Elementi elektronike – OKTOBAR 2016 - REŠENJA

2. Vut=9.7V, Vimax=10.63V, Vumin=-20V

3. a)

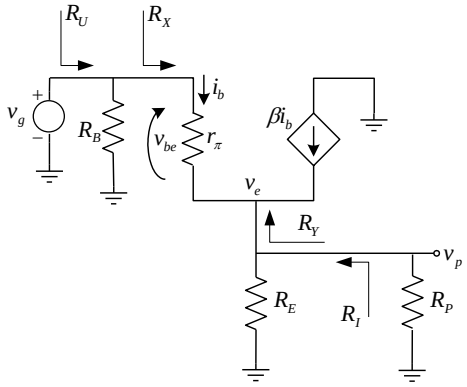
$$V_{CC} - R_B I_B - V_{BE} - (1+\beta) I_B R_E = 0$$

$$V_E = (1+\beta) I_B R_E$$

$$I_B = \frac{V_E}{(1+\beta) R_E}$$

$$R_B = \frac{V_{CC} - V_{BE} - V_E}{I_B} = 368.65\,\text{k}\Omega$$

b) Na osnovu šeme za male signale prikazane na slici može se pisati:



$$v_p = i_c (R_E \| R_P)$$

$$i_c = (1+\beta) i_b$$

$$i_b = \frac{v_g}{R_X}$$

Lako se izvodi da je: $R_X = r_\pi + (1+\beta)(R_E \| R_P)$

$$R_U = R_X \| R_B = (r_\pi + (1+\beta)(R_E \| R_P)) \| R_B \ .$$

Naponsko pojačanje je jednako:

$$A_v = \frac{(1+\beta)(R_E \| R_P)}{r_\pi + (1+\beta)(R_E \| R_P)}.$$

c) Na osnovu poznate struje baze u mirnoj radnoj tački određene pod a) dobija se:

$$I_C = \beta I_B = 1.98\,\text{mA}$$

$$g_m = \frac{I_C}{V_T} = 79.2\,\text{mS}$$

$$r_\pi = \frac{\beta}{g_m} = 1262.5\,\Omega$$

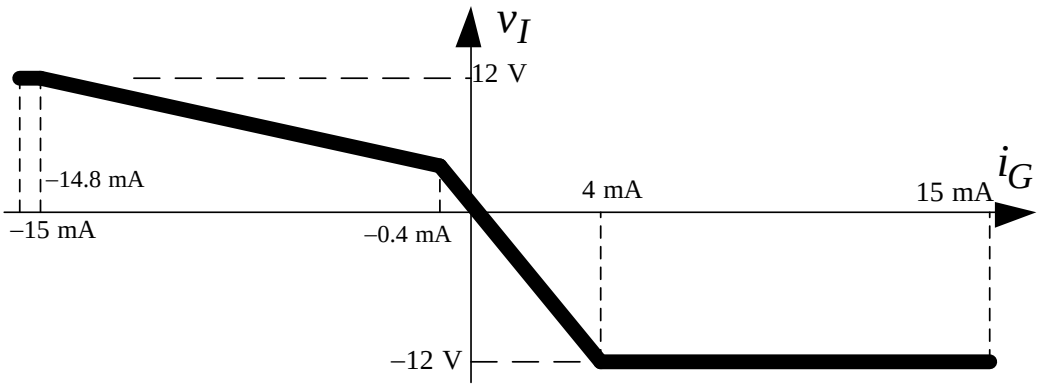
Vrednosti traženih parametara su:

$$R_U = 80\,\text{k}\Omega$$

$$A_v = 0.99$$

6.

$$v_I = \begin{cases} 12\ \text{V} & i_G \le -14.8\ \text{mA} \\ 0.9\ \text{V} - 750\,\Omega \cdot i_G & 14.8\ \text{mA} < i_G \le -0.4\ \text{mA} \\ -3\ \text{k}\Omega \cdot i_G & -0.4\ \text{mA} \le i_G < 4\ \text{mA} \\ -12\ \text{V} & i_G \ge 4\ \text{mA} \end{cases}$$

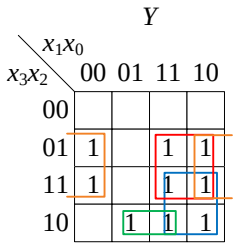


7.

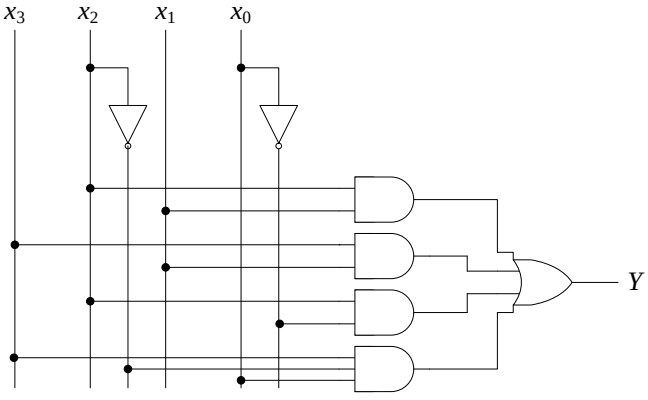
a)

x_3	x_2	x_1	x_0	Y
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	1
0	1	0	1	0
0	1	1	0	1
0	1	1	1	1
1	0	0	0	0
1	0	0	1	1
1	0	1	0	1
1	0	1	1	1
1	1	0	0	1
1	1	0	1	0
1	1	1	0	1
1	1	1	1	1

b)



