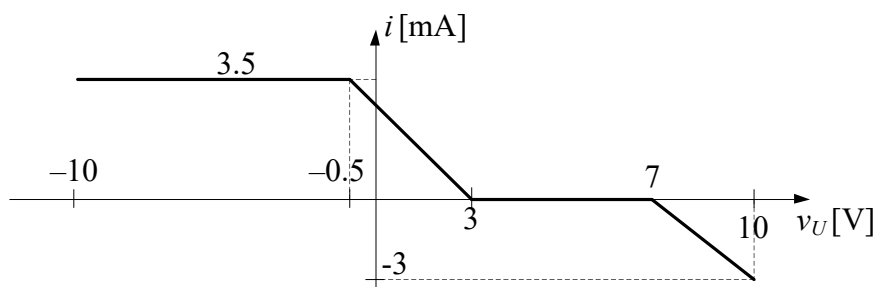
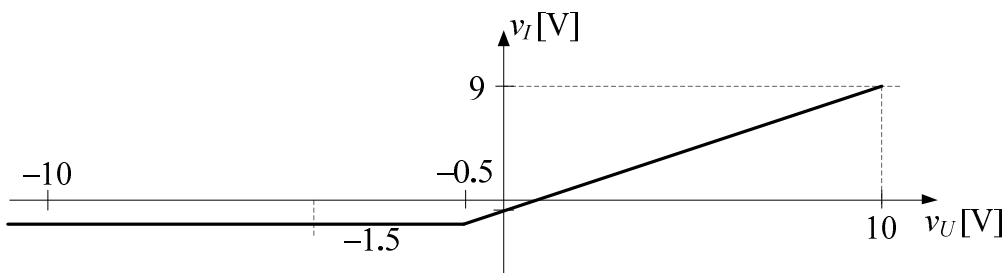


3.

$$\begin{aligned}
 -10\text{ V} \leq v_U < V_D - \frac{V_Z}{2} = -0.5\text{ V} & \quad \text{D1 off, DZ zener} \\
 -0.5\text{ V} \leq v_U < V_{CC} - V_Z + V_D = 3\text{ V} & \quad \text{D1 on, DZ zener} \\
 3\text{ V} \leq v_U < V_{CC} + 2V_D = 7\text{ V} & \quad \text{D1 on, DZ off} \\
 7\text{ V} \leq v_U \leq 10\text{ V} & \quad \text{D1 on, DZ dioda}
 \end{aligned}$$

$$v_I = \begin{cases} -\frac{V_Z}{2} & -10\text{ V} \leq v_U \leq V_D - \frac{V_Z}{2} \\ v_U - V_D & V_D - \frac{V_Z}{2} \leq v_U \leq 10\text{ V} \end{cases} = \begin{cases} -1.5\text{ V} & -10\text{ V} \leq v_U \leq -0.5\text{ V} \\ v_U - 1\text{ V} & -0.5\text{ V} \leq v_U \leq 10\text{ V} \end{cases}$$

$$i = \begin{cases} 3.5\text{ mA} & -10\text{ V} \leq v_U < -0.5\text{ V} \\ 3\text{ mA} - \frac{v_U}{R} & -0.5\text{ V} \leq v_U < 3\text{ V} \\ 0 & 3\text{ V} \leq v_U < 7\text{ V} \\ 7\text{ mA} - \frac{v_U}{R} & 7\text{ V} \leq v_U \leq 10\text{ V} \end{cases}$$



4. a)  $I_B = 47.8\ \mu\text{A}$ ,

$I_C = 2.39\text{ mA}$ ,

$V_P = V_{CC} - R_C I_C = 5.2\text{ V}$ .

b)  $A_v = \frac{v_p}{v_g} = \frac{g_m}{1/R_C}$

$$R_u = \frac{1}{\frac{1}{R_E} + \frac{1}{r_\pi} + g_m}$$

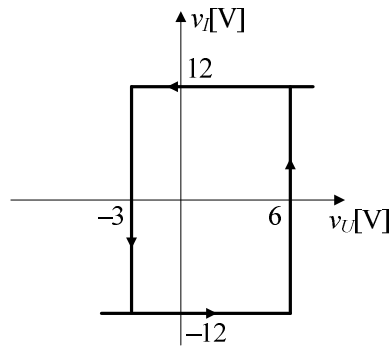
$$c) g_m = \frac{I_C}{V_T} = 95.6 \text{ mS}, r_\pi = \frac{\beta}{g_m} = 523 \Omega,$$

