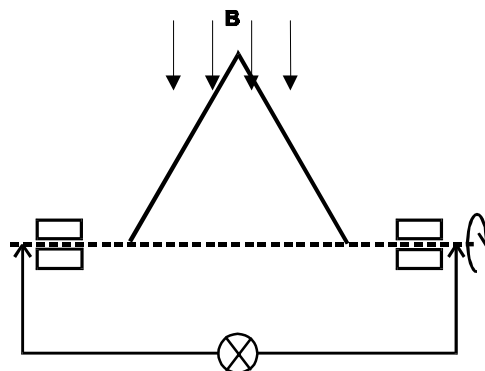
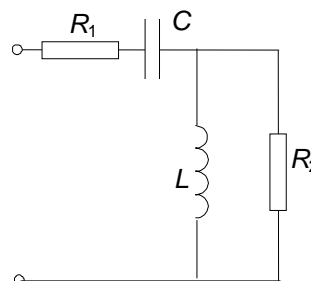
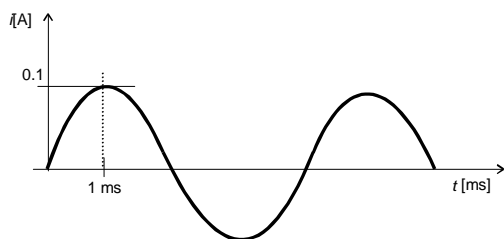


**OSNOVE ELEKTROTEHNIKE II (UNI)**  
**Kolokvij, 9.6.2000**

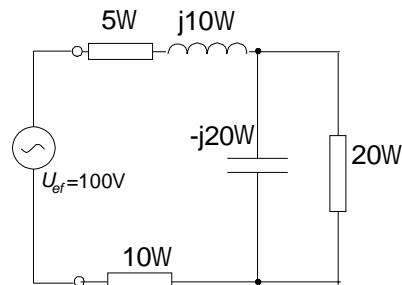
1. Določite potrebno kotno hitrost vrtenja zanke v obliki enakostraničnega trikotnika stranice  $a=10$  cm z 200 ovoji v homogenem polju gostote  $B=0,2$  T, da bo žarnica z  $R_z=1\Omega$  gorela z močjo 15W! ( $\mathbf{B}$  je pravokoten na os vrtenja.)



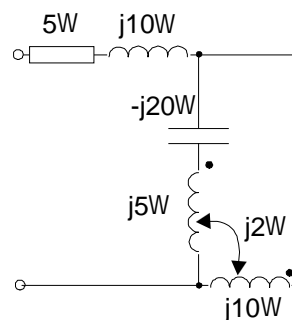
2. Idealni tokovni vir s harmoničnim signalom na sliki je priključen na vezje na sliki desno. Določite in skicirajte potek napetosti na upor  $R_2$ ! ( $R_1=10\Omega$ ,  $R_2=5\Omega$ ,  $L=1$  mH,  $C=1\mu$ F)



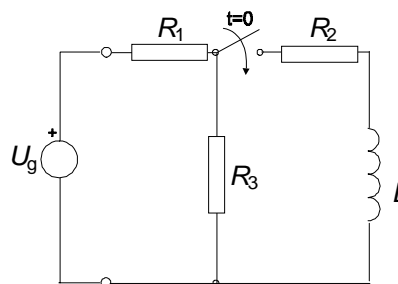
3. Določite delovno moč na bremenu!



4. Določite vhodno impedanco vezja na sliki!



5. Določite in skicirajte tok in napetost na tuljavi med prehodnim pojavom. ( $R_1=1$  k $\Omega$ ,  $R_2=5$  k $\Omega$ ,  $R_3=2$  k $\Omega$ ,  $L=10$  mH,  $U_g=60$  V)



