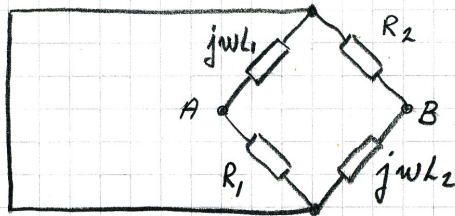


81.13

a) THE INTERNAL IMPEDANCE Z_i . RESET E .



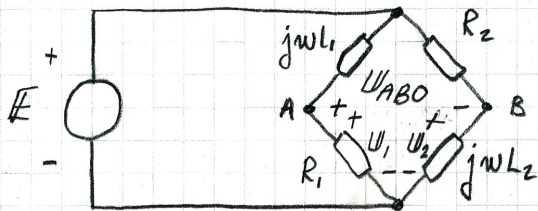
$$\begin{aligned} L_1 &= 1 \text{ mH} \\ L_2 &= 1 \text{ mH} \\ R_1 &= 2 \Omega \\ R_2 &= 2 \Omega \\ \omega &= 2000 \pi \frac{\text{RAD}}{\text{s}} \end{aligned}$$

BETWEEN A AND B WE'VE GOT

$$Z_i = \frac{j\omega L_1 \cdot R_1}{j\omega L_1 + R_1} + \frac{j\omega L_2 \cdot R_2}{j\omega L_2 + R_2} \Rightarrow$$

$$Z_i = \dots = \frac{j4\pi}{1 + j\pi} = \dots \approx 3,8 \cdot e^{j17,7^\circ} \Omega$$

b) THE OPEN CIRCUIT VOLTAGE U_{ABO} .



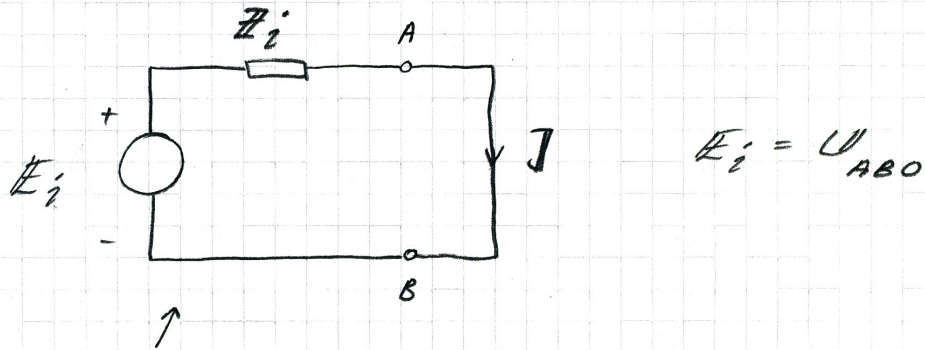
$$\begin{aligned} e(t) &= 10\sqrt{2} \sin(\omega t + 0) \text{ V} \\ E &= 10\sqrt{2} \cdot e^{j0} \text{ V} \end{aligned}$$

$$U_{ABO} = U_1 - U_2 = E \cdot \frac{R_1}{R_1 + j\omega L_1} - E \cdot \frac{j\omega L_2}{R_2 + j\omega L_2} \Rightarrow$$

VOLTAGE DIVIDING

$$U_{ABO} = \dots = 10\sqrt{2} \left(\frac{1 - j\pi}{1 + j\pi} \right) = \dots \approx 10\sqrt{2} \cdot e^{-j144,7^\circ} \text{ V}$$

c) THE SHORT CIRCUIT CURRENT BETWEEN A & B.



A THÉVENIN'S EQUIVALENT FOR THE GIVEN CIRCUIT.

$$J = \frac{E_i}{Z_i} \Rightarrow J = \frac{10\sqrt{2} \cdot e^{-j144.7^\circ}}{3.81 \cdot e^{j17.7^\circ}} \approx 2.6\sqrt{2} \cdot e^{-j162.4^\circ} \text{ A}$$

$$\underline{i(t) \approx 2.6\sqrt{2} \sin(2000\pi t - 162^\circ) \text{ A}}$$

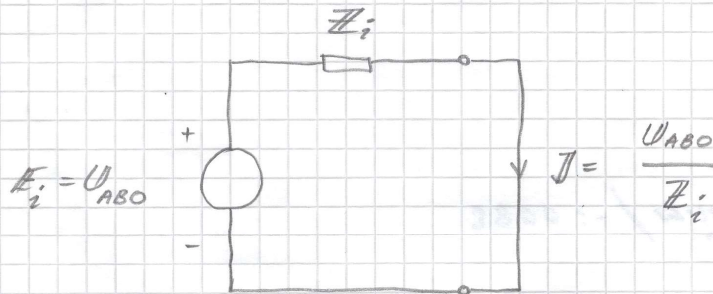
Lösning där beräkningarna visas mer detaljerat:

B1, 13 a)

$$\begin{aligned} Z_i &= \frac{j4\pi}{j2\pi + 2} + \frac{j4\pi}{j2\pi + 2} = \\ &= \frac{j8\pi}{2 + j2\pi} = \frac{8\pi \cdot e^{j90^\circ}}{\sqrt{2^2 + (2\pi)^2} \cdot e^{j\arctan \frac{2\pi}{2}}} = \\ &= \frac{8\pi \cdot e^{j90^\circ}}{6,59 e^{j72,3^\circ}} \approx 3,81 \cdot e^{j17,7^\circ} \Omega \end{aligned}$$

$$\begin{aligned} b) \quad U_{ABO} &= U_1 - U_2 = 10\sqrt{2} \cdot e^{j0^\circ} \cdot \frac{2}{2 + j2\pi} - 10\sqrt{2} \cdot e^{j0^\circ} \cdot \frac{j2\pi}{2 + j2\pi} = \\ &= 10\sqrt{2} \cdot \left(\frac{2 - j2\pi}{2 + j2\pi} \right) = 10\sqrt{2} \cdot \frac{6,59 \cdot e^{-j72,3^\circ}}{6,59 \cdot e^{j72,3^\circ}} = \\ &= 10\sqrt{2} \cdot e^{-j144,6^\circ} \text{ V} \end{aligned}$$

c)



$$I = \frac{10\sqrt{2} \cdot e^{-j144,6^\circ}}{3,81 \cdot e^{j17,7^\circ}} \approx 2,62\sqrt{2} e^{-j162,3^\circ} \text{ A}$$

$$\rightarrow i(t) \approx 2,6\sqrt{2} \sin(2000\pi t - 162^\circ) \text{ A}$$