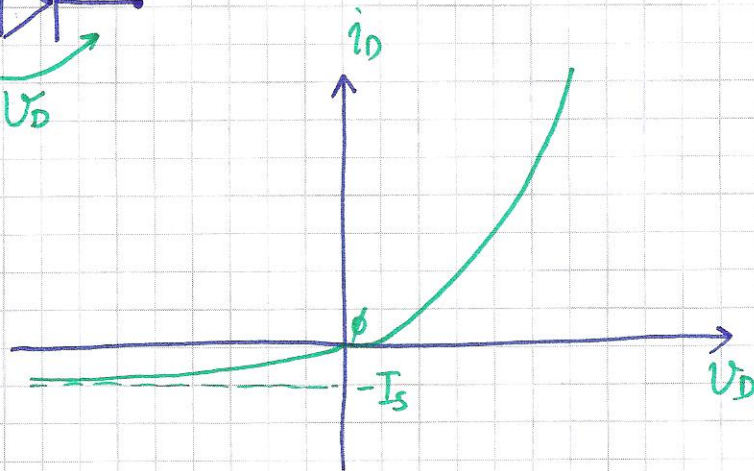
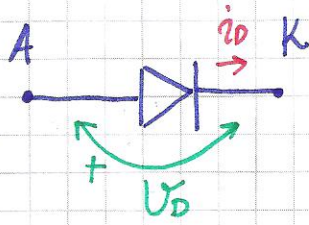
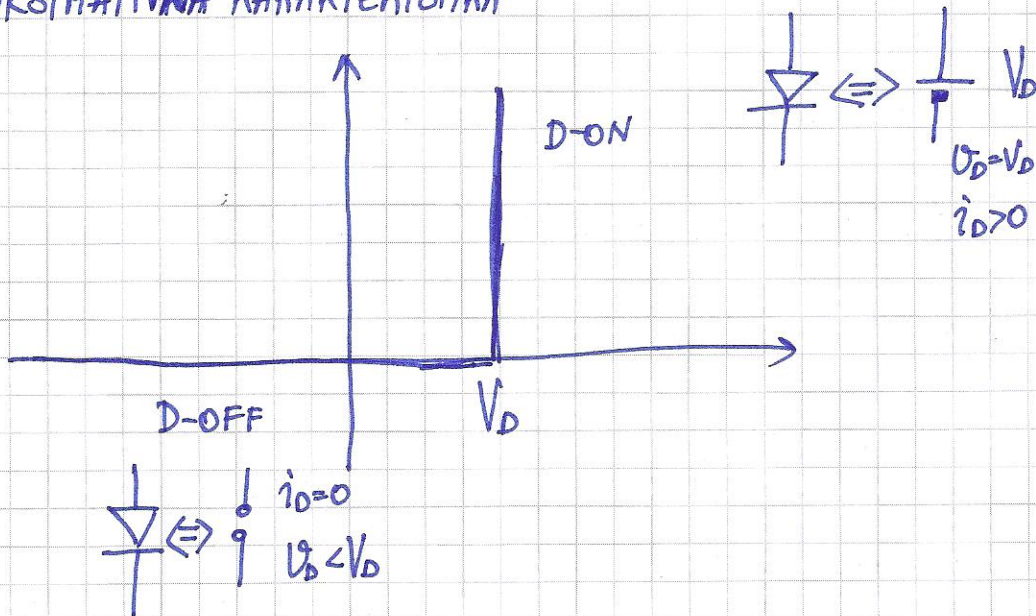


