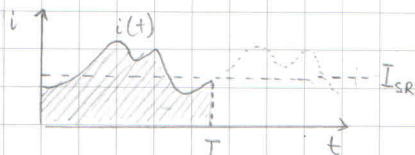


OSNELE - 4. MASOVNE INSTRUKCIJE - 2 DIO

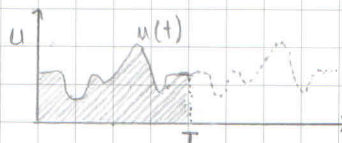
Srednja Vrijednost

Struja:



$$I_{sr} = \frac{1}{T} \int_0^T i(t) dt$$

Napona:



$$U_{sr} = \frac{1}{T} \int_0^T u(t) dt$$

Efektivna Vrijednost Struje

> Uspoređujemo toplinu koja struja stvori na otporniku R s $i(t)$ s toplinom koju bi stvorila s I_{ef} u vremenskom periodu T .

$$W = \int_0^T i^2(t) R dt$$

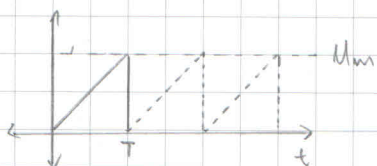
$$W = W$$

$$W = I_{eff}^2 \cdot R \cdot T$$



$$I_{ef} = \sqrt{\frac{1}{T} \int_0^T i^2(t) dt}$$

Osnovni Valni Oblici:



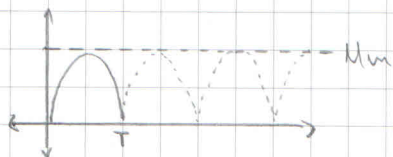
$$U_{sr} = \frac{U_m}{2}$$

$$U_{ef} = \frac{U_m}{\sqrt{2}}$$



$$U_{sr} = \frac{U_m}{\pi}$$

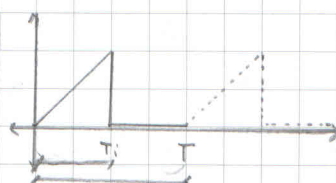
$$U_{ef} = \frac{U_m}{2}$$



$$U_{sr} = \frac{2U_m}{\pi}$$

$$U_{ef} = \frac{U_m}{\sqrt{2}}$$

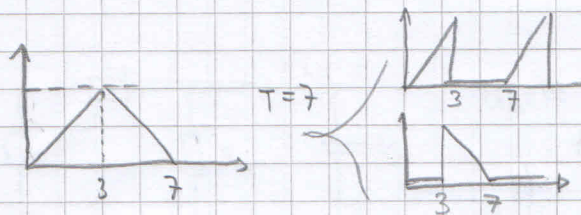
Složeni Valni Oblik



$$U_{sv} = U_{sv(T_i)} \cdot \frac{T_i}{T}$$

$$U_{ef} = U_{ef(T_i)} \cdot \sqrt{T_i/T}$$

11 (8.)



$$U_{sv1} = \frac{U_m}{2} \cdot \frac{3}{7} \quad U_{eff1} = \frac{U_m}{\sqrt{3}} \cdot \sqrt{\frac{3}{7}}$$

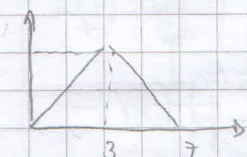
$$U_{sv2} = \frac{U_m}{2} \cdot \frac{4}{7} \quad U_{eff2} = \frac{U_m}{\sqrt{3}} \cdot \sqrt{\frac{4}{7}}$$

$$\xi = \frac{U_{eff}}{U_{sv}} = \frac{2.87}{2.5} = 1.154$$

$$U_{sv} = U_{sv1} + U_{sv2} = 2.5V$$

$$U_{eff} = \sqrt{U_{eff1}^2 + U_{eff2}^2} = 2.88V$$

(8.)



$$U_{sv} = \frac{1}{T} \int_0^T i(t) dt = \frac{1}{7} \left(\frac{3 \cdot 5}{2} + \frac{4 \cdot 5}{2} \right) = 2.5V$$

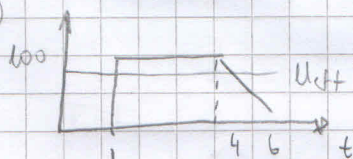
$$U_{eff} = \sqrt{\frac{1}{T} \int_0^T i(t)^2 dt}$$

$$i(t) = \begin{cases} [0, 3] & i(t) = \frac{5}{3}t \\ [3, 7] & i(t) = -\frac{5}{4}t + 8.75 \end{cases}$$

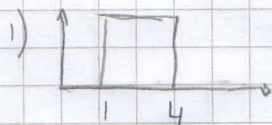
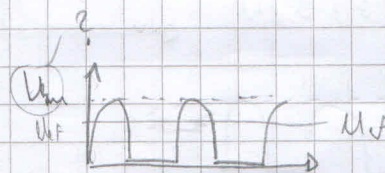
$$U_{eff} = \sqrt{\frac{1}{2} \left(\int_0^3 \left(\frac{5}{3}t \right)^2 dt + \int_3^7 \left(-\frac{5}{4}t + 8.75 \right)^2 dt \right)} = 2.88V$$

12.

