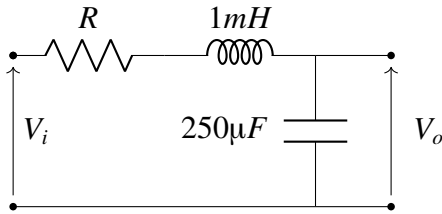# GATE 2021 EE.20

EE23BTECH11010 - VENKATESH BANDAWAR*

Question: The Bode magnitude plot for the transfer function $\frac{V_o(s)}{V_i(s)}$ of the circuit is as shown. The value of R is _____ Ω. (GATE 2021 EE Q20)
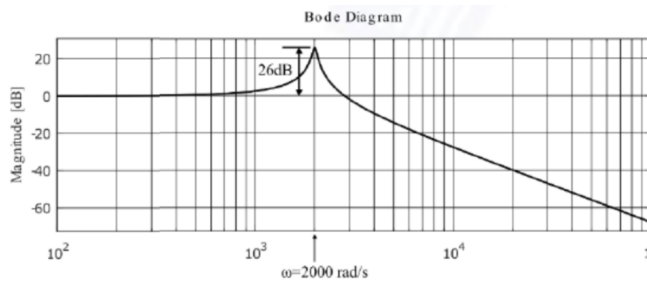

Bode Diagram

Magnitude in bode plot $= 20 \log |T(s)|$
Substitute $s = j\omega$, From given graph at $\omega = 2000 rad/s$

$$26 = 20 \log \left| \frac{-2j}{R - 2j + 2j} \right| \tag{5}$$

$$1.3 = \log \frac{2}{R} \tag{6}$$

$$R = 0.1\Omega \tag{7}$$

Solution:

Parameter	Description	Value
C	Capacitance	$250\mu F$
L	Inductor	$1mH$
I	Current	
Z	Impedence	
$T(s)$	Transfer Function	$\frac{V_o(s)}{V_i(s)}$
ω_0	Resonant frequency	

TABLE I: Given Parameters table

$$\therefore Z = R + \frac{1}{j\omega c} + j\omega L \tag{1}$$

$$= R + \frac{4000}{j\omega} + j\omega 10^{-3} \tag{2}$$

$$V_o = V_i \frac{X_c}{Z} \tag{3}$$

$$\frac{V_o}{V_i} = \frac{\frac{4000}{j\omega}}{R + \frac{4000}{j\omega} + j\omega 10^{-3}} \tag{4}$$