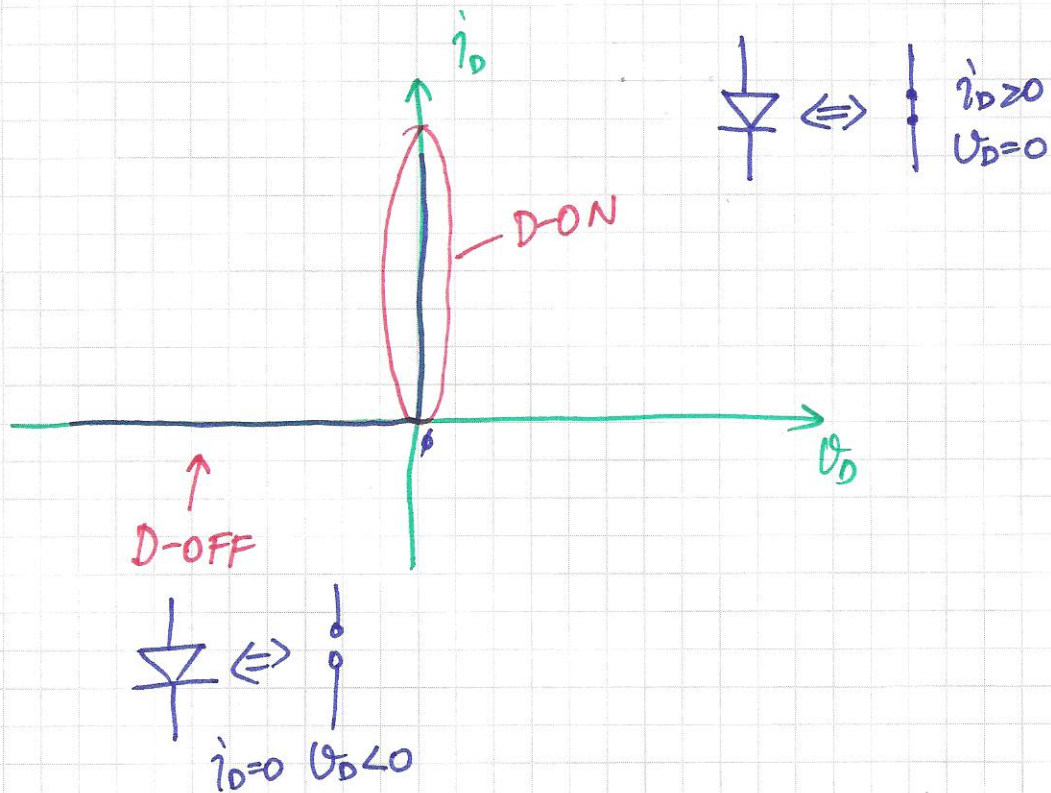
DIODE



$$U_D = I_S \left(e^{\frac{U_D}{V_T}} - 1 \right)$$

1^o APROKSIMATIVNA KARAKTERISTIKA



2^o APROKSIMATIVNA KARAKTERISTIKA

- ODREĐIVANJE REŽIMA RADA IDEALNIH DIODA

1^o UVODENJE: PRETPOSTAVKE: D-ON ILI D-OFF2^o ZAMENA DIODE EKVIVALENTNIM KOLOM3^o PROVERA PRETPOSTAVKE

- a) ZA PRETPOSTAVKU D-OFF
- $U_D < V_D$ PRETPOSTAVKA OK
 - $U_D \geq V_D$ LOŠA PRETPOSTAVKA
- b) ZA PRETPOSTAVKU D-ON
- $i_D > 0$ PRETPOSTAVKA OK
 - LOŠA PRETPOSTAVKA

- UKLJUČIVANJE IDEALNE DIODE: $U_D < V_D$ i AKO $U_D \nearrow$, KADA POSTANE $U_D = V_D$ UKLJUČUJE SE DIODA.

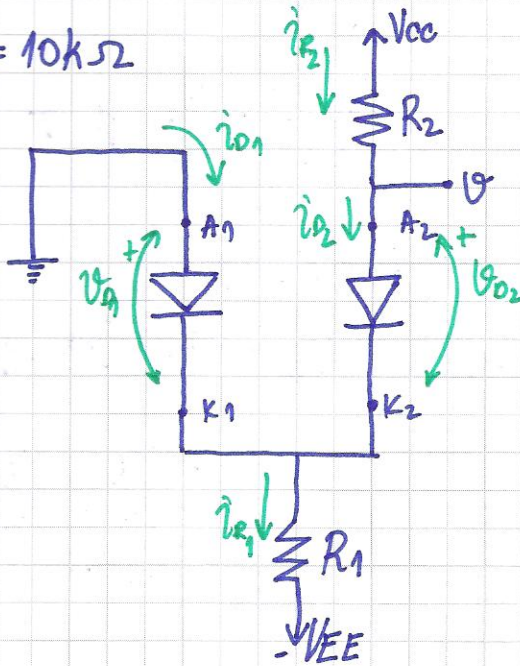
- ISKLJUČIVANJE IDEALNE DIODE: $i_D > 0$ i AKO $i_D \searrow$, KADA POSTANE $i_D = 0$, DIODA SE ISKLJUČUJE.

