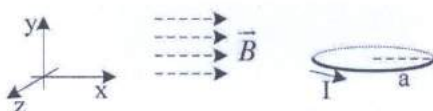


Drugi kolokvijum iz Elektrotehnike

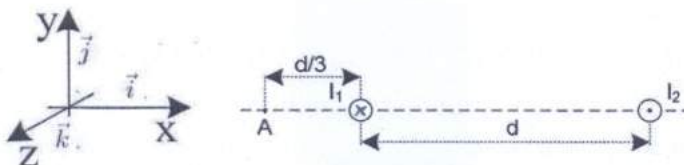
IME PREZIME BROJ INDEKSA

1. Ravna kontura na slici 1 u obliku kruga poluprečnika a postavljena je u XZ ravni koordinatnog sistema XZY . Kroz konturu protiče struja intenziteta I . U prostoru vlada homogeno magnetno polje čiji je vektor $\vec{B} = B_0 \vec{i}$. Magnetni fluks kroz kružnu konturu i intenzitet momenta sila koje deluju na strujnu konturu su:



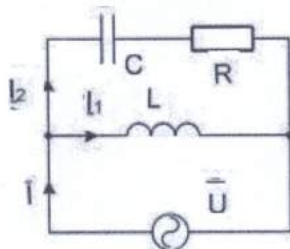
Slika 1

- a) $\Phi = B_0 a^2 \pi$, $M = I B a^2 p$ b) $\Phi = 0$, $M = 2 I B_0 a \pi$
 c) $\Phi = 0$, $M = B_0 a^2 \pi I$ d) $\Phi = B_0 a^2 \pi$, $M = 0$
2. Na slici 2 su prikazana dva veoma dugačka provodnika sa strujama $I_1 = I$ i $I_2 = 2I$ koja se nalaze u ravni XZ paralelna osi Z na međusobnom rastojanju d . Sredina je vakuum. Vektor magnetnog polja u tački A iznosi



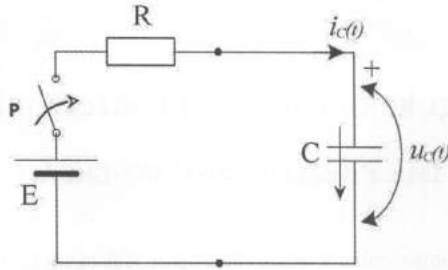
Slika 2

- a) $\vec{B}_A = \frac{\mu_0 I}{2\pi d} \vec{j} [\text{T}]$ b) $\vec{B}_A = \frac{3\mu_0 I}{\pi d} \vec{k} [\text{T}]$ c) $\vec{B}_A = -\frac{3\mu_0 I}{4\pi d} \vec{j} [\text{T}]$ d) $\vec{B}_A = \frac{3\mu_0 I}{4\pi d} \vec{j} [\text{T}]$
3. Kroz potrošač nepoznate kompleksne admitanse \bar{Y} koji je priključen na naizmenični napon $u(t) = 6\sqrt{2} \sin(314t + 60^\circ) \text{V}$ protiče struja $i(t) = 2\sqrt{2} \sin(314t + 15^\circ) \text{A}$. Kompleksna vrednos admitanse je:
- a) $\bar{Y} = \frac{3\sqrt{2}}{2} (1 - j) \Omega$ b) $\bar{Y} = \frac{3\sqrt{2}}{2} + j\frac{3\sqrt{2}}{2} \text{S}$ c) $\bar{Y} = \frac{6\sqrt{2}}{2} - j\frac{6\sqrt{2}}{2} \text{S}$ d) $\bar{Y} = \frac{\sqrt{2}}{2} \frac{(1-j)}{3} \text{S}$
4. U kolu na slici (3) je $u(t) = 100 \sin(\omega t + \frac{\pi}{2})$, $R = 5\Omega$, $L = 10 \text{mH}$, $C = 200 \mu\text{F}$, $\omega = 1000 \frac{\text{rad}}{\text{s}}$ kompleksni izraz za struju \bar{I} je:



Slika 3

- a) $\bar{I} = j10 \text{A}$ b) $\bar{I} = 10 \text{A}$ c) $\bar{I} = j\frac{5}{\sqrt{2}} \text{A}$ d) $\bar{I} = j5\sqrt{2} \text{A}$
5. Na slici 4 prelazni proces počinje uključenjem prekidača P u trenutku $t = 0$. Kondenzator je pre uključenja prekidača bio opterećen količinom elektricitet Q_0 u smeru prikazanom na slici. Struja kroz kondenzator u trenutku uključenja prekidača iznosi:



Slika 4

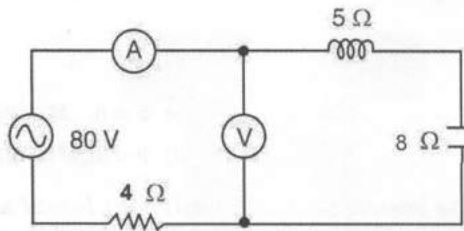
a) $i(0) = \frac{E}{R}$

b) $i(0) = 0$

c) $i(0) = \frac{E + \frac{Q_0}{C}}{R}$

d) $i(0) = \frac{E - \frac{Q_0}{C}}{R}$

6. U kolu na slici (5) struja kroz ampermetar I_A i napon koji pokazuje voltmetar U_V su:



Slika 5

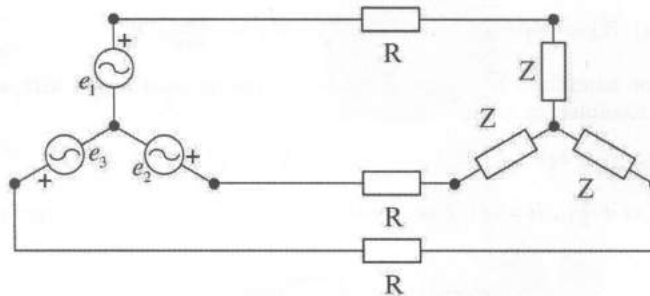
a) $I_A = \frac{80}{7} A, U_V = \frac{80}{3} V$

b) $I_A = 16 A, U_V = 0 V$

c) $I_A = 12 A, U_V = 48 V$

d) $I_A = 16 A, U_V = 48 V$

7. Na trofazni naponski generator, sa vezom u zvezdu (6), efektivne vrednosti ems $E_1 = E_2 = E_3 = 10V$ preko provodnika linijske otpornosti $R = 1\Omega$ je povezan na trofazni potrošač čija je fazna impedansa $\bar{Z} = 3 + j3\Omega$, Efektivna vrednost fazne struje generatora i prividna snaga generatora iznose



Slika 6

a) $I_f = \frac{10}{3\sqrt{2}} A, \bar{S}_g = 50 + j50 VA$

b) $I_f = 2 A, \bar{S}_g = 48 + j36 VA$

c) $I_f = 2 A, \bar{S} = 50 + j36 VA$

d) $I_f = \frac{10}{3\sqrt{2}} A, \bar{S} = 48 + j36 VA$

①

$$\phi = \vec{B} \cdot \vec{S} = 0$$

$$\vec{M} = I \vec{S} \times \vec{B}$$

$$|\vec{M}| = I S B = I a^2 \mu B$$

②

$$\vec{B}_A = \vec{B}_1 + \vec{B}_2$$

③

$$\vec{B}_1 = \frac{\mu_0 I_1}{2\pi d} \vec{d} = \frac{\mu_0 I}{2\pi \frac{d}{3}} \vec{d} = \frac{3\mu_0 I}{2\pi d} \vec{d}$$

$$\vec{B}_2 = -\frac{\mu_0 I_2}{2\pi d} \vec{d} = -\frac{\mu_0 2I}{2\pi \frac{4d}{3}} \vec{d} = -\frac{\mu_0 6I}{8\pi d} \vec{d} = -\frac{\mu_0 3I}{4\pi d} \vec{d}$$

$$B_A = \frac{6\mu_0 I}{4\pi d} \vec{d} - \frac{3\mu_0 I}{4\pi d} \vec{d} = \frac{3\mu_0 I}{4\pi d} \vec{d} \quad \boxed{d}$$

