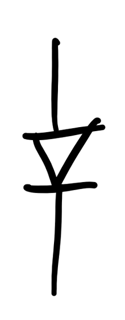
31.03.22

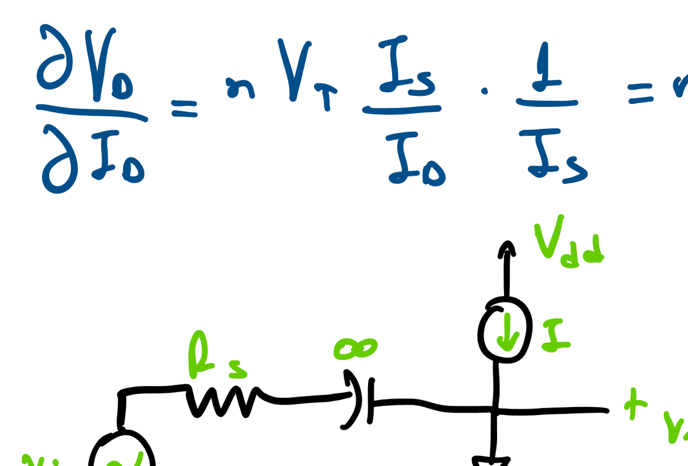
Thursday, 31 March 2022 12:49 PM



$I_D = I_S \cdot e^{V_D/nV_T}$

$V_D = nV_T \ln\left(\frac{I_D}{I_S}\right)$

$\frac{\partial V_D}{\partial I_D} = nV_T \frac{I_S}{I_D} \cdot \frac{1}{I_S} = n\frac{V_T}{V_D} = r_d$



Νδο: $v_o|_{ac} = \frac{nV_T}{nV_T + IR_s}$

DC: 

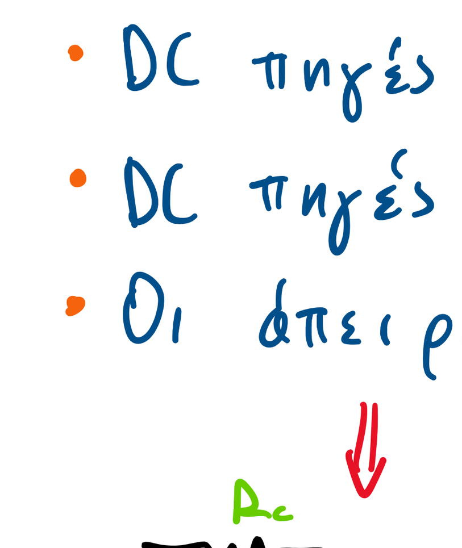
D_{ON} AC model

$r_d = n\frac{V_T}{I}$

AC ισοδύναμο:

- DC πηγές τάσης: βραχυκύκλωμα
- DC πηγές ρεύματος: ανοιχτοκύκλωμα
- Οι άπειροι πυκνωτές: βραχυκύκλωμα

⇓



$r_d = n\frac{V_T}{I}$

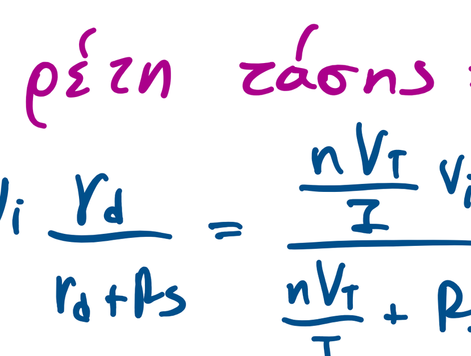
Από διαιρέτη τάσης:

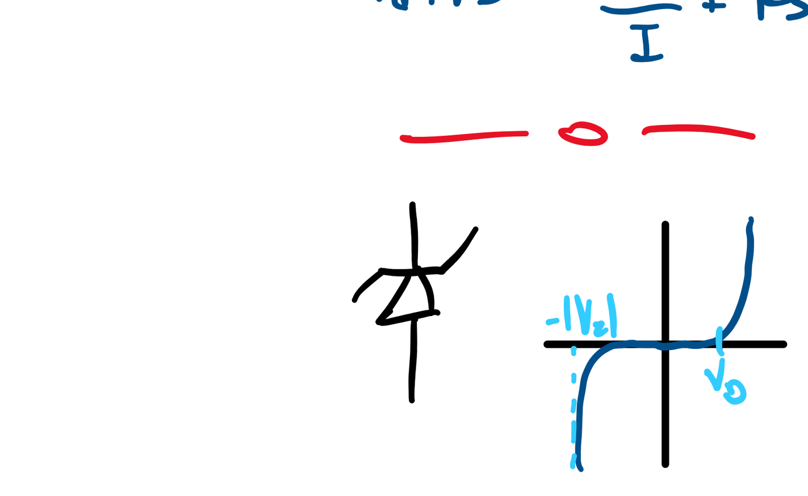
$V_o = V_i \frac{r_d}{r_d + R_s} = \frac{\frac{nV_T}{I} V_i}{\frac{nV_T}{I} + R_s} \Rightarrow$