1. U KOLU SA SLIKE UPOTREBLJENE SU IDEALNE DIODE, A POZNATO JE I $V_{CC} = V_{EE} = 10V$. ODREDITI i_{D1} , i_{D2} I NAPON φ KADA JE:

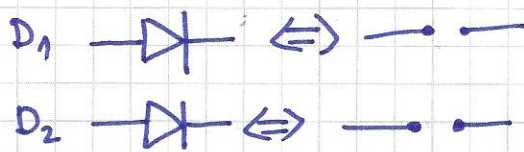
a) $R_2 = 2R_1 = 10k\Omega$

b) $R_1 = 2R_2 = 10k\Omega$

$V_{D1} = V_{D2} = 0$



a) PRETPOSTAVKA: OBE DIODE ISKLJUČENE D_1 -OFF, D_2 -OFF

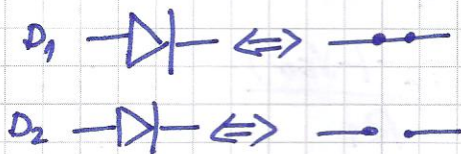


USLOV
 $U_{D1} < 0 \wedge U_{D2} < 0$

$U_{D1} = U_{A1} - U_{K1}$; $U_{A1} = \phi$
 $U_{K1} = -V_{EE}$
 $U_{D1} = V_{EE} = 10V > \phi$

LOŠA PRETPOSTAVKA

PRETPOSTAVKA: D_1 -ON D_2 -OFF

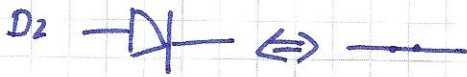
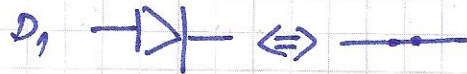


USLOV
 $i_{D1} > 0 \wedge U_{D2} < 0$

$U_{D2} = U_{A2} - U_{K2}$
 $i_{D2} = 0 \Rightarrow i_{R2} = 0 \Rightarrow V_{A2} = V_{CC}$
 $U_{K2} = U_{K1} = U_{A1} = \phi$

LOŠA PRETPOSTAVKA $\Rightarrow U_{D2} = V_{CC} = 10V$

PRETPOSTAVKA: D_1 -ON, D_2 -ON



USLOV

$$i_{D1} > 0$$

$$i_{D2} > 0$$

$$i_{D2} = i_{R2} = \frac{V_{CC} - U}{R_2} = \frac{V_{CC}}{R_2} > \phi \quad T$$

$$U = \phi - U_{D1} + U_{D2} = \phi$$

$$i_{D1} = i_{R1} - i_{D2} = \frac{U_{K1} + V_{EE}}{R_1} - i_{D2}$$

$$= \frac{V_{EE}}{R_1} - \frac{V_{EE}}{R_2} > \phi$$

$$R_1 < R_2$$

$$i_{D1} = 2\mu A - 1\mu A = 1\mu A$$

$$i_{D2} = \frac{10V}{10k\Omega} = 1\mu A$$

$$U = \phi V$$

OBE DIODE SU

UKLJUČENE

b) PRETPOSTAVKA D_1 -ON, D_2 -ON

USLOV

$$i_{D2} = i_{R2} = \frac{V_{CC} - U}{R_2} = \frac{V_{CC}}{R_2} = 2\mu A > \phi$$

$$i_{D1} > 0 \quad \vee \quad i_{D2} > 0$$

$$U = \phi$$

$$i_{D1} = i_{R1} - i_{D2} = \frac{U_{K1} - (-V_{EE})}{R_1} - i_{D2} = -1\mu A < \phi$$