$$A_v = 191.2,$$

$$R_u = 10.25 \Omega .$$

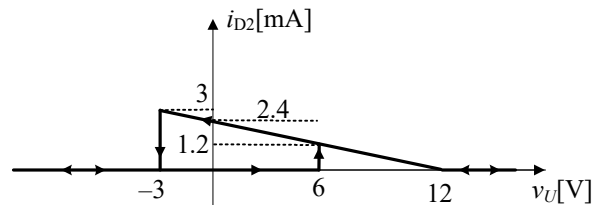
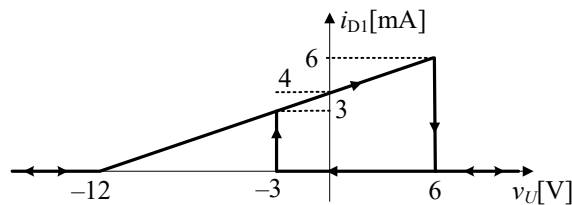
7.

$$v_l = \begin{cases} V_{CC} & v_U > -\frac{R_3}{R_2}V_{CC} \\ -V_{CC} & v_U < \frac{R_3}{R_1}V_{CC} \end{cases} = \begin{cases} 12 \text{ V} & v_U > -3 \text{ V} \\ -12 \text{ V} & v_U < 6 \text{ V} \end{cases}$$



$$i_{D1} = \begin{cases} 0 & v_U < -V_{CC} \\ \frac{V_{CC} + v_U}{R_1 + R_3} & -V_{CC} < v_U < \frac{R_3}{R_1}V_{CC} \\ 0 & v_U > -\frac{R_3}{R_2}V_{CC} \end{cases} = \begin{cases} 0 & v_U < -12 \text{ V} \\ 4 \text{ mA} + \frac{v_U}{3 \text{ k}\Omega} & -12 \text{ V} < v_U < 6 \text{ V} \\ 0 & v_U > -3 \text{ V} \end{cases}$$

$$i_{D2} = \begin{cases} 0 & v_U > V_{CC} \\ \frac{V_{CC} - v_U}{R_2 + R_3} & V_{CC} > v_U > -\frac{R_3}{R_2}V_{CC} \\ 0 & v_U < \frac{R_3}{R_1}V_{CC} \end{cases} = \begin{cases} 0 & v_U > 12 \text{ V} \\ 2.4 \text{ mA} - \frac{v_U}{5 \text{ k}\Omega} & 12 \text{ V} > v_U > -3 \text{ V} \\ 0 & v_U < 6 \text{ V} \end{cases}$$



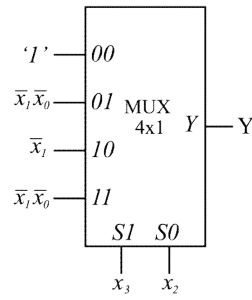
8.  
a)

	$x_1x_0$			
	00	01	11	10
$x_3x_2$				
00	1	1	1	1
01	1	0	0	0
11	1	0	0	0
10	1	1	0	0

Slika 1.

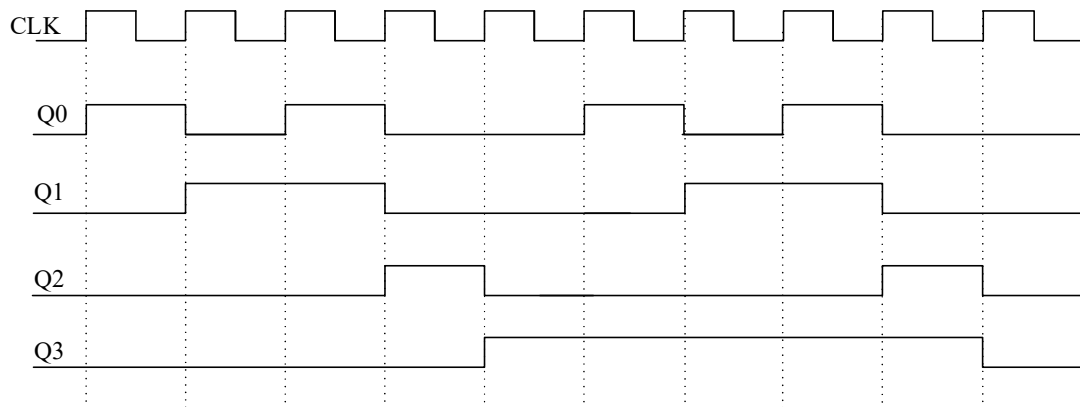
$$Y = \overline{x_3x_2} + \overline{x_2x_1} + \overline{x_1x_0}$$

b)



Slika 2.

9.



Slika 4.

Osnova brojanja je 10.