

# GATE -BM 16

EE23BTECH11057 - Shakunaveti Sai Sri Ram Varun

**Question:** For the circuit given below, choose the angular frequency  $\omega_0$  at which voltage across capacitor has maximum amplitude?

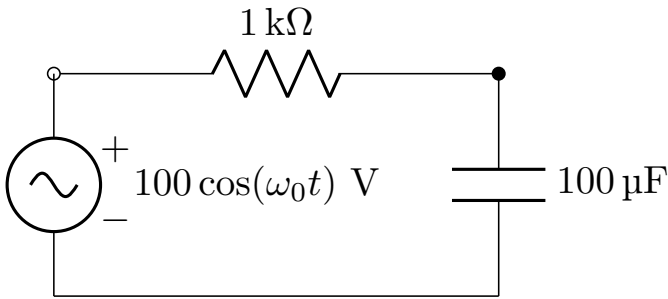


Fig. 1. circuit

- (A) 1000
- (B) 100
- (C) 1
- (D) 0

(GATE BM 2023)

**Solution:**

$$V_c(s) = \frac{V_1(s) \frac{1}{sC}}{R + \frac{1}{sC}} \quad (1)$$

$$\Rightarrow H(s) = \frac{1}{1 + sRC} \quad (2)$$

$$\therefore H(j\omega) = \frac{1}{1 + j\omega RC} \quad (3)$$

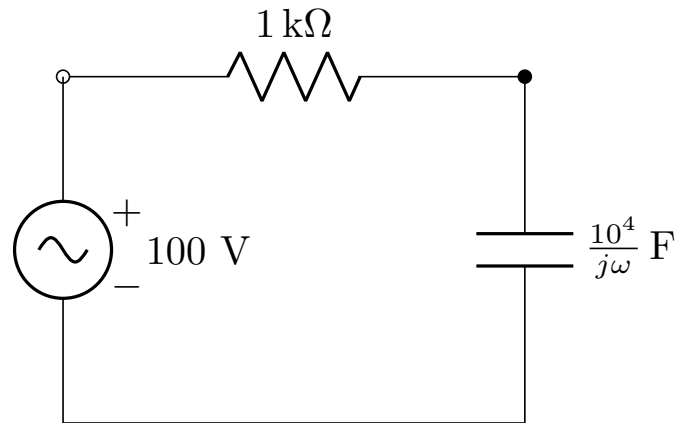


Fig. 2. circuit in  $\omega$ -domain

$$|v_c(t)| \propto |H(j\omega)| \quad (4)$$

$$|H(j\omega)| = \frac{1}{\sqrt{1 + (\omega RC)^2}} \quad (5)$$

Maximum value of  $H(j\omega)$  occurs at  $\omega = 0$

$$\therefore \omega_o = 0 \quad (6)$$

Parameter	Description	Value
$V_i(s)$	Input voltage	$\frac{100s}{s^2 + \omega_o^2}$
$v_c(t)$	Potential difference across Capacitor	?
$V_c(s)$	Potential difference across Capacitor	$V_c(s)$
$H(s)$	Transfer function	$\frac{V_c(s)}{V_i(s)}$
$V_o$	Amplitude of input voltage	100 V
$R$	Resistance in circuit	1 k $\Omega$
$C$	Capacitance in circuit	100 $\mu$ F
$\omega_o$	angular frequency of input voltage	$\omega_o$

TABLE I

INPUT VALUES