Συνάρτηση μεταφοράς

$\boxed{\frac{V_o}{V_i} = V_o|_{ac} = \frac{nV_T}{nV_T + IR_s}}$

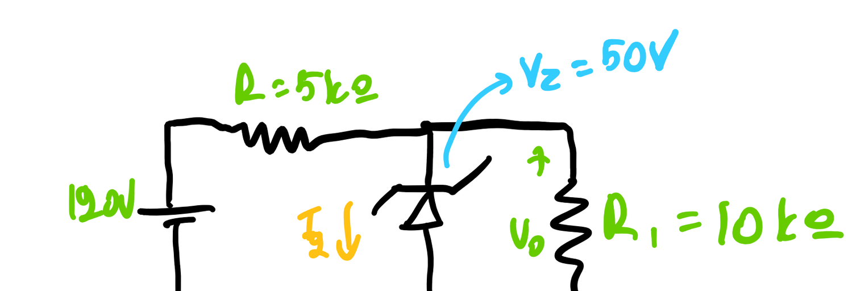
— o —





λειτουργεί στη Zener γιατί 80>50

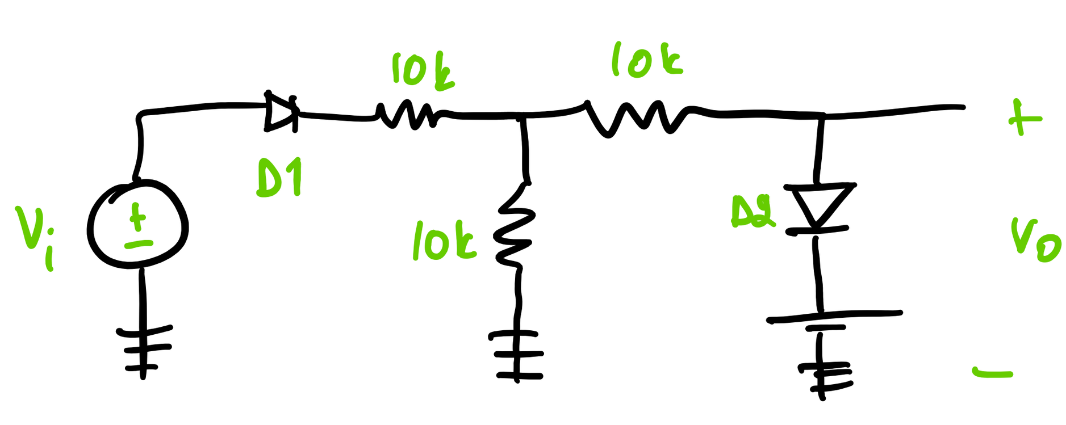
⇓



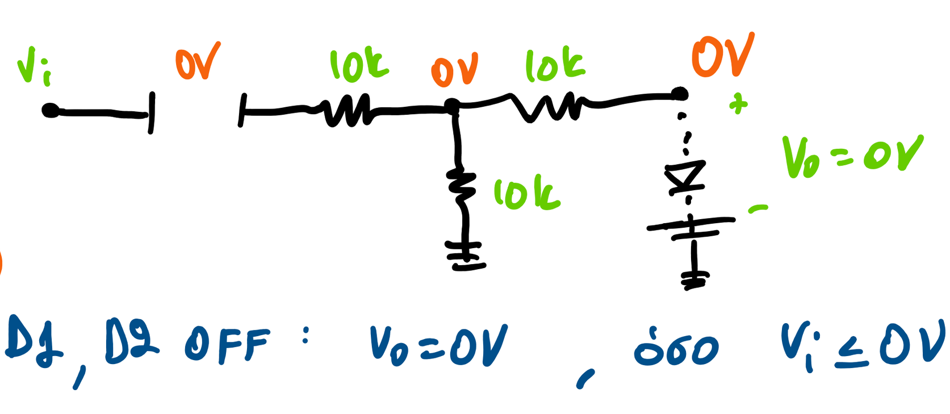
$I = I_z + I_L \Rightarrow \frac{120-50}{5k} = \frac{50}{10k} + I_z \Rightarrow \boxed{I_z = 9mA}$

