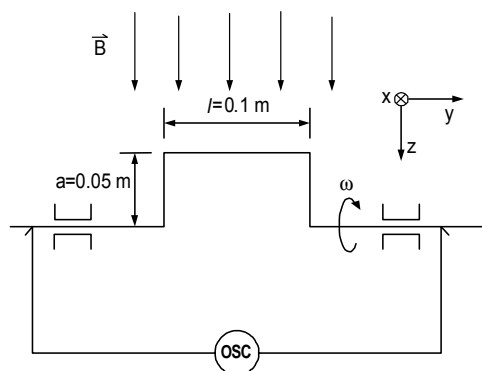
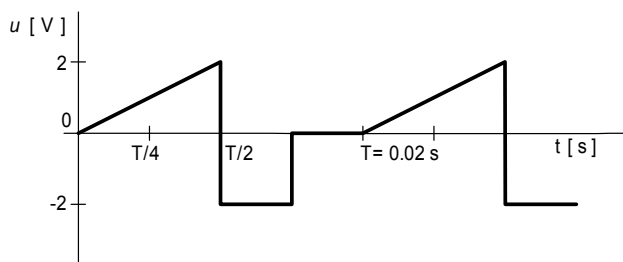


OSNOVE ELEKTROTEHNIKE II
Drugi kolokvij, 25.5.2001

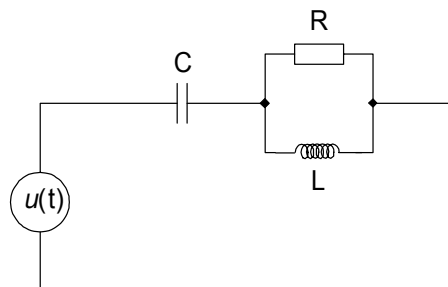
1. V homogenem magnetnem polju $\vec{B} = \vec{e}_z 0.4 \text{ T}$ se enakomerno vrti po sliki oblikovan in uležajen električno prevoden vodnik. Krožna frekvenca vrtenja je $\omega = 120 \text{ s}^{-1}$. Določite obliko in velikost inducirane napetosti, ki jo bo prikazal po sliki priključen osciloskop!



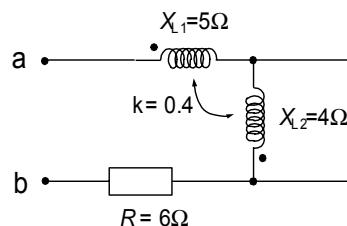
2. Izračunajte poprečno in efektivno vrednost periodičnega signala napetosti po sliki!



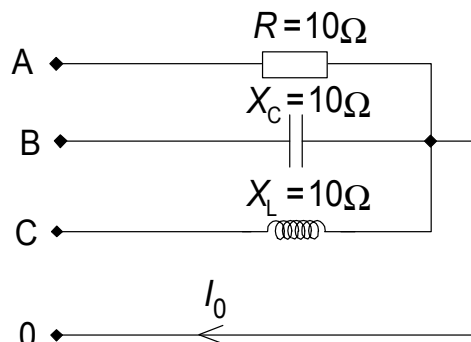
3. Narišite kazalčni diagram napetosti in tokov pri $\omega < \omega_0$ ter določite enačbo za izračun resonančne frekvence!



4. Določite vhodno impedanco \underline{Z}_{ab} vezja na sliki med spinkama a in b!



5. Trifazno nesimetrično breme v vezavi zvezda je priključeno na simetrično trifazno napetost $3 \times 400/230 \text{ V}_{ef}$. Določite delovno moč, ki se troši na bremenu ter tok I_0 !



OSNOVE ELEKTROTEHNIKE II
Rešitve drugega kolokvija, 25.5.2001

1.

$$U_i = \vec{l} \cdot (\vec{v} \times \vec{B})$$

$$\vec{l} = -\vec{e}_y l$$

$$\vec{v} = \vec{e}_x v = \vec{e}_x \omega a \cos(\omega t)$$

$$\vec{B} = \vec{e}_z B$$

$$U_i = -\vec{e}_y l \cdot (\vec{e}_z B \times \vec{e}_x \omega a \cos(\omega t)) = l B \omega a \cos(\omega t) = 0.24 \cos(\omega t) \text{ V}$$

2.

$$U_{pop} = \frac{1}{T} \left[\int_0^T u(t) dt \right]$$

$$U_{ef} = \sqrt{\frac{1}{T} \left[\int_0^T u^2(t) dt \right]}$$

$$u(t) = \frac{4}{T} t \Rightarrow 0 \leq t \leq \frac{T}{2}$$

$$u(t) = -2 \Rightarrow \frac{T}{2} \leq t \leq \frac{3T}{4}$$

$$u(t) = 0 \Rightarrow \frac{3T}{4} \leq t \leq T$$

$$U_{pop} = \frac{1}{T} \left[\int_0^{T/2} \frac{4}{T} t dt + \int_{T/2}^{3T/4} (-2) dt + \int_{3T/4}^T 0 dt \right] = 0 \text{ V}$$

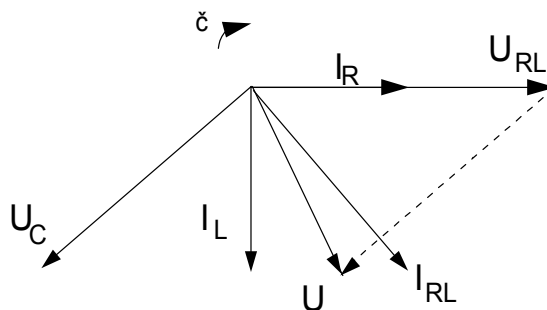
$$U_{ef} = \sqrt{\frac{1}{T} \left[\int_0^{T/2} \left(\frac{4}{T} t \right)^2 dt + \int_{T/2}^{3T/4} (-2)^2 dt + \int_{3T/4}^T 0^2 dt \right]} = \sqrt{\frac{5}{3}} \text{ V}$$

3.

$$\underline{Z} = \frac{R \cdot jX_L}{R + jX_L} - jX_C$$

$$\text{Im}\{\underline{Z}\} = 0, \quad R^2 X_L - X_C R^2 - X_C X_L^2 = 0$$

$$f_0 = \frac{1}{2\pi} \sqrt{\frac{R^2}{R^2 CL - L^2}}$$

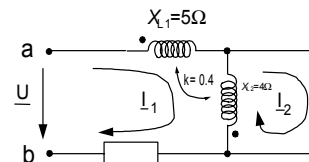


4.

$$\underline{U} = I_1 (R + jX_1 + jX_2) - 2jX_M I_1 - jX_2 I_2 + jX_M I_2$$

$$0 = jX_2 I_2 + jX_M I_1 - jX_2 I_1$$

$$\underline{Z} = \frac{\underline{U}}{I_1} = 6 + j4.2 \text{ } \Omega$$



5. Delovna moč se troši le na uporu R in znaša:

$$I_a = \frac{U}{R} = \frac{230(1 + j0)}{10} = 23 \text{ A}$$

$$\underline{S} = \underline{U} \cdot \underline{I}^* = P + jQ = 230(1 + j0) \cdot 23 = 5290 + j0 \text{ VA} \Rightarrow P = 5290 \text{ W}$$

$$I_0 = I_a + I_b + I_c = \frac{230(1 + j0)}{10} + \frac{230(-0.5 - j0.866)}{-j10} + \frac{230(-0.5 + j0.866)}{j10} = 63 \text{ A}$$