

EE 320 Electronics

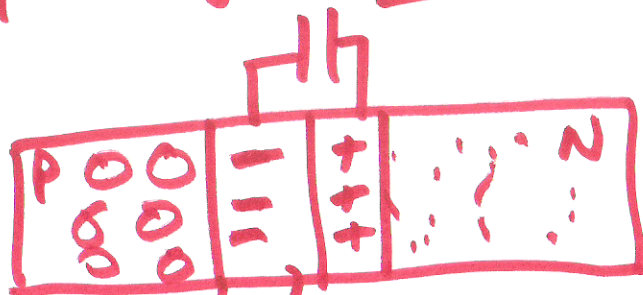
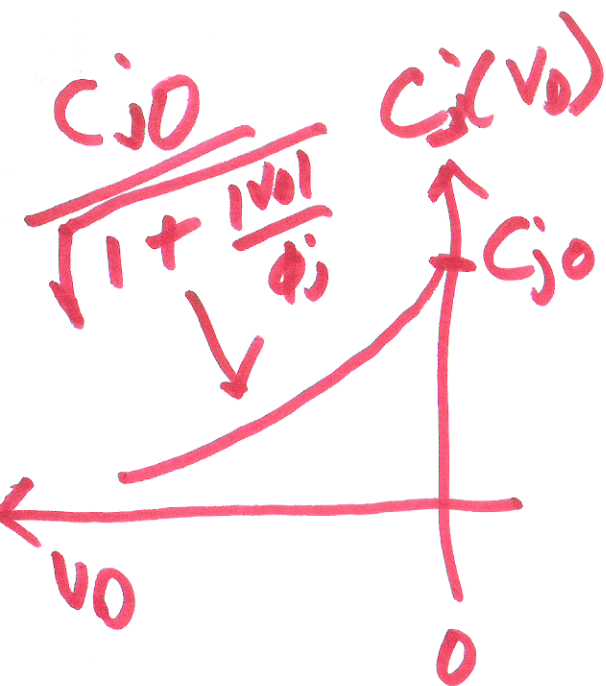
H.W. Help #1

2/28/13

3.44)

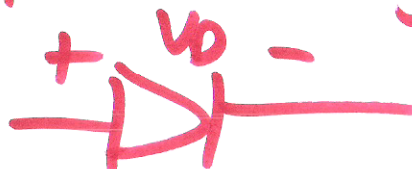
PN-junction depletion CAP.
junction CAP.

NO applied bias

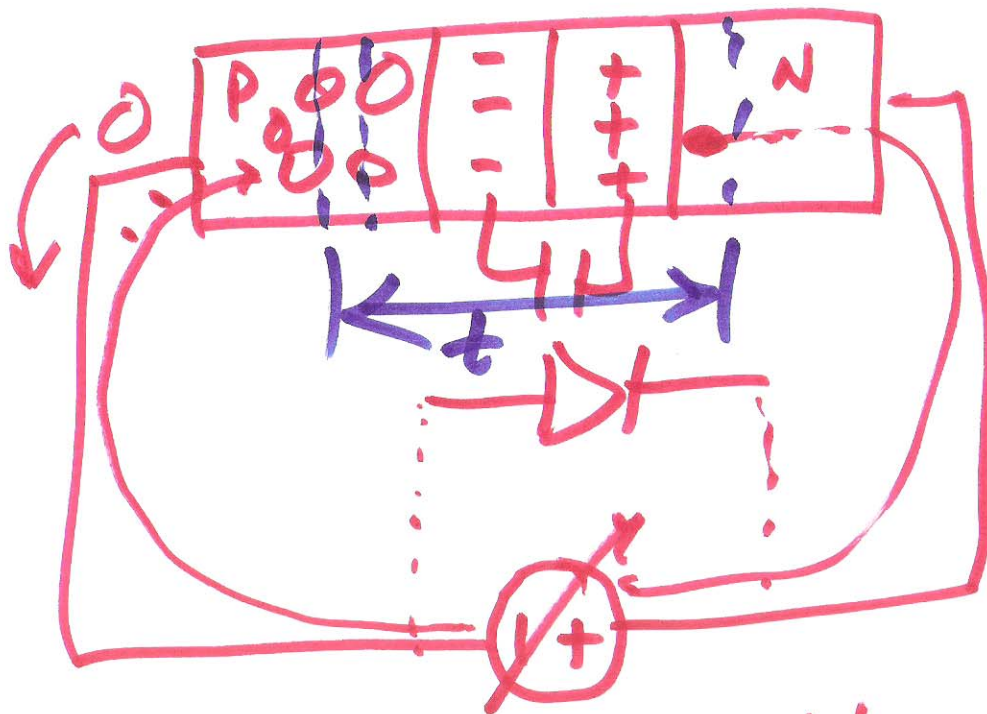


space, region (SCR)

charge
depletion region



zero-bias
depletion
CAP.

