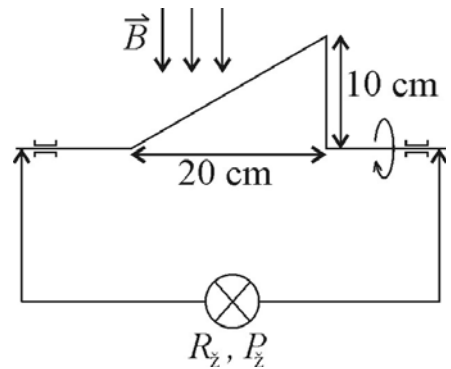
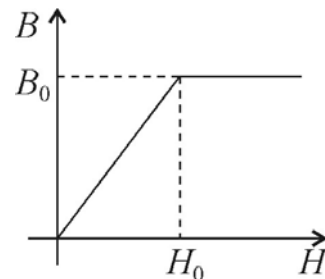


Osnove elektrotehnike 2  
2. kolokvij (11.06.2002)

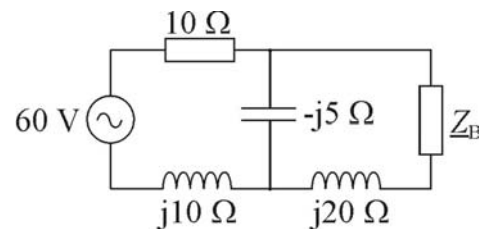
1. S koliko obrati na minuto se mora vrteti trikotno oblikovana žica v homogenem magnetnem polju gostote  $B = 0,6 \text{ T}$ , ki je pravokotno na os vrtenja, da bo žarnica z upornostjo  $R_z = 10 \Omega$ , in nazivno močjo  $P_z = 20 \text{ W}$  pravilno napajana? Samoindukcijo zanemarimo!



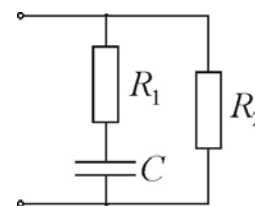
2. Aproximacija krivulje magnetenja feromagnetnega jedra je podana grafično,  $B_0 = 0,5 \text{ T}$ ,  $H_0 = 50 \text{ A/m}$ . Kolikšna energija je potrebna za namagnetenje jedra volumna  $V = 150 \text{ dm}^3$  do nasičenja (do gostote  $B_0$ )?



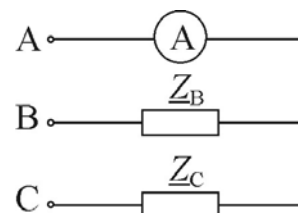
3. Vezje na sliki je napajno s harmoničnim napetostnim virom  $u_g = 60 \cos(\omega t + \varphi_0) \text{ V}$ . Določite impedanco  $Z_B$  bremena tako, da bo na njem največja delovna moč! Kolikšna je ta moč?



4. Določite trikotnik moči  $\underline{S} = P + jQ$  harmonično vzbujanega dvopolnega vezja, če je moč na upor  $R_2$  enaka  $4 \text{ W}$ . ( $R_1 = 1 \Omega$ ,  $R_2 = 2 \Omega$ ,  $X_C = 5 \Omega$ )



5. Na pozitiven simetričen trifazni sistem napetosti  $3 \times 230/400 \text{ V}$  je priključeno nesimetrično breme. Določite odčitek idealnega A-metra v fazi A!  
 $Z_B = 40e^{-j40^\circ} \Omega$ ,  $Z_C = 40e^{j70^\circ} \Omega$ !



