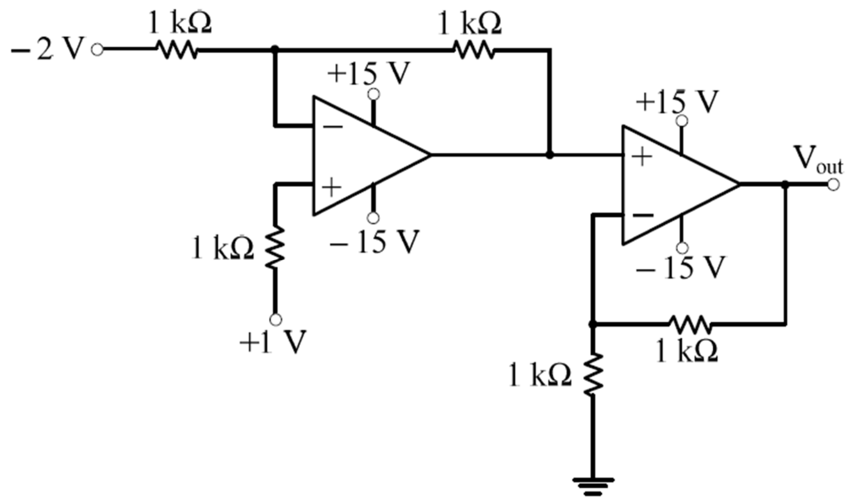
[Q] In the circuit shown below the op-amps are ideal. Then V_{out} in Volts is

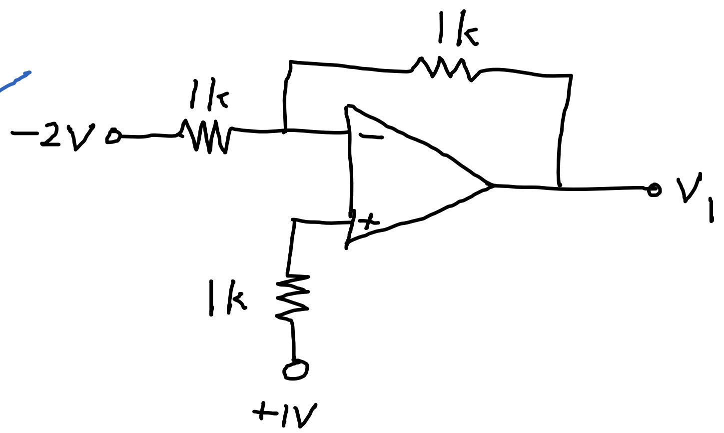


(A) 4 (B) 6 (C) 8 (D) 10

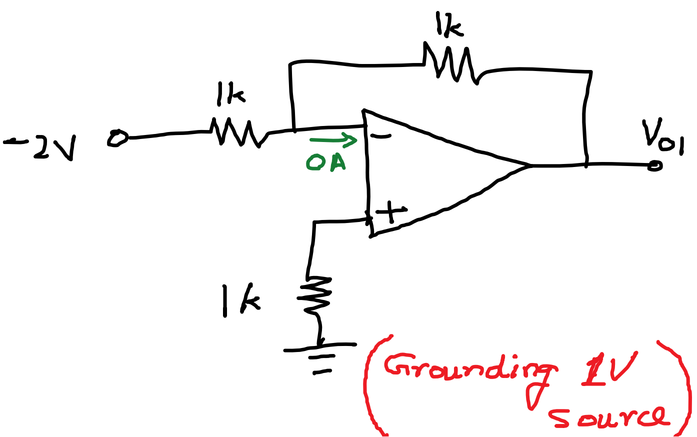
Ans: Here, the output of the first op-amp is given as the input to the second op-amp.