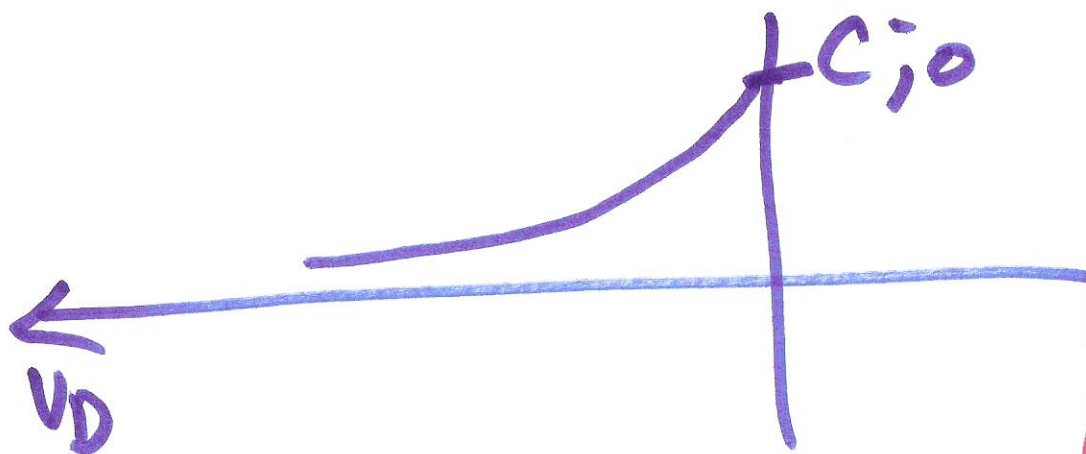


$$C = \frac{A \cdot \epsilon}{t}$$

+ ↑

C ↓

$$V_R = -V_D$$



3.44

$$C_{i0} = ? \text{ F}/\mu^2$$

$$N_A = 10^{18} / \text{cm}^3$$

$$N_D = 10^{15} / \text{cm}^3$$

$$V_R = 9\text{V}, W = .02 \mu^2$$

$$C_i(9) = ?$$

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$$CV = Q$$

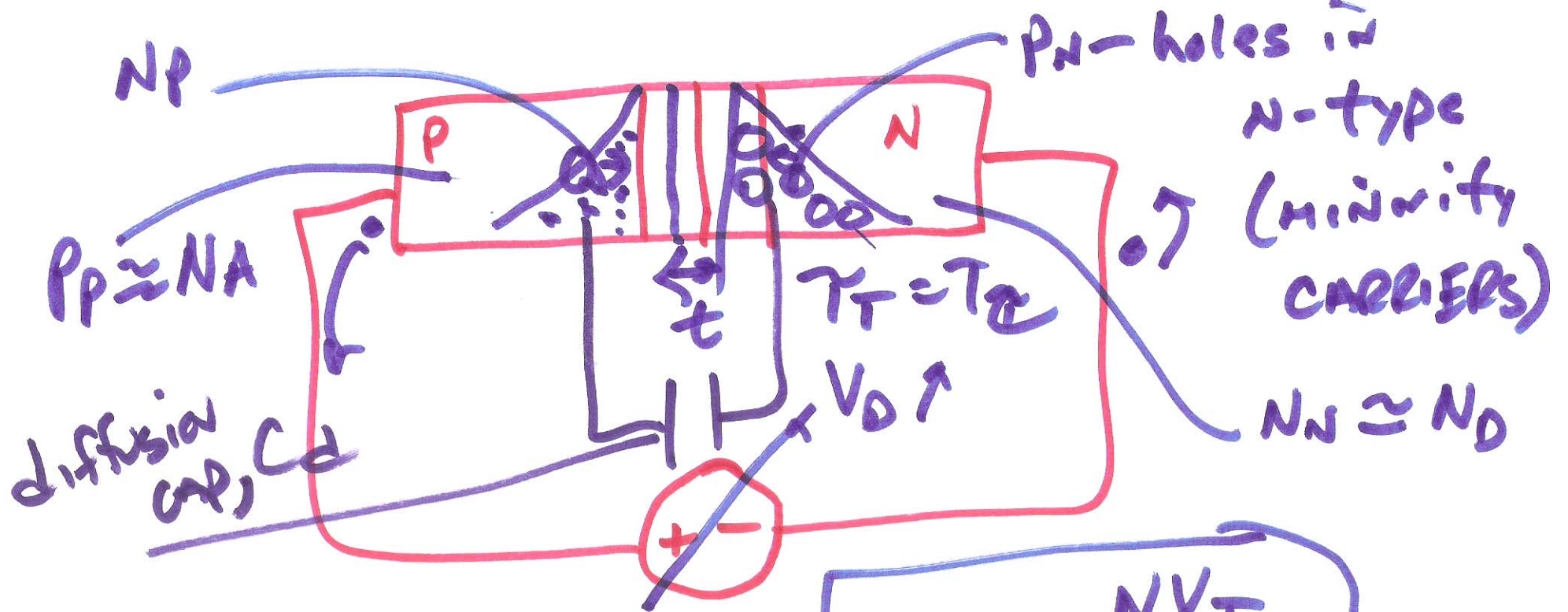
$$C_{j0} \cdot V_{bi} = Q_{N,P}$$

↓
 ϕ_j

Should be able to
calculate C_{j0}

$$C_j(q) = \frac{C_{j0} \cdot A}{\sqrt{1 + \frac{q}{\phi_j}}}$$

3)