Osnove elektrotehnike 2  
2. kolokvij (11.06.2002) - rešitve

1.

$$U_{ind} = \sqrt{2P_z R_z} = 20 \text{ V}$$

$$u_{ind} = -\frac{d\phi}{dt}; \quad \phi(t) = BA_{trik} \cos(\omega t + \varphi_0)$$

$$u_{ind} = BA_{trik} \omega \sin(\omega t + \varphi_0)$$

$$U_{ind} = BA_{trik} \omega \Rightarrow \omega = \frac{U_{ind}}{BA_{trik}} = 3333 \text{ s}^{-1}$$

$$\omega = 2\pi f; \quad n = 60f \Rightarrow n = \frac{60\omega}{2\pi} \approx 31,8 \cdot 10^3 \text{ ob/min}$$

2.

$$B = kH; \quad k = \frac{B_0}{H_0} = 0,01 \frac{\text{V} \cdot \text{s}}{\text{A} \cdot \text{m}}$$

$$w = \int_0^{B_0} H dB = \int_0^{B_0} \frac{B}{k} dB = \frac{B_0^2}{2k}$$

$$W = \int_V w dV = \frac{B_0^2}{2k} V = \frac{0,5^2}{2 \cdot 0,01} 0,15 \text{ J} = 1,875 \text{ J}$$

3.

$$\underline{Z}_{Th} = [(10 + j10) \parallel (-j5) + j20] \Omega = [(2 - j6) + j20] \Omega = (2 + j14) \Omega$$

$$\underline{Z}_B = \underline{Z}_{Th}^* = (2 - j14) \Omega$$

$$\underline{U}_{Th} = \underline{U}_C = I \cdot (-j5) \Omega = \frac{60}{10 + j5} (-j5) \text{ V} = (-12 - j24) \text{ V}$$

$$P_{\max} = \frac{U_{Th}^2}{8R_{Th}} = \frac{26,83^2}{8 \cdot 2} \text{ W} = 45 \text{ W}$$

4.

$$\underline{I}_2 = \sqrt{\frac{2P}{R_2}} = 2 \text{ A}; \quad \underline{U} = R_2 \underline{I}_2 = 4 \text{ V}$$

$$\underline{I}_1 = \frac{\underline{U}}{\underline{Z}_1} = \frac{4}{1 - j5} \text{ A} = \frac{2 + j10}{13} \text{ A}; \quad \underline{I} = \underline{I}_1 + \underline{I}_2 = \frac{28 + j10}{13} \text{ A}$$

$$\underline{S} = \frac{1}{2} \underline{U} \underline{I}^* = \frac{1}{2} 4 \left( \frac{28 - j10}{13} \right) = (4,31 - j1,54) \text{ VA}$$

$$P = 4,31 \text{ W}$$

$$Q = -1,54 \text{ VAr}$$

5. Ker ima idealni ampermeter notranjo upornost  $0 \Omega$  je na sponkah bremen  $\underline{Z}_B$  in  $\underline{Z}_C$  medfazna napetost  $\underline{U}_{BA}$  ter  $\underline{U}_{CA}$ .

$$\underline{U}_A = 230e^{j0^\circ} \text{ V}; \quad \underline{U}_B = 230e^{-j120^\circ} \text{ V}; \quad \underline{U}_C = 230e^{j120^\circ} \text{ V};$$

$$\underline{U}_{Z_B} = \underline{U}_B - \underline{U}_A = 230(e^{-j120^\circ} - 1) \text{ V} \cong (-345 - j199) \text{ V} \cong 400e^{-j150^\circ} \text{ V}$$

$$\underline{U}_{Z_C} = \underline{U}_C - \underline{U}_A = 230(e^{j120^\circ} - 1) \text{ V} \cong (-345 + j199) \text{ V} \cong 400e^{j150^\circ} \text{ V}$$

$$\underline{I}_B = \frac{\underline{U}_{Z_B}}{\underline{Z}_B} = \frac{400e^{-j150^\circ}}{40e^{-j40^\circ}} \text{ A} = 10e^{-j110^\circ} \text{ A}$$

$$\underline{I}_C = \frac{\underline{U}_{Z_C}}{\underline{Z}_C} = \frac{400e^{j150^\circ}}{40e^{j70^\circ}} \text{ A} = 10e^{j80^\circ} \text{ A}$$

$$\underline{I}_A = -(\underline{I}_B + \underline{I}_C) = (1,68 - j0,45) \text{ A} = 1,74e^{-j15^\circ} \text{ A}$$

$$I_A = |\underline{I}_A| = 1,74 \text{ A}$$