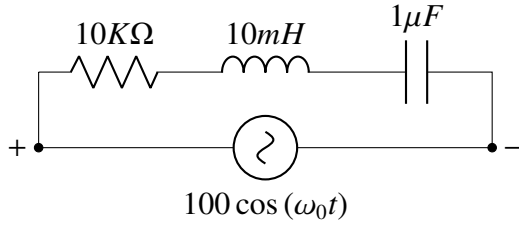


GATE-2023 BM Q-42

EE23BTECH11207 -KAILASH.C*

In the circuit shown below, it is observed that the amplitude of voltage across the resistor is the same as the amplitude of the source voltage. What is the angular frequency ω_0 (in rad/s)?

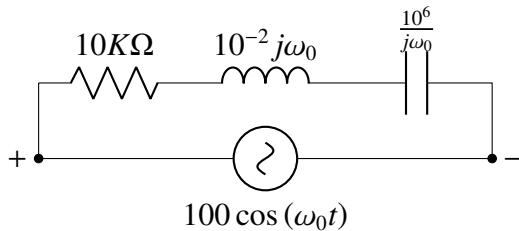


- (A) 10^4
 (B) 10^3
 (C) $10^3\pi$
 (D) $10^4\pi$

Solution:

Symbols	Parameters	Value
R	Resistance	$10K\Omega$
L	Inductance	$10mH$
C	Capacitance	$1\mu F$
ω_0	Angular Frequency	
V_s	Source Voltage	

TABLE 0
PARAMETER TABLE



From question, we get:

$$V_R = V_s \quad (1)$$

Using KVL:

$$V_s = V_R + V_C + V_L \quad (2)$$

By using (1) in (2):

$$V_C = -V_L \quad (3)$$

$$X_C = -X_L \quad (4)$$

$$\frac{10^6}{j\omega_0} = -10^{-2} j\omega_0 \quad (5)$$

$$\frac{10^6}{10^{-2}} = -j^2 \omega_0^2 \quad (6)$$

$$\omega_0^2 = 10^8 \quad (7)$$

$$\omega_0 = 10^4 \text{ rad/s} \quad (8)$$