③

$$\bar{Y} = \frac{\bar{I}}{\bar{U}} = \frac{2 e^{j15^\circ}}{6 e^{j60^\circ}} = \frac{1}{3} e^{-j45^\circ} = \frac{1}{3} \left(\frac{\sqrt{2}}{2} - j \frac{\sqrt{2}}{2} \right)$$

$$= \frac{\sqrt{2}}{6} (1 - j1) \text{ S}$$

$$\frac{\sqrt{2}}{6} (1 - j1) \quad \boxed{d}$$

④

$$X_L = \omega L = 10 \cdot 10^3 \cdot 10^{-3} = 10 \Omega$$

$$X_C = \frac{1}{\omega C} = \frac{1}{10^3 \cdot 10^{-6} \cdot 200} = \frac{1}{2 \cdot 10^{-1}} = \frac{10}{2} = 5 \Omega$$

$$\bar{U} = \frac{100}{\sqrt{2}} e^{j5/2}$$

$$\bar{Z}_e = \frac{jX_L (R - jX_C)}{R + jX_L - jX_C} =$$

$$\bar{Z}_e = \frac{j10(5 - j5)}{5 + j10 - j5} = \frac{j10(5 - j5)}{5 + j5} = \frac{10(5 + j5)}{5 + j5} = 10$$

$$\bar{I} = \frac{\bar{U}}{\bar{Z}_e} = \frac{100}{\sqrt{2} \cdot 10} e^{j5/2} = \frac{10}{\sqrt{2}} j = 5\sqrt{2} j \quad \boxed{d}$$

⑥

$$I = \frac{U}{\sqrt{4^2 + (8-5)^2}} = \frac{80}{\sqrt{25}} = \frac{80}{5} = 16 \text{ A}$$

$$V = 16 \cdot 5 - 8 \cdot 16$$

$$U = 8 \cdot 16 - 5 \cdot 16 = 3 \cdot 16 = 48 \quad \boxed{d}$$

⑦

$$U_f = E \quad \bar{Z}_f = R + jX = 4 + j3$$

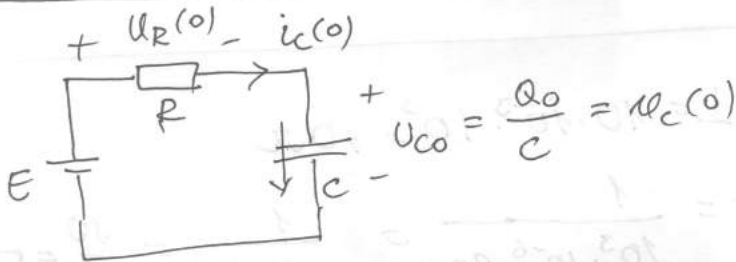
$$I_f = I_R = \frac{E}{\bar{Z}_f} = \frac{10}{5} = 2 \text{ A}$$

$$\bar{S} = 3 \frac{U_f^2}{\bar{Z}_f^*} = 3 \frac{100}{4 - j3} = 3 \cdot \frac{100(4 + j3)}{25} = 12(4 + j3) =$$

$$\bar{S} = 48 + j36 \text{ VA}$$

⑧

⑤



$$u_R(t) = E - u_C(t) = E - \frac{q_0}{c}$$

$$i_C(t) = \frac{u_R(t)}{R} = \frac{E - q_0/c}{R} \quad \boxed{d}$$