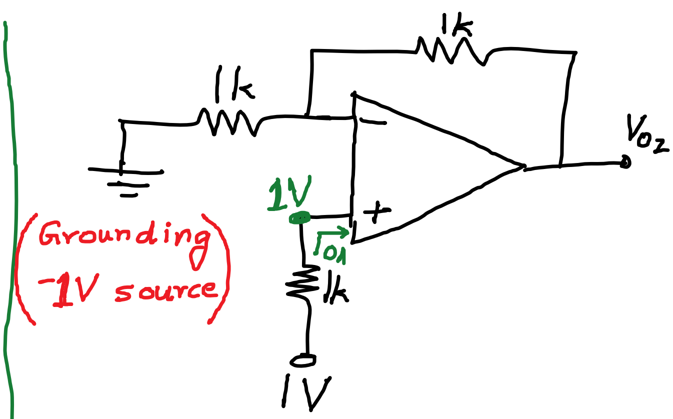
Considering the first op-amp alone

Opamp-1



Here V_1 can be found out using superposition theorem as:





$V_{01} = -2\left(\frac{-1k}{1k}\right) = 2V$

(inverting configuration)

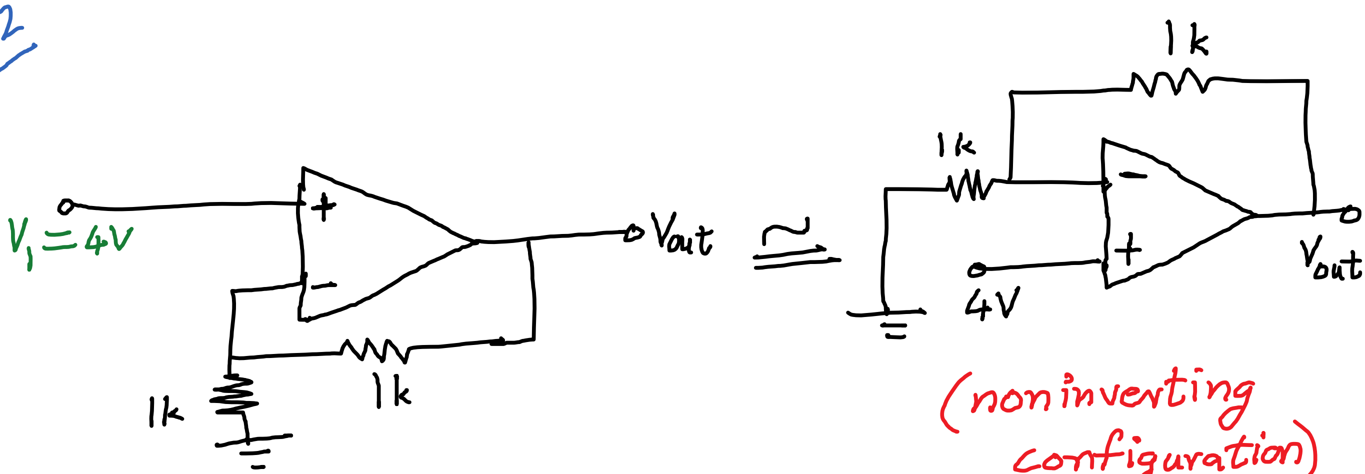
$V_{02} = 1\left[1+\frac{1k}{1k}\right] = 2V$

(noninverting configuration)

$V_1 = V_{01} + V_{02} = 2V + 2V = \underline{\underline{4V}}$

The input to the second op-amp is V_1

Opamp-2

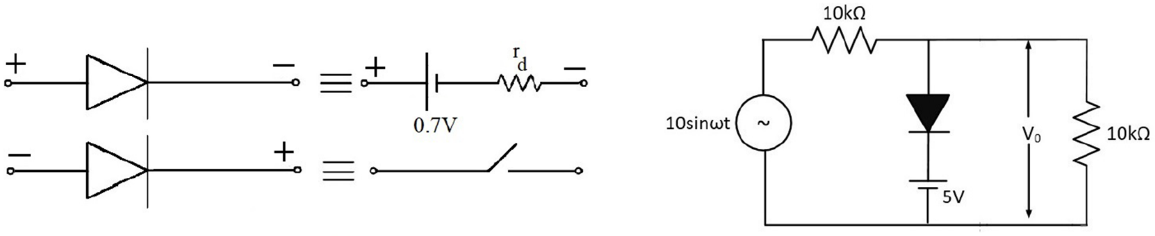


(noninverting configuration)

