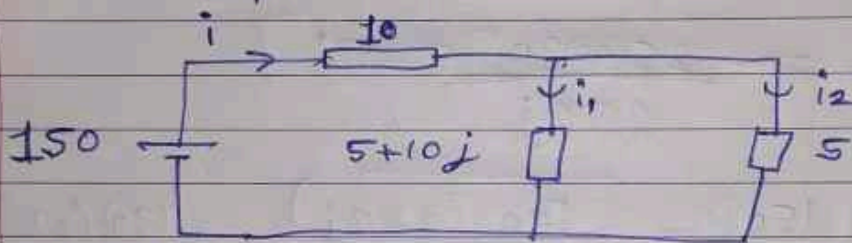


Simulink 22 Problem Statement  
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 Electronics (ECE)

①  $X_L = j\omega L = sL$   $\omega = 1000 = 10^3$   
 $\therefore V = 150 \sin(1000t) V$   
 $j\omega L = 10^3 \times 10^{-2} \times j = 10j$

Converting to phasor domain



We know that

$$i_1 = \left[ \frac{(5+10j)}{(5+10j) + (5)} \right] (i)$$

$$i_2 = \left[ \frac{(5)}{(5) + (5+10j)} \right] (i)$$

Where  $i$  is the current in the main branch.

$$\& V = i Z$$

$$\frac{150}{Z} = i$$

$$Z = 10 +$$

$$\frac{1}{\frac{1}{5} + \frac{1}{5+10j}}$$

$$Z = 10 + \frac{(5)(5+10j)}{10+10j}$$

$$10 + \frac{5+10j}{2+2j}$$

$$\frac{20+20j + 5+10j}{2+2j}$$

$$Z = \frac{25+30j}{2+2j}$$

$$i = \frac{150}{Z} = \frac{150(2+2j)}{25+30j} \rightarrow \frac{(30)(2)(1+j)}{5+6j}$$

$$i = (60) \frac{(1+j)(5-6j)}{5^2+6^2} \quad \begin{array}{r} 36 \\ 25 \\ \hline 61 \end{array}$$

$$i = \frac{60}{61} [5+6-6j+5j]$$

$$i = \frac{60}{61} [11-j]$$

$$i_1 = \left[ \frac{5+10j}{10+10j} \right] i = \left[ \frac{1+2j}{2+2j} \right] i$$

$$i_1 = \frac{(1+2j)(2-2j)}{8} i$$

$$i_1 = \left[ \frac{2+4+\cancel{4j}-2j}{8} \right] i$$



$$i_1 = \left( \frac{6+2j}{8} \right) \left( \frac{60}{61} \right) [11-j]$$

$$\frac{1}{4} \frac{60}{61} (3+j)(11-j)$$

$$\left( \frac{15}{61} \right) (33+1+11j-3j)$$

$$i_1 = \frac{15}{61} (34+8j)$$

$$i_1 = \left( \frac{30}{61} \right) (17+4j)$$

$$|i_1| = \frac{30}{61} \sqrt{17^2 + 4^2} \quad \begin{array}{r} \sqrt{289+16} \\ \downarrow \\ \sqrt{305} \\ \downarrow \\ 17.46 \end{array}$$

$$|i_1| = 8.58$$

$$\angle i_1 \Rightarrow \tan^{-1} \left( \frac{4}{17} \right) = 13.24^\circ$$

$$\therefore \cancel{i_1} = i_1 = 8.58 \cos(\omega t + 13.24^\circ)$$

$$i_1 = 8.58 \cos(1000t + 13.24^\circ)$$

$$\& i_2 = \frac{5}{10+10j} i \Rightarrow \frac{1}{2} \frac{1}{1+j} i$$

$$\frac{1}{2} \frac{1-j}{2} i \Rightarrow \frac{1}{4} (1-j) i$$

$$i_2 = \frac{1-j}{4} \cdot \frac{60}{61} [11-j]$$

$$\frac{15}{61} [11 - 1 - 11j - j]$$

$$\frac{15}{61} [10 - 12j]$$

$$I_2 = \frac{30}{61} [5 - 6j]$$

$$|i_2| = \frac{30}{61} \sqrt{5^2 + 6^2}$$

$$\frac{36}{61}$$

$$\frac{30}{61} \sqrt{61} \rightarrow \frac{30}{\sqrt{61}} = 3.8411$$

$$\angle \theta_{i_2} \Rightarrow \tan^{-1} \left( -\frac{6}{5} \right) = -50.19^\circ$$

$$i_2 = 3.84 \cos(1000t - 50.19^\circ)$$

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