LOŠA PRETPOSTAVKA

PRETPOSTAVKA: D_1 -OFF, D_2 -ON



$$i_{D2} = i_{R2} = \frac{V_{CC} - U}{R_2}$$

$$i_{R1} = i_{D2} \Rightarrow \frac{U_{K2} - (-V_{EE})}{R_1} = \frac{V_{CC} - U}{R_2}$$

$$U_{D1} = U_{A1} - U_{K1}$$

$$U_{D1} = \phi - U = -U < 0$$

$$\frac{U + V_{EE}}{R_1} = \frac{V_{CC} - U}{R_2}$$

⇓

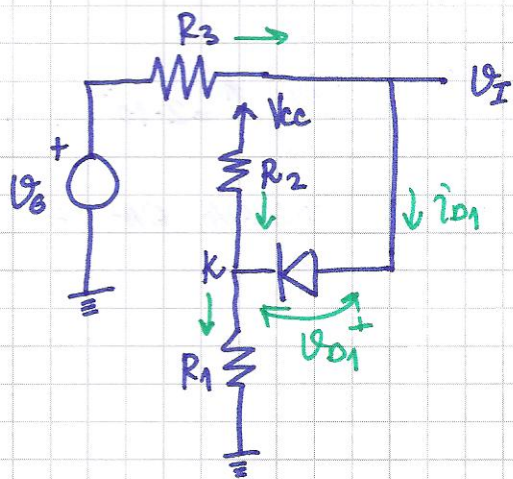
$$U = 3,3V$$

PRETPOSTAVKA JE TAČNA

$$i_{D2} = 1,33\mu A$$

$$i_{D1} = \phi$$

2. U KOLU SA SLIKE UPOTREBLJENA JE IDEALNA DIODA SA PARAMETRIMA $V_D = 0,7V$, A POZNATO JE $V_{CC} = 5V$ $R_1 = R_2 = 1k\Omega$ $R_3 = 10k\Omega$.
 ODREDITI I NACRTATI ZAVISNOST $U_I(U_G)$ AKO SE U_G MENJA U GRANICAMA $-5V \leq U_G \leq 5V$



$U_G = -5V$ POČETNA VREDNOST: REŽIM RADA DIODE
 PRETPOSTAVKA: D_1 -OFF



$$U_{D1} = U_G - \frac{R_1}{R_1 + R_2} V_{CC} = -5V - 2,5V = -7,5V < V_D$$

PRETPOSTAVKA TAČNA

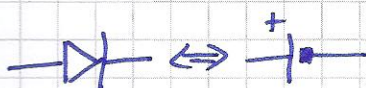
$$U_I = U_G$$

AKO $U_G \uparrow \Rightarrow U_{D1} = \left(U_G - \frac{R_1}{R_1 + R_2} V_{CC} \right) \uparrow \rightarrow$ POSTOJI TENDENCIJA
 DA SE DIODA UKLJUČI

$$U_{D1}^* = V_D$$

$$U_G - \frac{R_1}{R_2 + R_1} V_{CC} = 0,7V \Rightarrow U_G = 3,2V$$

DALJE JE D_1 -ON



ZA ČVOR K: $\frac{U_G - U_I}{R_3} + \frac{V_{CC} - (U_I - V_D)}{R_2} = \frac{U_I - V_D}{R_1}$

$$U_I = \frac{\frac{1}{R_3}}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}} U_G + \frac{\frac{V_0}{R_1} + \frac{V_{cc} + V_0}{R_2}}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}}$$

$$U_I = \frac{1}{21} U_G + \frac{64}{21} - II$$

$$U_I (SV) = \frac{5}{21} + \frac{64}{21} = 3,286 V$$

DOKLE GOD JE D₁-ON

$$AKO U_G \uparrow \Rightarrow U_I \uparrow \Rightarrow i_{D1} = \frac{U_I - V_0}{R_1} - \frac{V_{cc} - (U_I - V_0)}{R_2} \uparrow = 2 \cdot 10^{-3} U_I - 6,4 \cdot 10^{-3}$$

STRUJA SE POVEĆAVA, NE POSTOJI TENDENCIJA DA SE DIODA ISKLJUČI

