

Home Assignment 6

IE1206 Embedded Electronics

Emil Ståhl

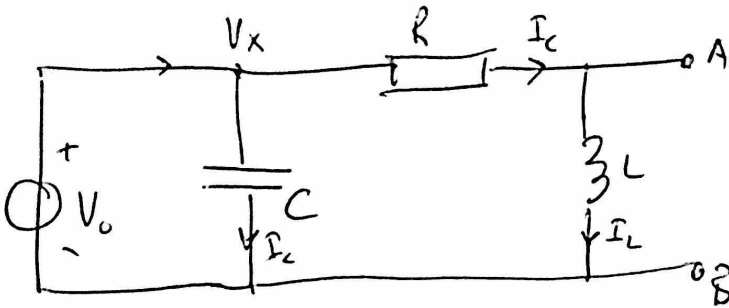
PROBLEM 2.

$$V_o = 5 \cos(\omega t + 30^\circ) \text{ V}$$

$$R = 100 \, \Omega$$

$$C = 10 \, \text{nF}$$

$$L = 100 \, \mu\text{H}$$



$$\frac{V_c}{R} = \frac{V_o - V_x}{R} \Rightarrow V_x \cdot \frac{1}{R} = (V_o - V_x) \frac{1}{R} \Rightarrow V_o \cdot \frac{1}{R} = V_x \cdot \frac{1}{R} - V_o \cdot \frac{1}{R}$$

$$V_o \cdot \frac{1}{R} \cdot V_o \cdot \frac{1}{R} = V_o \cdot \frac{1}{R} \Rightarrow V_x = \frac{-V_o \cdot \frac{1}{R}}{\frac{1}{R} - \frac{1}{R}} = V_o \cdot \frac{1}{R}$$

$$= 100 \angle 90^\circ \quad V_c = 5 \angle 30^\circ$$

$$V_x = \frac{V_o \cdot \frac{1}{R}}{\frac{1}{R} + \frac{1}{R}} = \frac{600 \angle 90^\circ (5 \angle 30^\circ)}{-100 + (100 \angle 120^\circ)} = \frac{500 \angle 120^\circ}{100 + 100 \angle 96^\circ}$$

$$\cos 120 = -\frac{1}{2} \quad \sin(120) = \frac{\sqrt{3}}{2} \Rightarrow 500 \angle -\frac{1}{2} + \frac{\sqrt{3}}{2} = 500 \angle 30 \sqrt{3}$$

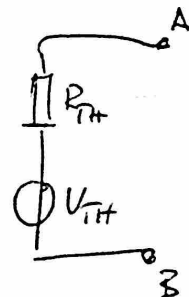
$$V_{TH} = \frac{-500 \angle 30 \sqrt{3}}{-100 \angle 300 \angle 96^\circ} = \frac{(-5 + 5 \cdot \sqrt{3})}{(-2 + 2j)} = \frac{-10 \cdot 10j \cdot 10j \cdot \sqrt{3} \cdot 10 \sqrt{3}}{3}$$

$$\Rightarrow 0,92 - 3,42j = V_{TH}$$

$$V_{TH} = A \cos(\omega t + \phi^\circ) \quad A = \sqrt{0,92^2 + (-3,42)^2} = 3,59 \quad \phi = \frac{3,42}{0,92} = 95^\circ$$

$$V_{TH} = 3,59 \cos(10^\circ + 95^\circ)$$

$$R_{TH} \Rightarrow R_{TH} = \frac{1}{\frac{1}{2C} \cdot \frac{1}{R}} = \frac{1}{\frac{R+2C}{2 \cdot R}} = \frac{2 \cdot R}{R+2C} = \frac{j\omega t \cdot R}{R+j\omega t} = \frac{10000j}{100j+900}$$



$$R_{TH} = \frac{10000j}{100j+900}$$

$$V_{TH} = 3,59 \cos(10^\circ + 95^\circ)$$