τ_T = transit time.
carrier lifetime

$$\tau_T = \tau_d \cdot C_d$$

$$\tau_d = \frac{NV_T}{I_D}$$

$$C_d = \tau_T \cdot \frac{I_D}{NV_T}$$

diffusion

$$3.46) \quad I_D = 200 \mu A$$

$$\tau_T = 100 \text{ ps}$$

$$C_d = 100 \text{ ps} \cdot \frac{200 \mu A}{1.25 \text{ mV}}$$

$$V_0 = .7$$

$$C_d = Q = C_d \cdot V_0$$

stored charge

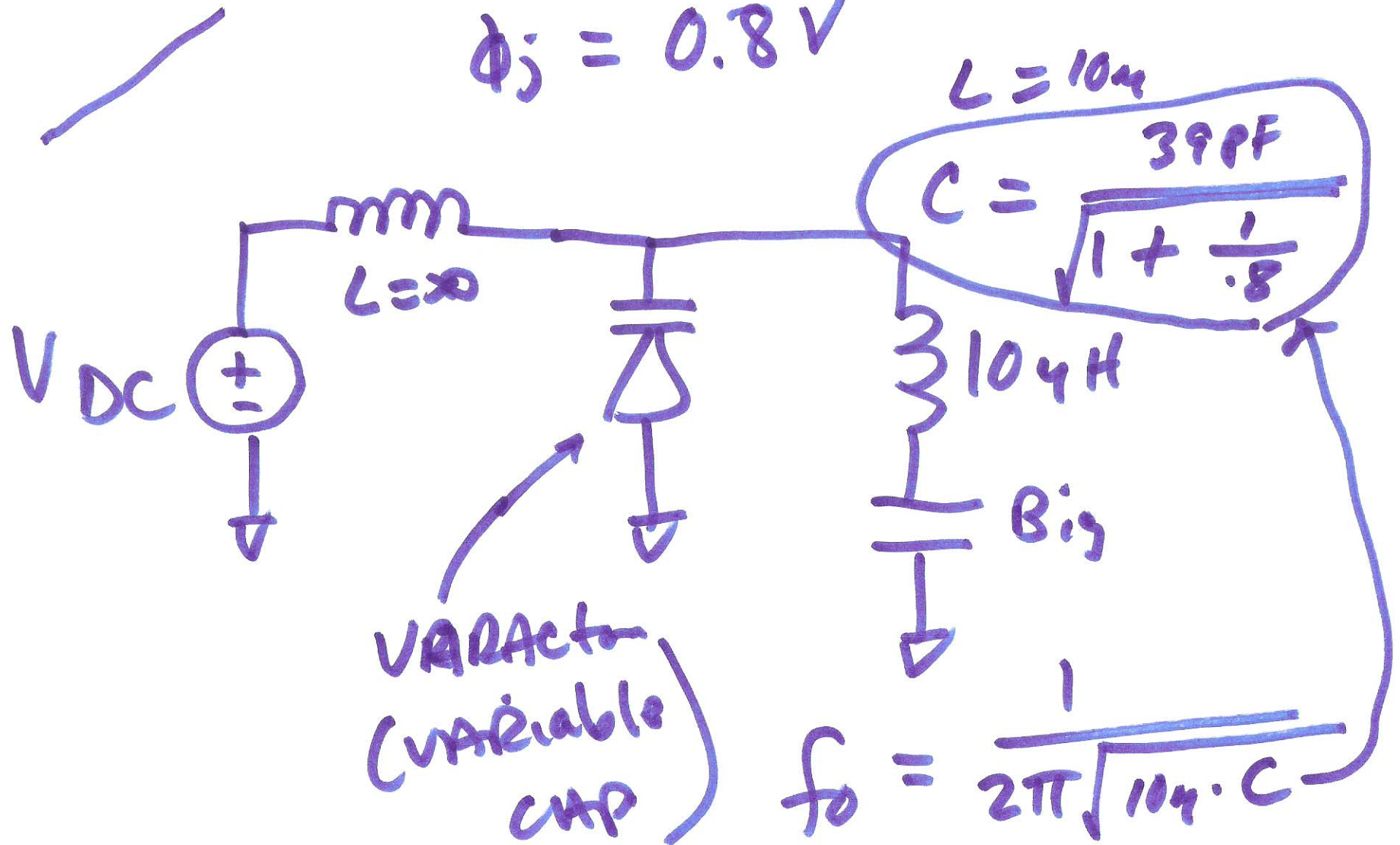
$$Q = I_D \cdot \tau_T$$

3.50)

