

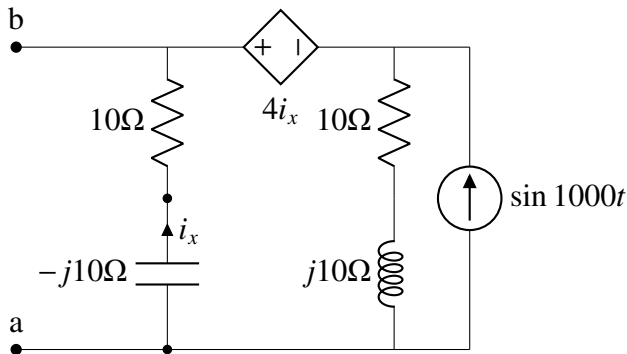
GATE: 51.2023

EE22BTECH11005- Ambati Krishna Kaustubh*

Question: For the circuit shown, if $i = \sin 1000t$, the instantaneous value of the Thevenin's voltage (in volts) across the terminals a and b at time $t=5\text{ms}$ is

Applying KVL we get,

$$10\angle 45^\circ - (j\omega L)I_x - 10I_x + 4I_x - 10I_x - \left(\frac{1}{j\omega C}\right)I_x = 0 \quad (1)$$



$$I_x = \frac{10\angle 45^\circ}{16 + j\omega L + \frac{1}{j\omega C}} \quad (2)$$

$$V_{ab} = I_x \left(10 + \frac{1}{j\omega C}\right) \quad (3)$$

$$V_{ab} = \frac{10\angle 45^\circ (10j\omega C + 1)}{16j\omega C - \omega^2 LC + 1} \quad (4)$$

From the question we can observe that,

$$\frac{1}{\omega C} = \omega L \quad (5)$$

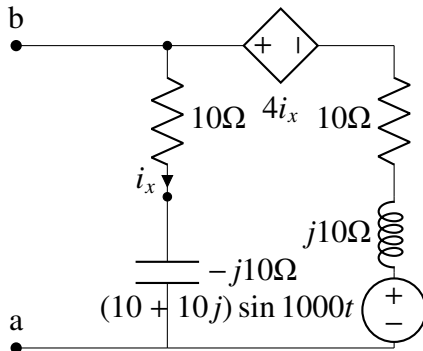
$$\omega^2 LC = 1 \quad (6)$$

Substituting ?? and values of ωC and ωL

$$V_{ab} = 12.5\angle 0^\circ \quad (7)$$

$$V_{ab} = 12.5 \sin 1000t \quad (8)$$

Solution: By source transforming the given circuit we get



Solving using sinusoidal steady state analysis,