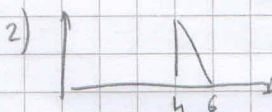
(20.)



$$U_{eff} = U_{eff\text{polu}} = U_{eff\text{puls}}$$



$$U_{eff1} = U_m \sqrt{\frac{3}{6}}$$



$$U_{eff2} = U_m \sqrt{\frac{2}{6}}$$

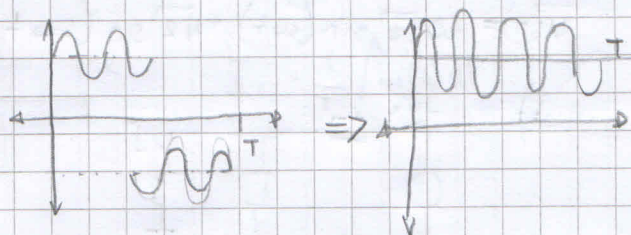
$$U_{eff} = \sqrt{U_{eff1}^2 + U_{eff2}^2} = 78.17V$$

$$U_{eff\text{poluvalna}} = \frac{U_m}{2}$$

$$U_{m\text{polu}} = 2 \cdot U_{eff\text{polu}} = 2 \cdot 78.17V = 156.3V$$

3

(3)



$$I_0 + I_n \sin(\omega t)$$

\downarrow \downarrow
 I_0 $\frac{I_n}{\sqrt{2}}$

$$I_{eff} = \sqrt{I_0^2 + \left(\frac{I_n}{\sqrt{2}}\right)^2}$$

$$= \sqrt{8^2 + 6^2} = 10 \text{ A}$$

4

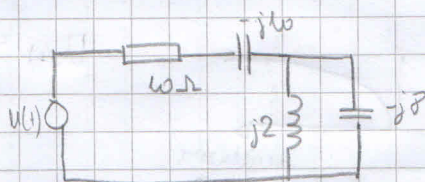
(10)

$$u(t) = 100 + \sqrt{2} \sin(\omega t) + 2\sqrt{2} \sin(2\omega t)$$

$\omega = 6$

$$X_C = \frac{1}{\omega C}$$

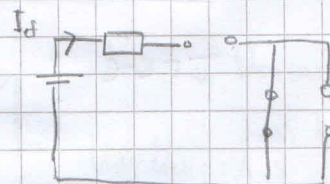
$$X_L = \omega L$$



$$1) \quad U = 100 \text{ V}$$

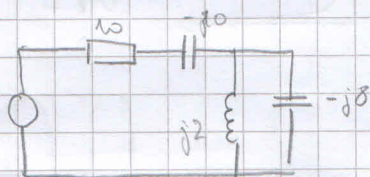
$$X_C = \infty \quad I_{eff} = 0 \text{ A}$$

$$X_L = 0$$



$$2) \quad u_1(t) = \sqrt{2} \sin(\omega t)$$

$$\dot{U}_2 = 1 \angle 0^\circ \text{ V}$$



$$I_{01} = \frac{1 \angle 0^\circ}{10 - j10 + (j2 \parallel -j8)}$$

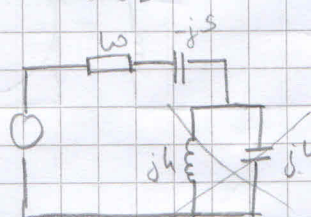
$$= 0.0806 \angle 36^\circ$$

$$3) \quad u(t) = 2\sqrt{2} \sin(\omega t \cdot 2)$$

$$\dot{U}_3 = 2 \angle 0^\circ$$

$$X_C = \frac{1}{\omega C \cdot 2}$$

$$X_L = \omega \cdot L \cdot 2$$



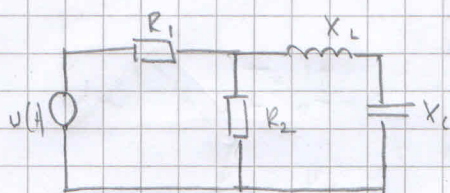
$$I_{03} = 0 \text{ A}$$

$$I_{eff} = \sqrt{I_{01}^2 + I_{02}^2 + I_{03}^2}$$

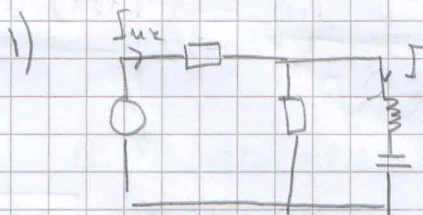
$$= 0.0806 \text{ A}$$

5

(18.)

