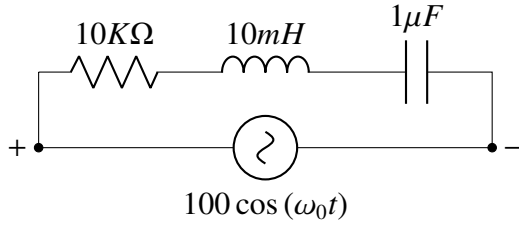# GATE-2023 BM Q-42

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 sorce voltage. What is the angular frequency ω_0(in rad/s)?
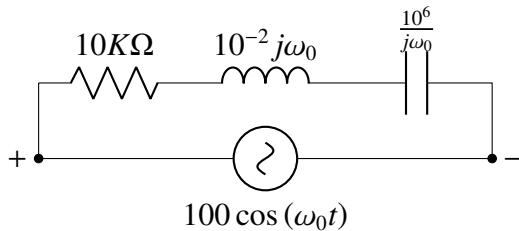

$$100\cos(\omega_0 t)$$

(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

$$100\cos(\omega_0 t)$$

From question,we get:

$$V_R = V_s \tag{1}$$

Using KVL:

$$V_s = V_R + V_C + V_L \tag{2}$$

By using (**??**) in (**??**):

$$V_C = -V_L \tag{3}$$

$$X_C = -X_L \tag{4}$$

$$\frac{10^6}{j\omega_0} = -10^{-2}j\omega_0 \tag{5}$$

$$\frac{10^6}{10^{-2}} = -j^2\omega_0^2 \tag{6}$$

$$\omega_0^2 = 10^8 \tag{7}$$

$$\omega_0 = 10^4 rad/s \tag{8}$$