

1. Prema oznakama sa slike, vektori jačine električnih polja od naelektrisanja Q_1 i Q_2 su

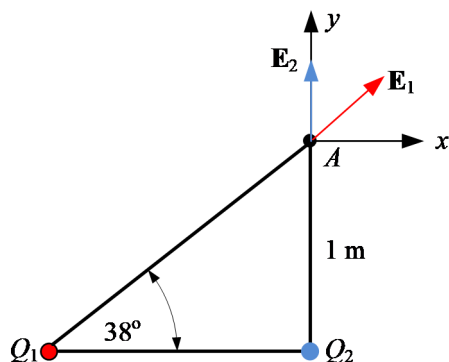
$$\mathbf{E}_1 = \frac{-Q_1}{4\pi\epsilon_0 r^2} (\cos 38^\circ \mathbf{i}_x + \sin 38^\circ \mathbf{i}_y), \quad \mathbf{E}_2 = \frac{Q_2}{4\pi\epsilon_0 1^2} \mathbf{i}_y,$$

gde je $r = \frac{1}{\sin 38^\circ}$. Izraz za intenzitet je

$$|\mathbf{E}| = \frac{1}{4\pi\epsilon_0} \sqrt{\frac{Q_1^2}{r^4} \cos^2 38^\circ + \left(-\frac{Q_1}{r^2} \sin 38^\circ + Q_2\right)^2},$$

odakle se dobija

$$Q_1 \approx -8,8 \text{ nC} \text{ i } Q_2 \approx 2,93 \text{ nC}.$$

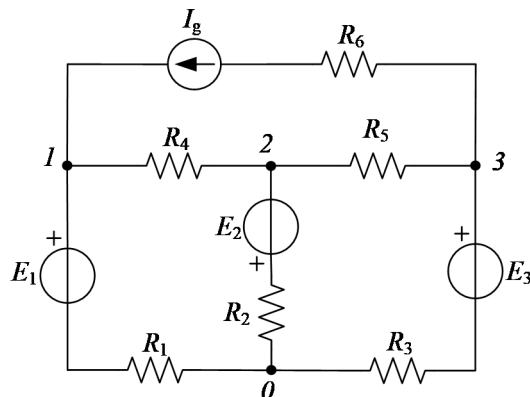


2. Prema numeraciji čvorova sa slike, jednačine po metodu potencijala čvorova su

$$\begin{aligned} \left(\frac{1}{R_1} + \frac{1}{R_4}\right) V_1 - \frac{1}{R_4} V_2 &= \frac{E_1}{R_1} + I_g \\ -\frac{1}{R_4} V_1 + \left(\frac{1}{R_2} + \frac{1}{R_4} + \frac{1}{R_5}\right) V_2 - \frac{1}{R_5} V_3 &= -\frac{E_2}{R_2} \\ -\frac{1}{R_5} V_2 + \left(\frac{1}{R_3} + \frac{1}{R_5}\right) V_3 &= \frac{E_3}{R_3} - I_g. \end{aligned}$$

Odavde se rešavanjem sistema dobija $V_1 = 20 \text{ V}$, $V_2 = 10 \text{ V}$ i $V_3 = -20 \text{ V}$, pa je snaga idealnog naponskog generatora

$$P_{E_2} = E_2 I_2 = E_2 \frac{V_2 + E_2}{R_2} = 1200 \text{ mW}.$$



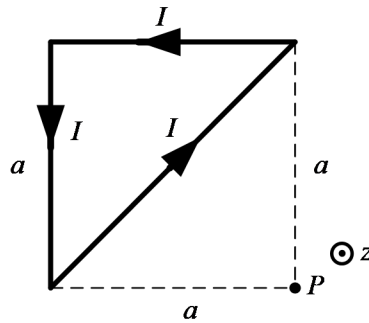
3. Za usvojenu z -osu kao na slici, dobija se

$$\mathbf{B}_1 = \mathbf{B}_2 = \frac{\mu_0 I}{4\pi a} \frac{\sqrt{2}}{2} \mathbf{i}_z$$

$$\mathbf{B}_3 = \frac{2\mu_0 I}{4\pi a} (-\mathbf{i}_z).$$

Odavde je

$$\mathbf{B} = \mathbf{B}_1 + \mathbf{B}_2 + \mathbf{B}_3 = \frac{\mu_0 I}{4\pi a} (\sqrt{2} - 2) \mathbf{i}_z = -23,4 \mathbf{i}_z \text{ nT}.$$



4. U kompleksnom domenu je, uz zadati uslov:

$$\bar{I}_L = I$$

$$\bar{I}_1 = \frac{\bar{U}}{j\omega L} + \frac{\bar{U}}{-j\frac{1}{\omega C}} = -\frac{\bar{U}}{j\omega L} = -\frac{j\omega L \bar{I}_L}{j\omega L} = -I,$$

pa je

$$i(t) = -I\sqrt{2} \cos \omega t.$$