GATE -BM 16

EE23BTECH11057 - Shakunaveti Sai Sri Ram Varun

Question: For the circuit given below, choose the angular frequency ω_0 at which voltage across capacitor has maximum amplitude?

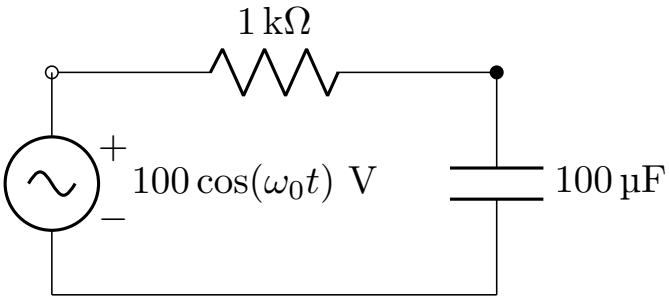

Fig. 1. circuit

(A) 1000

(B) 100

(C) 1

(D) 0

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Solution:

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

$$\implies H(s) = \frac{1}{1 + sRC} \tag{2}$$

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

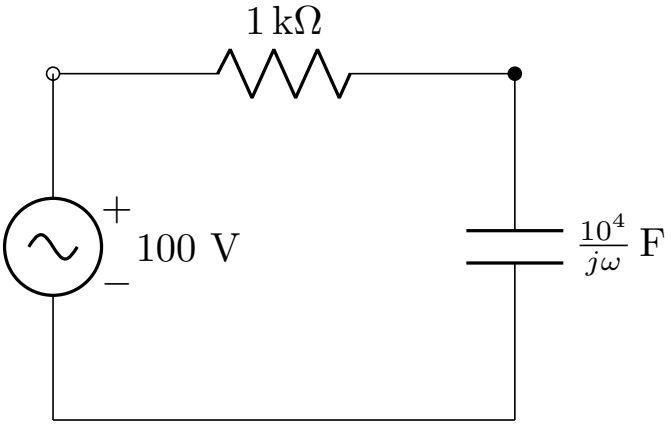

Fig. 2. circuit in ω-domain

$$|H(j\omega)| = \frac{1}{\sqrt{1 + (\omega RC)^2}} \tag{4}$$

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

$$\therefore \omega_o = 0 \tag{5}$$

Parameter	Description	Value
$v_i(t)$	Input voltage in circuit	$100\cos(\omega_o t)$ Volts
$v_c(t)$	Potential difference across Capacitor in time domain	?
$V_i(s)$	Input voltage	$\frac{100s}{s^2+\omega_o^2}$
$V_c(s)$	Potential difference across Capacitor	$V_c(s)$
$H(s)$	Transfer function	$H(s)$
V_o	Amplitude of input voltage	100 Volts
R	Resistance in circuit	1 kΩ
C	Capacitace in circuit	100 µF
ω_o	angular frequency of input voltage	ω_o

TABLE I
INPUT VALUES