$$C_{j0} = 39 \text{ pF}$$

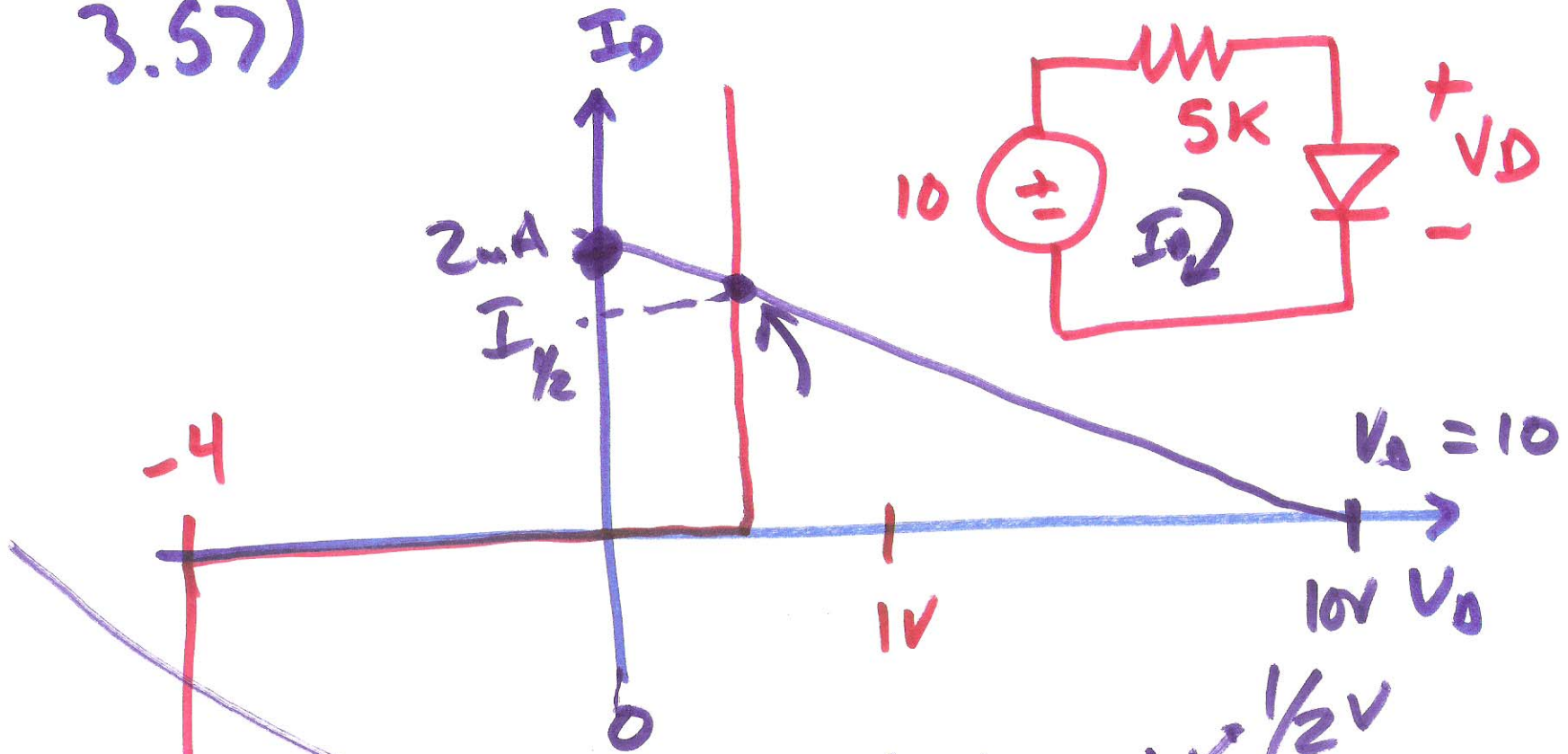
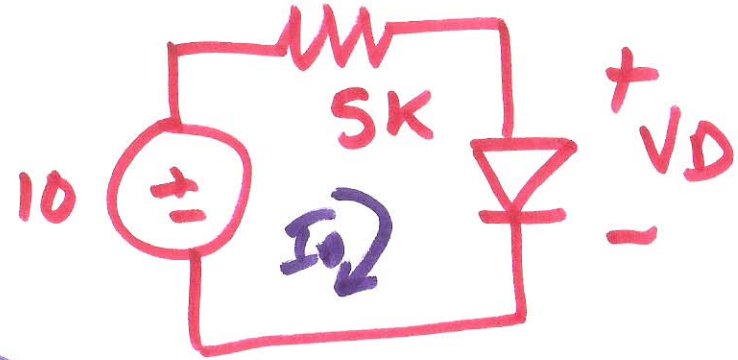
$$V_J = 0.8$$

$$\phi_j = 0.8 \text{ V}$$



6)

3.57)