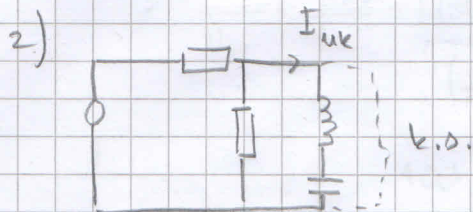


$$u(t) = 10\sqrt{2} \sin(\omega t) + \sqrt{2} \sin(2\omega t + 30^\circ) \text{ V}$$



$$I_{uk} = \frac{10 \angle 0^\circ}{10 + 12 \parallel (-j30)} = 0.4816 \angle 11.49^\circ \text{ A}$$

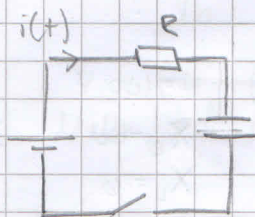
$$I = I_{uk} \cdot \frac{-j30}{12 - j30} = 0.447 \angle -40.3^\circ \text{ A}$$



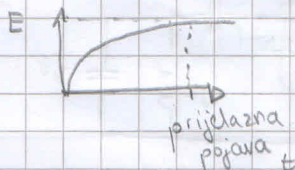
$$I_{uk} = \sqrt{0.447^2 + 0^2} = 0.447 \text{ A}$$

6

R-C



$$\tau = R \cdot C$$



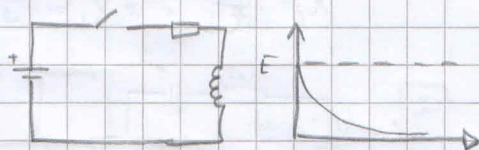
$$U(t) = E \cdot (1 - e^{-\frac{t}{\tau}})$$

$$i(t) = \frac{U_R(t)}{R}$$

$$U_C(t) + U_R(t) = E$$

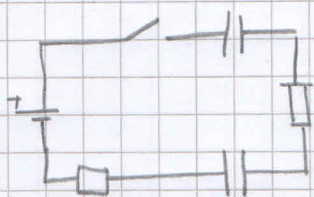
$$U_R = E (e^{-\frac{t}{\tau}})$$

R-L

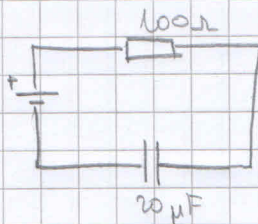


$$U_L = U \cdot e^{-\frac{t}{\tau}}$$

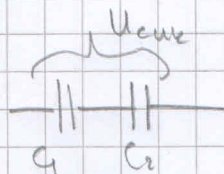
6



≡



$$C_{\text{Gek}} = \left(\frac{1}{C_1} + \frac{1}{C_2} \right)^{-1}$$



$$U_{\text{Gek}}(t=20\text{ms}) = E \left(1 - e^{-\frac{t}{\tau}} \right) = 12 \cdot (1 - e^{-1})$$

$$= 7.585\text{V} = U_{\text{Gek}}$$

$$\tau = R \cdot C = 1000 \cdot 20 \cdot 10^{-6}$$

$$Q_1 = U_1 C_1$$

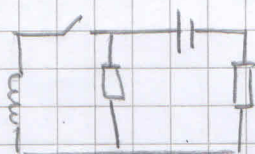
$$Q_2 = U_2 C_2$$

$$U_1 + U_2 = U_{\text{Gek}}$$

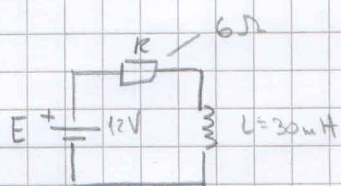
$$U_2 = U_{\text{Gek}} \cdot \frac{C_1}{C_1 + C_2} = \frac{7.585}{3}$$

$$U_1 = U_2 \cdot \frac{C_2}{C_1} = 2.528$$

7

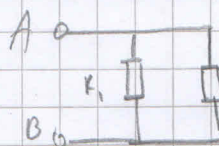


≡



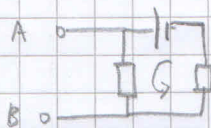
$$U_L(t) = U_T \cdot e^{-\frac{t}{\tau}}$$

$$= 12 \cdot e^{-\frac{8}{3}} = 2.42\text{V}$$



$$R_T = R_1 \parallel R_2$$

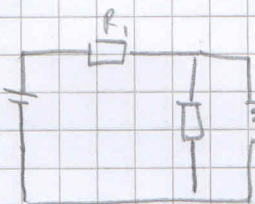
$$R_T = 6\Omega$$



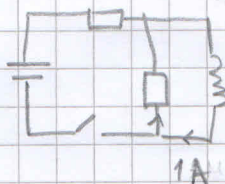
$$I_0 = \frac{16}{24+8} = 0.5\text{A}$$

$$U_T = 24 \cdot 0.5 = 12\text{V}$$

8



≡



$$U_R = 54 \cdot 1 = 54\text{V}$$