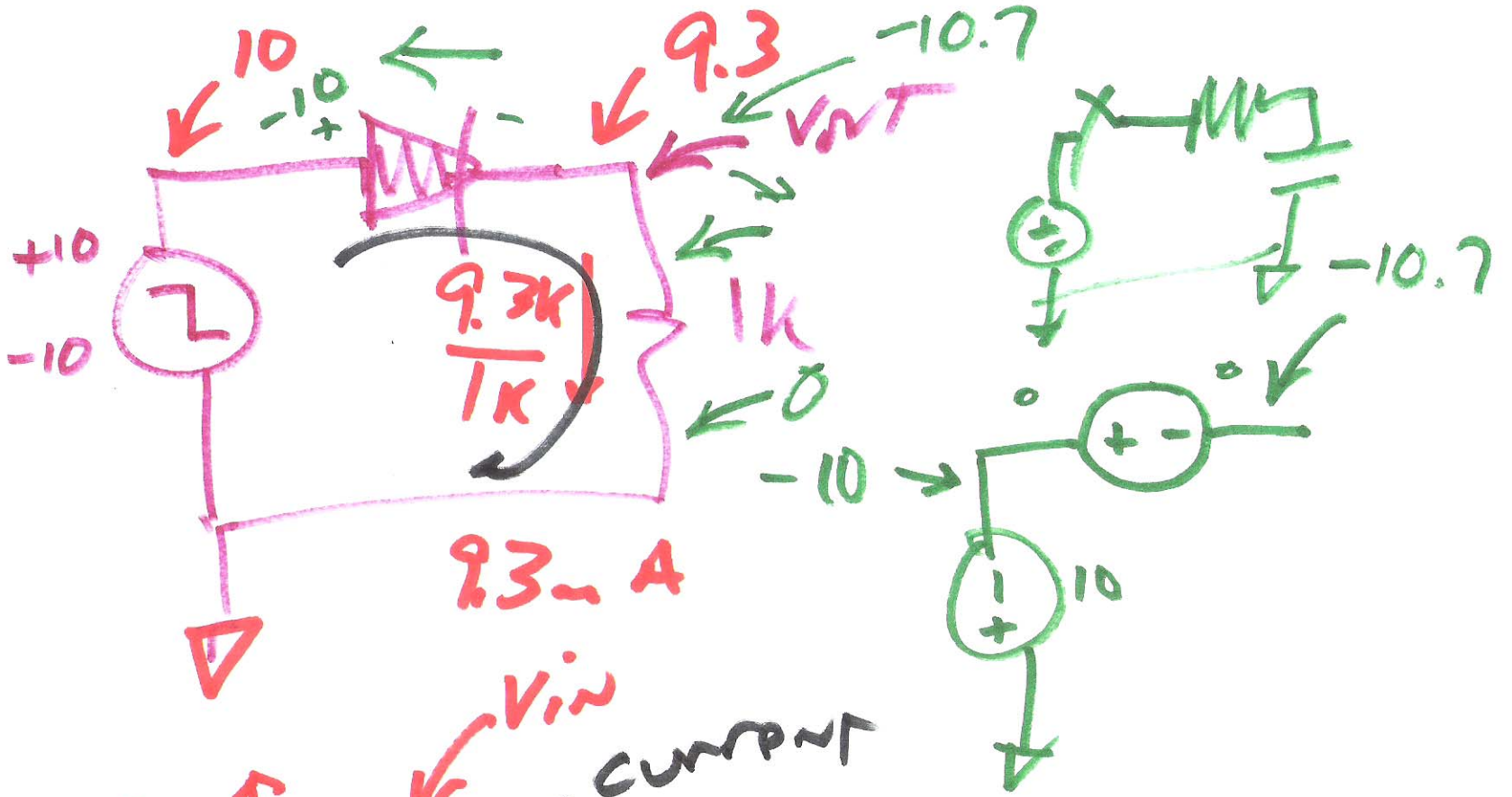
$\tau_T = r_d \cdot C_d$

η emission coeff.

V_T Thermal voltage

$r_d = \frac{\eta V_T}{I_D}$ $\quad C_d = \tau_T \cdot \frac{I_D}{\eta V_T}$


10V
-10
1K
.7
after a long period of time = -10
10-.7 / 1K
+10
Vin
-10
+
Vd
-
TT = 10NS
=0
9.3mA
Vin
Vd
ts = time to remove stored charge
+10
0.7
-10
0
ts
t
90% Vin
trr = reverse recovery time



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