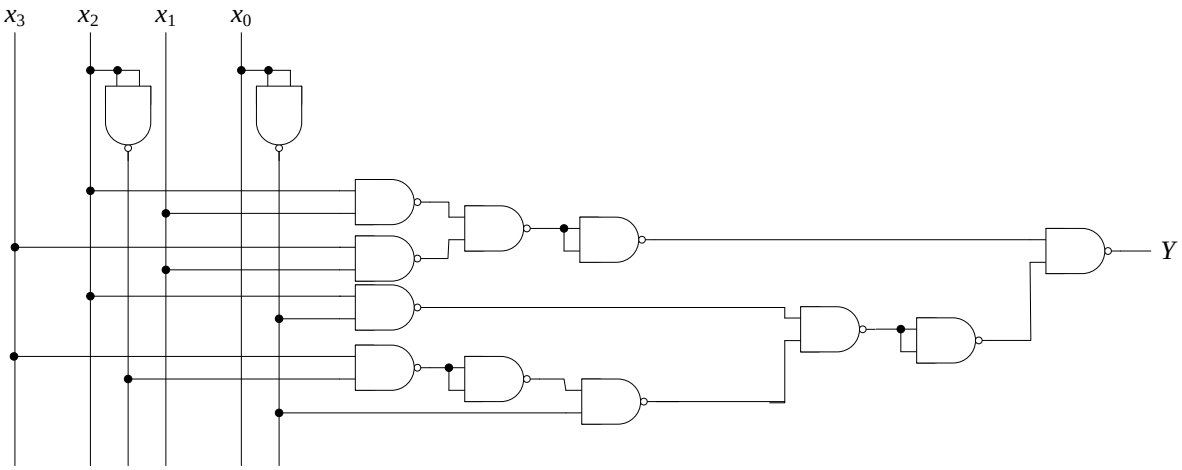
$$Y = x_2x_1 + x_3x_1 + x_2\overline{x_0} + x_3\overline{x_2}x_0$$



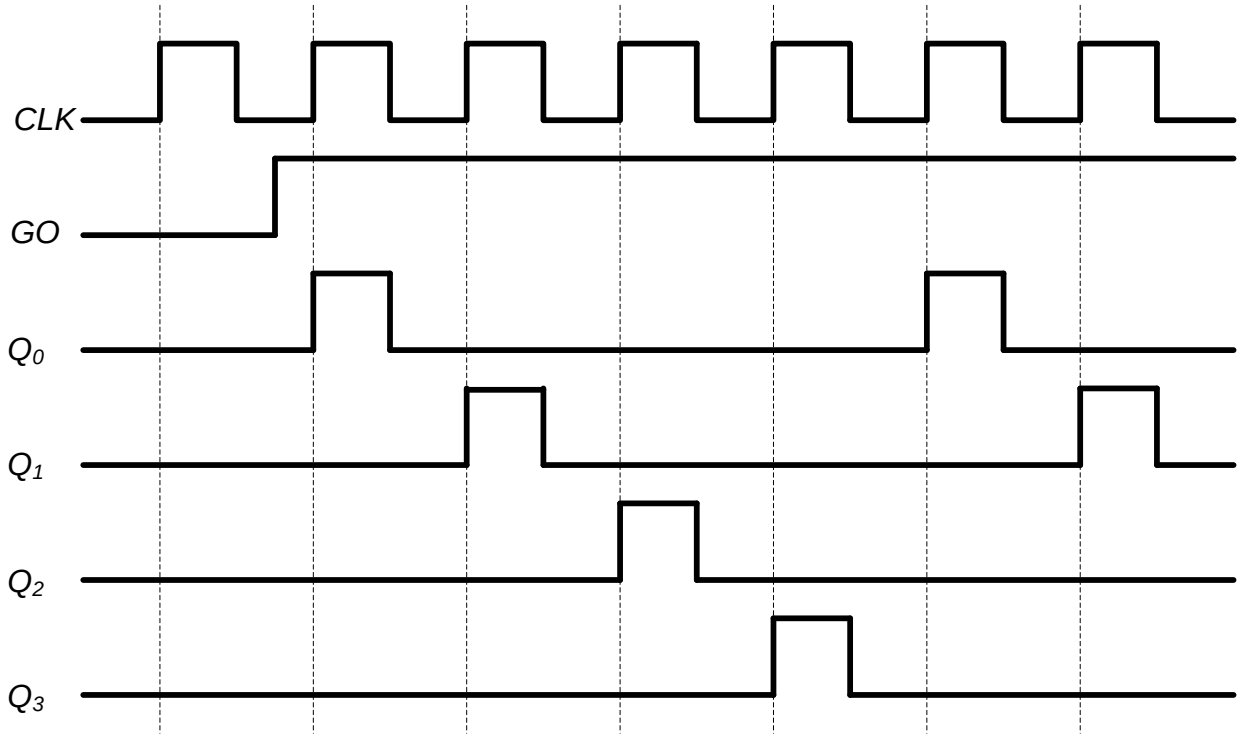
c)

$$Y = x_2x_1 + x_3x_1 + x_2\overline{x_0} + x_3\overline{x_2}x_0 = \overline{\overline{x_2x_1 + x_3x_1 + x_2\overline{x_0} + x_3\overline{x_2}x_0}} = \overline{\left(\overline{x_2x_1}\cdot\overline{x_3x_1}\right)\cdot\left(\overline{x_2\overline{x_0}}\cdot\overline{\left(x_3\overline{x_2}\right)x_0}\right)} =$$

$$= \overline{\overline{x_2x_1}\cdot\overline{x_3x_1}\cdot\overline{x_2x_0}\cdot\overline{x_3x_2x_0}}$$



8.



Perioda rada sekvencijalne mreže je četiri.