$\therefore V_{out} = 4\left[1+\frac{1}{1}\right] = \underline{\underline{8V}}$

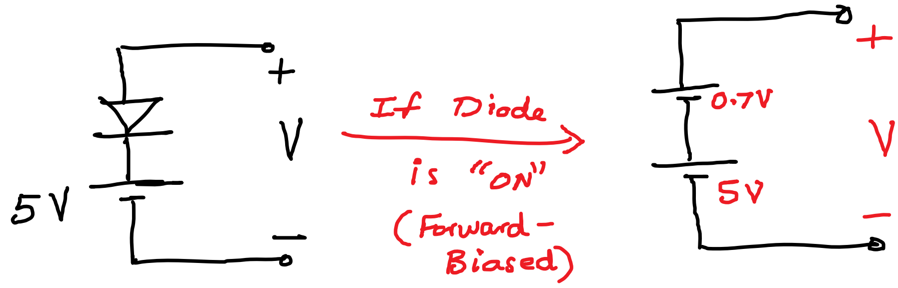
Answer: (c)

[Q] The equivalent circuits of a diode, during forward and reverse biased conditions are shown in figure (a). Here, r_d is the forward dynamic resistance of the diode. If such a diode is used in the clipper circuit of figure (b), sketch the output voltage (V_o).

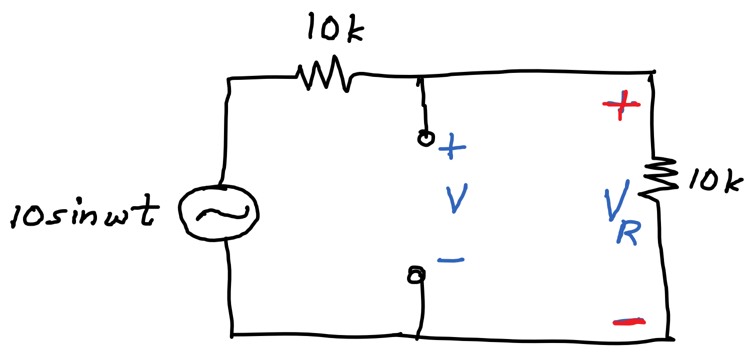


(a) (b)

Ans: Consider the diode along with 5V source together



From the figure, we know that for the Diode to be "ON", the voltage V must exceed 5.7V (to overcome the battery voltage 5V and diode forward voltage 0.7V).



$\Longrightarrow$ From the figure, we find that the voltage V (considered previously) is same as V_R.

i.e, $V = V_R = V_{10k} = (10\sin\omega t) \times \dfrac{10k}{10k + 10k}$

(voltage-division rule)

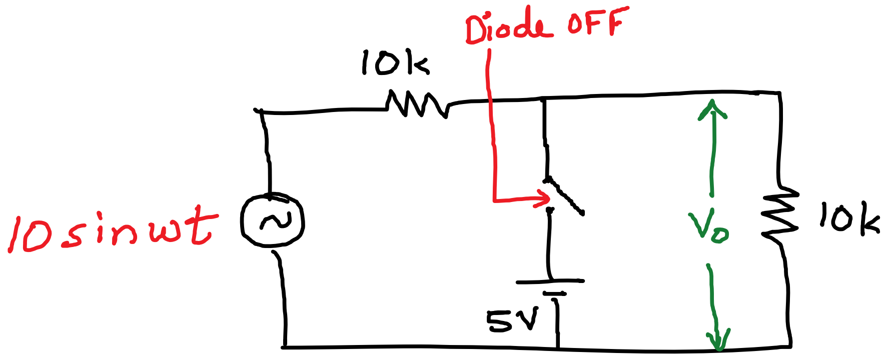
$$V = V_R = 10 \sin \omega t \times \frac{1}{2} = 5 \sin \omega t$$

$$V = V_R = 5 \sin \omega t \quad \text{—— (1)}$$

i.e, the voltage V_R (across $10k\Omega$ resistor) as given in equation (1) must exceed $5 \cdot 7$ V for the Diode to become "ON" (forward biased).

The maximum and minimum values of V are $+5$ V and -5 V respectively $(\because -1 \le \sin \omega t \le +1)$

Hence the diode never becomes "on" (forward biased). The circuit may be redrawn as:



$\therefore V_o$ is given by

$$V_o = 10 \sin \omega t \times \frac{10k}{10k + 10k} = \underline{5 \sin \omega t}$$

(voltage-division rule)