— o —

(Ιδανική D)

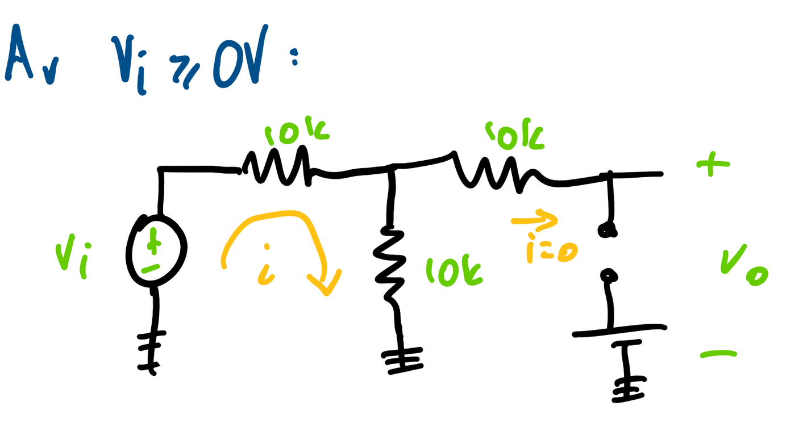


- Αν $V_i \to -\infty$



(I) Άρα D1, D2 OFF: $V_o = 0V$, όσο $V_i \le 0V$

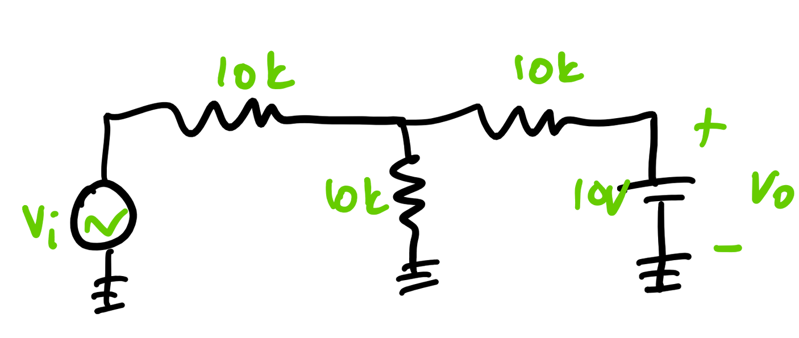
- Αν $V_i \ge 0V$:

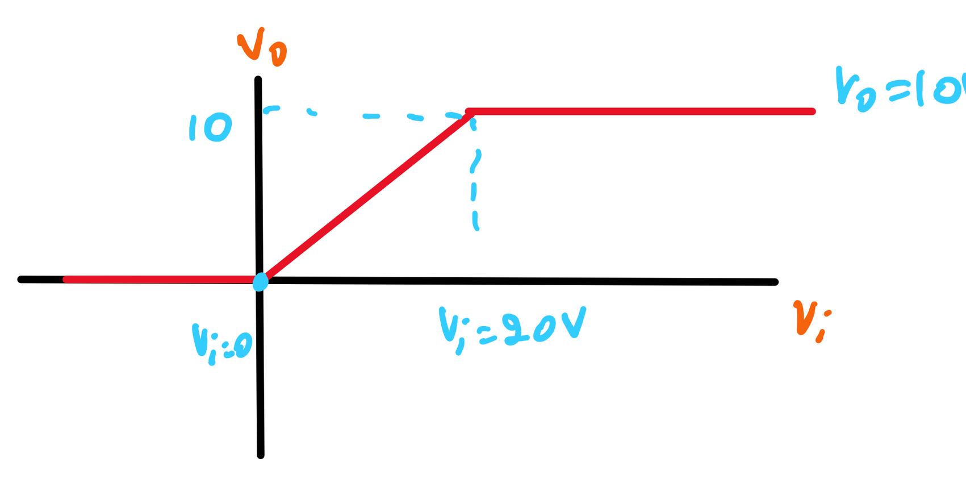


D1 ON

(II) $\boxed{V_o = \frac{V_i}{2}}$ μέχρι $V_o \ge 10V \Rightarrow V_i = 20V$

(III) Για $V_i \ge 20V$





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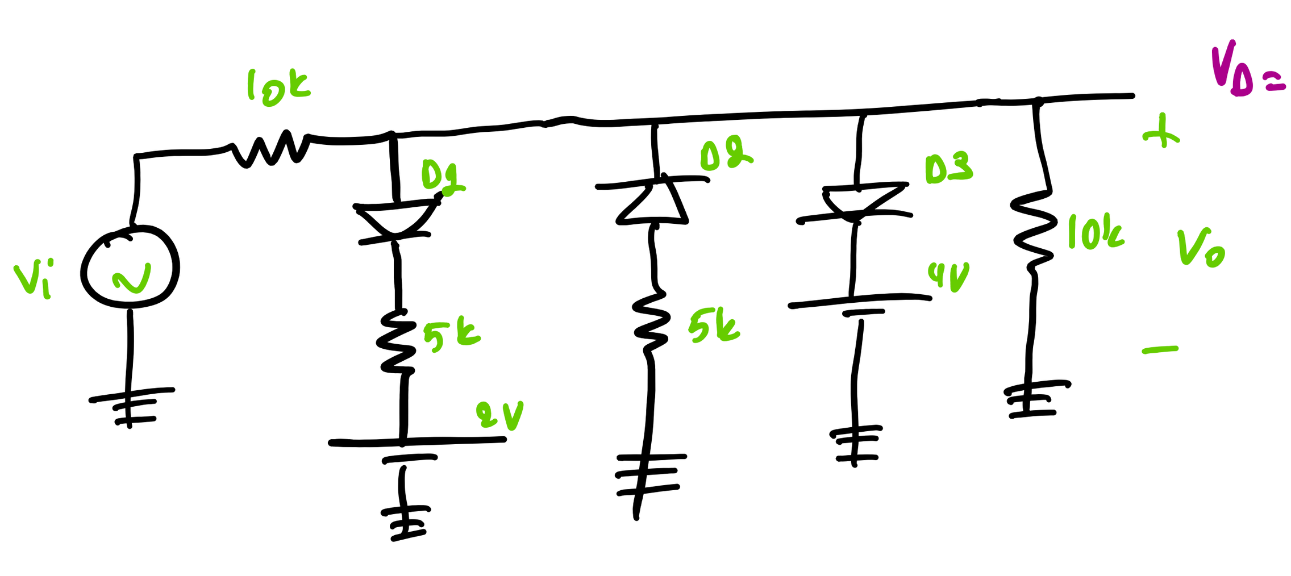
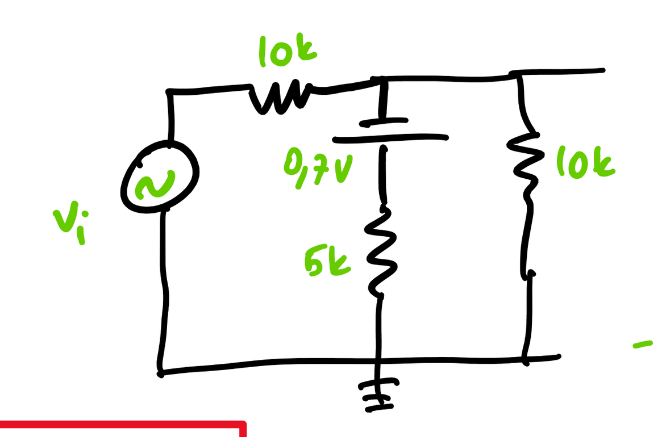
$V_D = 0,7V$



Για $V_o \le -0,7V$:

(I) $D_{1,3}$ OFF

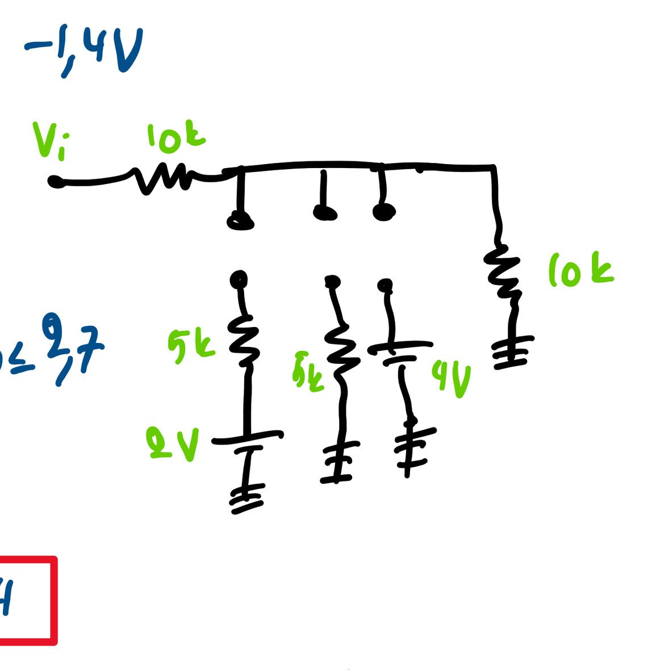
D_2 ON



$V_o = \frac{1}{4}V_i - \frac{0,7}{2} \Rightarrow \boxed{V_i \le -1,4V}$

(II) Για $V_i \ge -1,4V$

όλες OFF



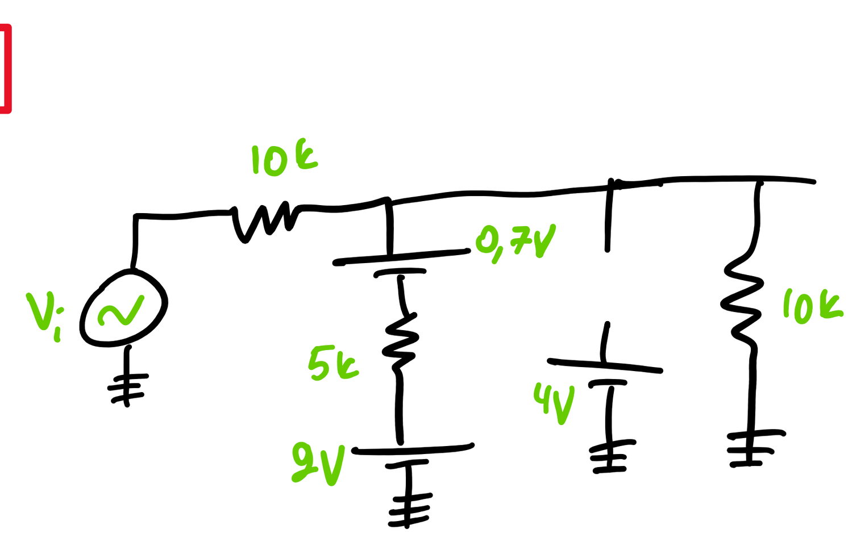
$V_o = \frac{V_i}{2}$ όσο $V_o \le 2,7$

⇓

$\boxed{-1,4 \le V_i \le 5,4}$

(III) D1 ON

$D_{2,3}$ OFF

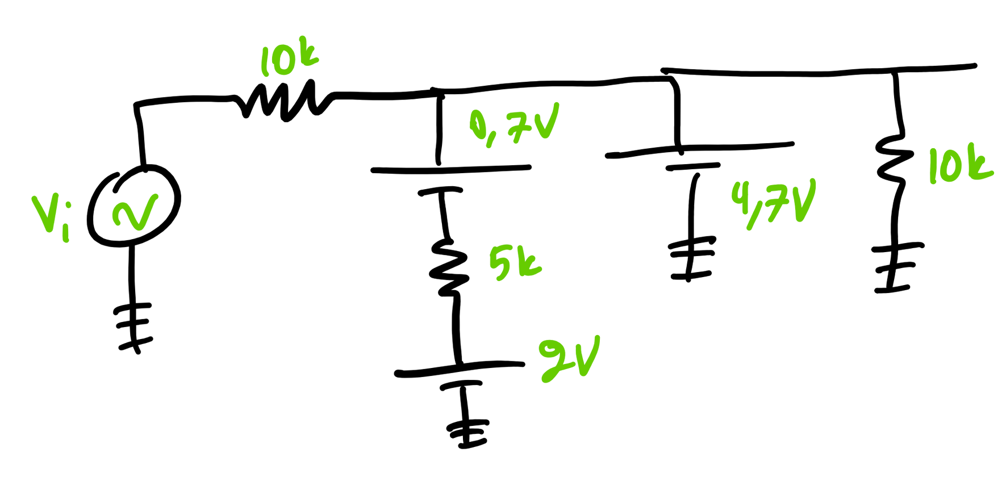


$V_o = \frac{1}{4}V_i + \frac{2,7}{2}$, όσο $V_o \le 4 + 0,7V$

$\boxed{5,4 \le V_i \le 13,4V}$

(IV) $D_{1,3}$ ON

D2 OFF



$V_o = 4,7V$

$\boxed{V_i \ge 13,4V}$

Σύνοψη