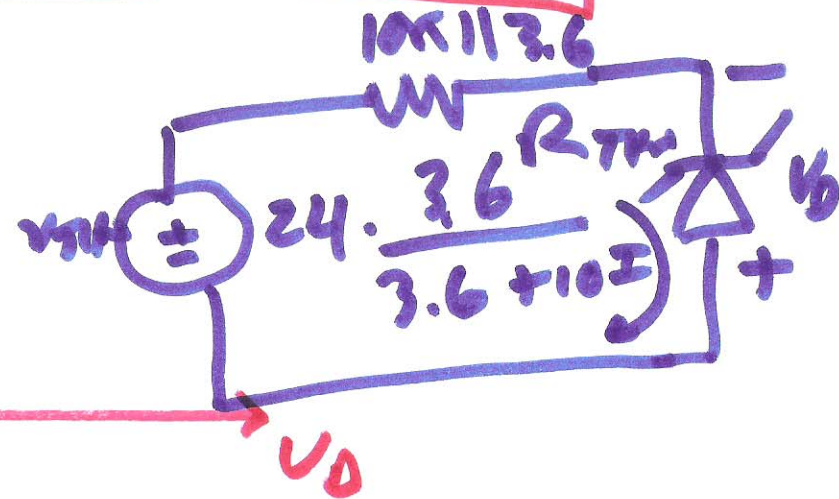
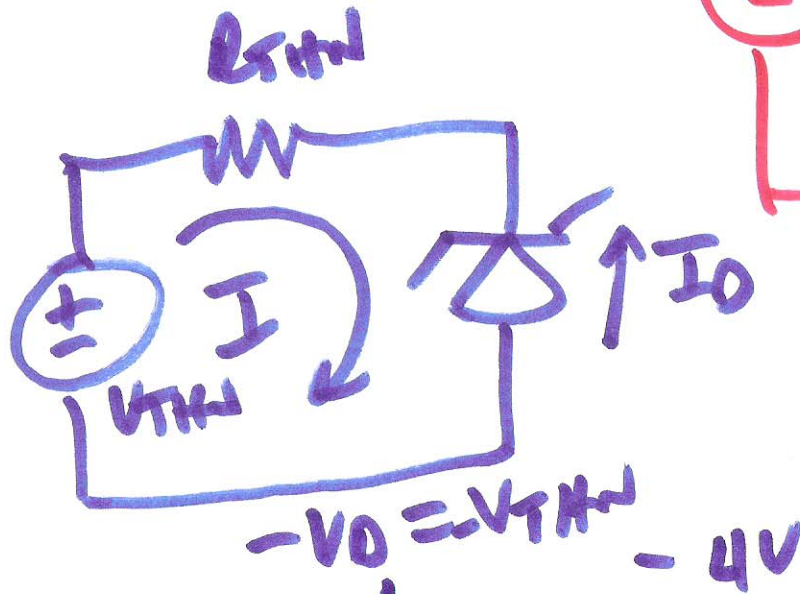
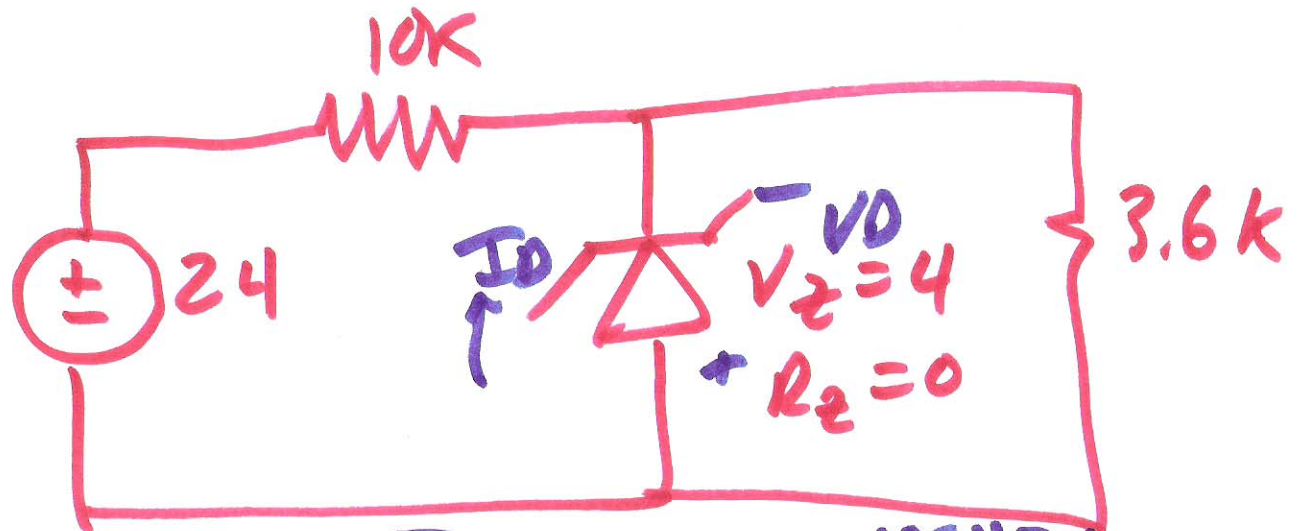


$$V_D = NV_T \ln \frac{I_D}{I_s} \quad \left\{ \begin{array}{l} \frac{10 - V_D}{5K} = I_{1/2} \\ \end{array} \right.$$

$V_D = 0$ get I at y -axis

$V_D = 10$ $I = 0$ to x -axis

3.81)



Load line

Q-point

$$\frac{V_{TH}}{R_{TH}}$$

$$\frac{V_{TH} - (-V_O)}{R_{TH}} = -I_D$$

$$= I$$