**Rešitve kolokvija iz OSNOV ELEKTROTEHNIKE II (UNI), 9.6.2000**

1. Inducirana napetost postane gonilna napetost:

$$u = -N \frac{d}{dt}(B.A.\cos(\omega t)) = NAB\omega.\sin(\omega t) = U_m.\sin(\omega t)$$

$$P = \frac{U_m^2}{2R} \Rightarrow P = \frac{(NAB\omega)^2}{2R} \Rightarrow \omega = \frac{1}{NAB} \sqrt{2PR}$$

$$A = \frac{a}{2} \cdot \frac{a\sqrt{3}}{2} = 4,33 \cdot 10^{-3} \text{ m}^2$$

$$\omega = \frac{1}{200 \cdot 4,33 \cdot 10^{-3} \cdot 0,2} \sqrt{2 \cdot 15 \cdot 1} = 31,6 \text{ rad.s}^{-1}$$

2. Zapišemo kompleksor toka in določimo admitanco elementov L in R<sub>2</sub>, saj na napetost na uporu R<sub>2</sub> ne vplivata R<sub>1</sub> in C:

$$i(t) = 0,1 \cdot \sin\left(\frac{2\pi}{4 \cdot 10^{-3}} t\right) = 0,1 \cdot \cos\left(\omega t - \frac{\pi}{2}\right) \Rightarrow \underline{I} = -j0,1 \text{ A} ; \omega = 1570 \text{ s}^{-1}$$

$$\underline{Y}_{RL} = G_2 - j \frac{1}{\omega L} = (0,2 - j0,64) \text{ S}$$

$$\underline{U}_{R2} = \frac{\underline{I}}{\underline{Y}_{RL}} = -j0,1 \cdot (0,44 + j1,42) = (0,142 - j0,044) \text{ V}$$

$$|\underline{U}_{R2}| = 148,7 \text{ mV}; \varphi = \text{Arctg} \frac{1,42}{0,44} = 72,78^\circ$$

$$u_{RL}(t) = 148,7 \cdot 10^{-3} \cdot \sin(1570t + 72,78^\circ) \text{ V}$$

3.

$$\underline{Z} = 20 \parallel (-j20) + 15 + j10 = 25 \Omega$$

$$P = \text{Re}[\underline{U} \cdot \underline{I}^*] = U^2 \text{Re}\left[\frac{1}{\underline{Z}^*}\right] = \frac{100^2}{25} = 400 \text{ W}$$

4.

$$\underline{U} = \underline{I}_1(5 + j10) + (\underline{I}_1 - \underline{I}_2)(j5 - j20) + \underline{I}_2 \cdot j2$$

$$0 = \underline{I}_2 \cdot j10 + (\underline{I}_2 - \underline{I}_1) \cdot (j5 - j20) - (\underline{I}_2 - \underline{I}_1) \cdot j2 - \underline{I}_2 \cdot j2$$

-----

$$\underline{U} = \underline{I}_1(5 - j5) + \underline{I}_2 \cdot j17$$

$$0 = \underline{I}_1 \cdot j17 + \underline{I}_2 \cdot (-j9)$$

$$\Rightarrow \underline{U} = \underline{I}_1(5 - j5 + \frac{17}{9} \cdot j17)$$

$$\Rightarrow \underline{Z} = \frac{\underline{U}}{\underline{I}_1} = (5 + j27,1) \Omega$$

5. Za lažji izračun nadomestimo del vezja levo od stikala s Thev.

nadomestnim vezjem in dobimo eno samo zanko, za katero po preklopu stikala velja:

$$L \frac{di}{dt} + (R_{Th} + R_2) \cdot i = U_{Th}$$

$$R_{Th} = R_1 \parallel R_3 = 0,667 \text{ k}\Omega, U_{Th} = U_s \frac{R_3}{R_1 + R_3} = 40 \text{ V}$$

$$u_L(t=0) = U_{Th}, i_L(t=0) = 0 \text{ A}$$

$$u_L(t=\infty) = 0 \text{ V}, i_L(t=\infty) = \frac{U_{Th}}{R_{Th} + R_2} = 7,06 \text{ mA}$$

$$u_L(t > 0) = 40 \cdot e^{-t/\tau} \text{ V}$$

$$i_L(t > 0) = 7,06 \cdot (1 - e^{-t/\tau}) \text{ mA}$$

$$\tau = \frac{L}{R_{Th} + R_2} = 1,76 \mu\text{s}$$

