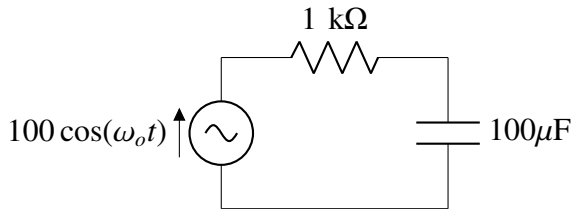


Gate Assignment

EE:1205 Signals and Systems
Indian Institute of Technology, Hyderabad

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Question: In the circuit shown below, the amplitudes of the voltage across the resistor and the capacitor are equal. What is the value of the angular frequency ω_o (in rad/s)? (Round off the answer to one decimal place.) (GATE BM 32 2023)



Solution:

Parameter	Value	Description
R	$1 \text{ k}\Omega$	Resistance
C	$100 \mu\text{F}$	Capacitance
ω_o	?	Angular Frequency
$Z_R = R$	10^3	Impedance for resistor
$Z_C = \frac{1}{j\omega_o C}$	$\frac{10^{-6}}{j\omega_o}$	Impedance for capacitor

TABLE 1
PARAMETER TABLE

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

$$\Rightarrow |Z_R| = |Z_C| \quad (2)$$

$$\Rightarrow R = \left| \frac{1}{j\omega_o C} \right| \quad (3)$$

$$\Rightarrow \omega_o = \frac{1}{RC} \quad (4)$$

$$\Rightarrow \omega_o = \frac{1}{(1 \text{ k}\Omega)(100 \mu\text{F})} \quad (5)$$

$$\therefore \omega_o = 10.0 \quad (6)$$