

# GATE 2022-PH

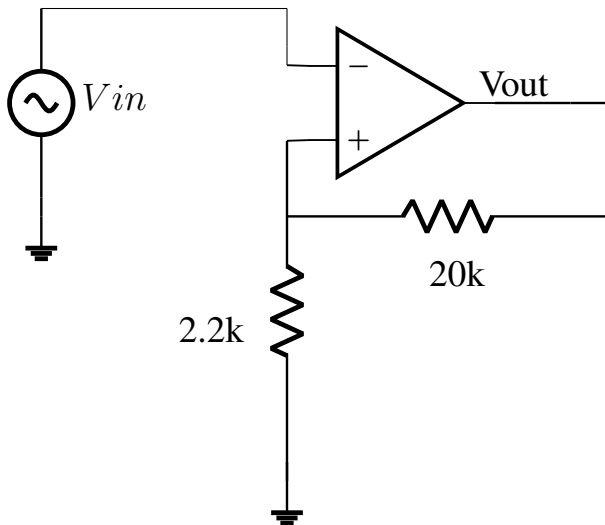
EE23BTECH1205 - Avani Chouhan\*

Parameter	Value	description
$V_{in}$	$1.5 \sin(20\pi t)$	Non-inverting/inverting input terminal
$V_{sat}$	$\pm 10 \text{ V}$	saturation voltage
$V_o$	?	output voltage of the op-amp
$I_1$	$\frac{-1.5 \sin(20\pi t)}{2.2 \text{ k}\Omega}$	
$I_2$	$\frac{-1.5 \sin(20\pi t)}{2.2 \text{ k}\Omega}$	

TABLE 0  
INPUT PARAMETERS

## Question : 11

For the Op-Amp circuit shown below, choose the correct output waveform corresponding to the input  $V_{in} = 1.5 \sin(20\pi t)$  (in Volts). The saturation voltage for this circuit is  $V_{sat} = \pm 10 \text{ V}$ .



- (A)
- (B)
- (C)
- (D)

$$V_{in} = 1.5 \sin(20\pi t) \quad (1)$$

$$V_{sat} = \pm 10 \text{ V} \quad (2)$$

$$I_1 = I_2 \quad (3)$$

$$\frac{0 - V_{in}}{2.2 \text{ k}\Omega} = \frac{V_{in} - V_o}{20 \text{ k}\Omega} \quad (4)$$

$$\frac{-20}{2.2} = \frac{V_{in} - V_o}{V_{in}} \quad (5)$$

$$\frac{-20}{2.2} = 1 - \frac{V_o}{V_{in}} \quad (6)$$

$$\frac{V_o}{V_{in}} = 1 + \frac{20}{2.2} \quad (7)$$

$$V_o \sim 10V_{in} \quad (8)$$

$$V_o = 10 \times 1.5 \sin(20\pi t) \quad (9)$$

Output amplitude is greater than  $V_{sat}$ , so the voltage saturates at  $V_{sat}$ .  
Therefore, correct answer is (A).

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**Solution:**

