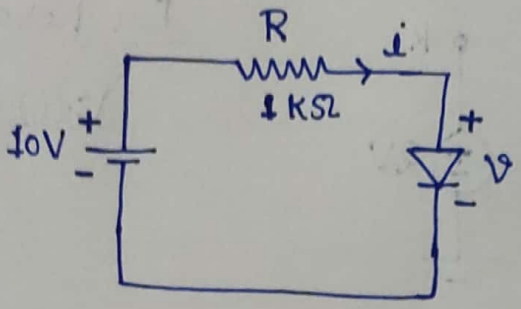
Q.1: For the given circuit, i-v characteristics are

$$i = \begin{cases} 0 \; ; \; v < 0.7V \\ \frac{v - 0.7}{500} \; A \; ; \; v \geq 0.7V. \end{cases}$$




Find Current i?

Sol:

$$i = \frac{10 - v}{R}$$

$$i = \frac{10 - v}{1000} \quad — ①$$

$$i = \frac{v - 0.7}{500} \quad — ②$$

From ① & ②,

$$v = \frac{11.4}{3} \quad — ③$$

From ① & ③,

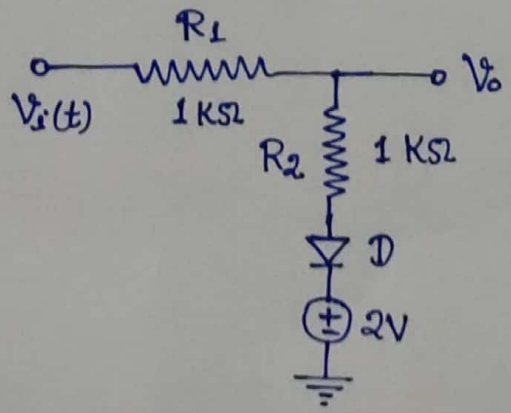
$$i = \frac{10 - \frac{11.4}{3}}{1000}$$

$$= \frac{30 - 11.4}{1000}$$

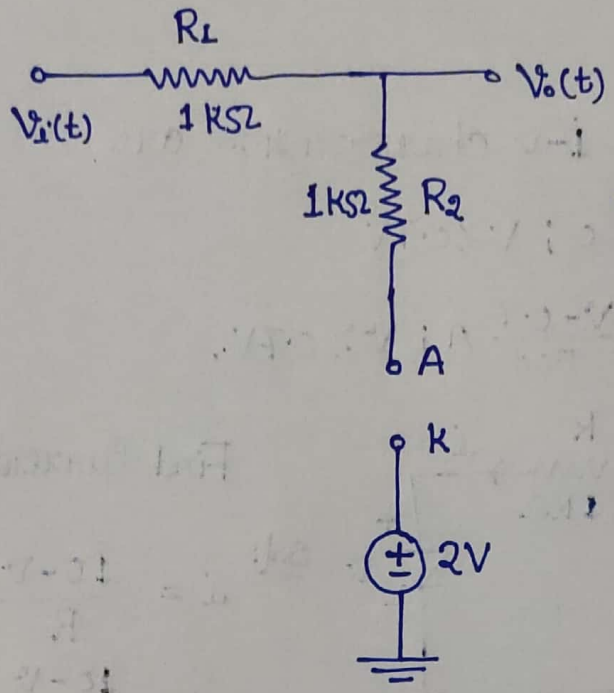
$$= \frac{18.6}{1000 \times 3}$$

$$= 6.2 \text{ mA}$$

Q.2: The diode in the given circuit has cut-in voltage 0.7V. ~~but~~ If $V_i(t) = 5 \sin \omega t$ V, the minimum and the maximum values of $V_o$ (in Volts) are ?



Sol:- Step 1:




For Forward Bias

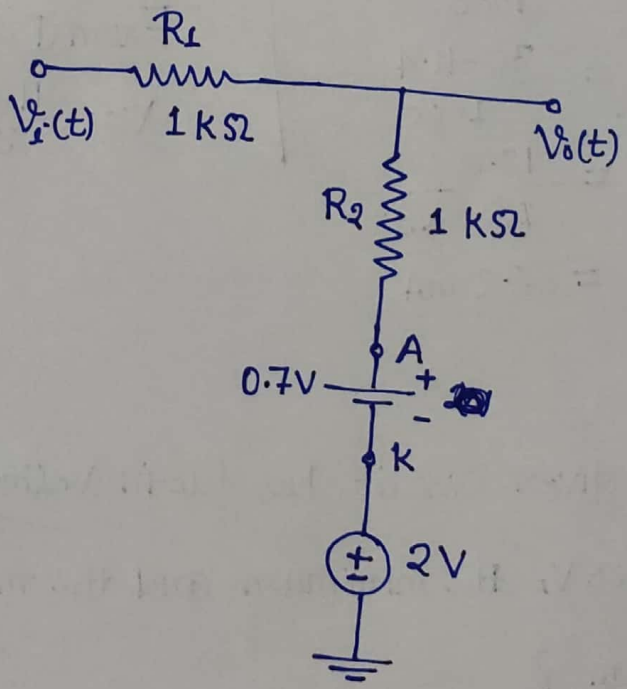
$V_i(t) - 2 > 0.7$

or $V_i(t) > 2.7V$

For Reverse Bias

$V_i(t) \leq 2.7V$

Step2: When diode is Forward Bias



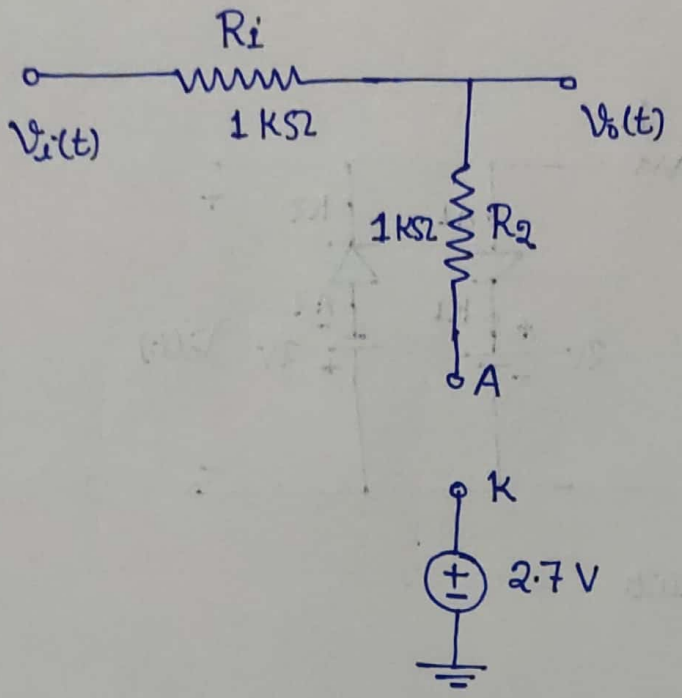

$\{V_o(t)\}_{max} = 2.7 + \frac{2.3}{2}$

$= 2.7 + 1.15$

$= 3.85V$

$\{V_o(t)\}_{min} = 2.7V$

Step 3: When diode D is in reverse bias




$\{V_o(t)\}_{max} = 2.7\ V$

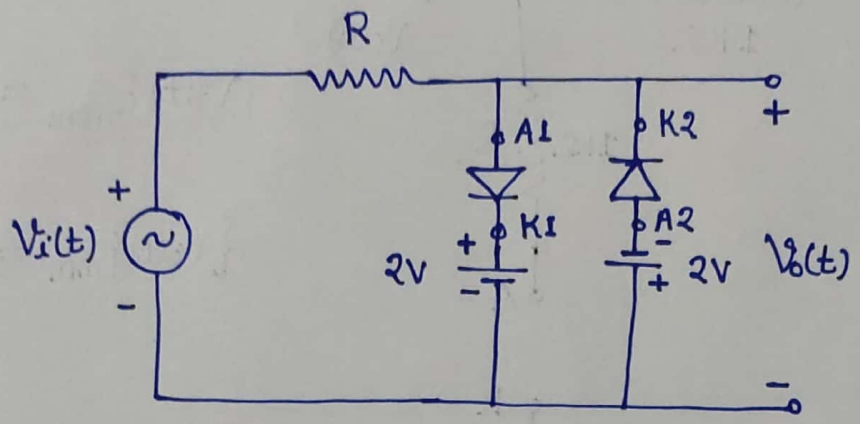
$\{V_o(t)\}_{min} = -5\ V$

Step 4:

$\{V_o(t)\}_{max} = 3.85\ V$

$\{V_o(t)\}_{min} = -5\ V$

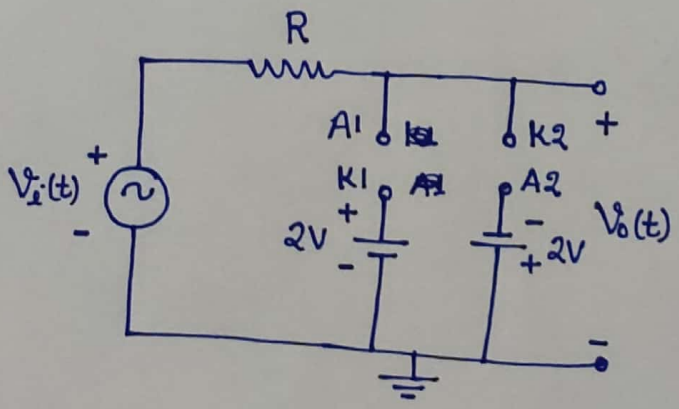
Q.3: Determine $V_o(t)$ and transfer characteristic for the given circuit?




$V_i(t) = 5 \sin \omega t$

Sol: Determine condition for F.B. and R.B. for diodes

Step1:




For D1

$V_i(t) > 2V \Rightarrow$ F.B.

$V_i(t) \leq 2V \Rightarrow$ R.B.

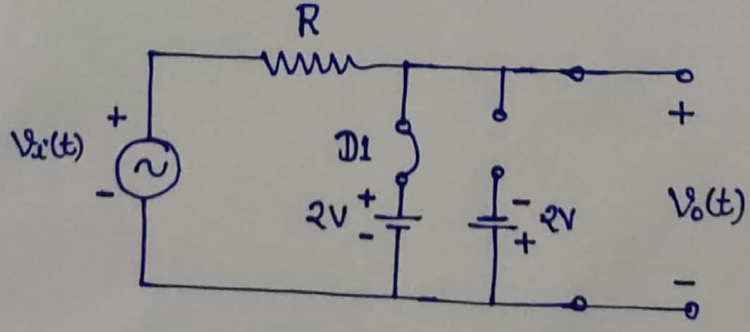
For D2

$-2 - V_i(t) > 0$

or $V_i(t) < -2V \Rightarrow$ F.B.

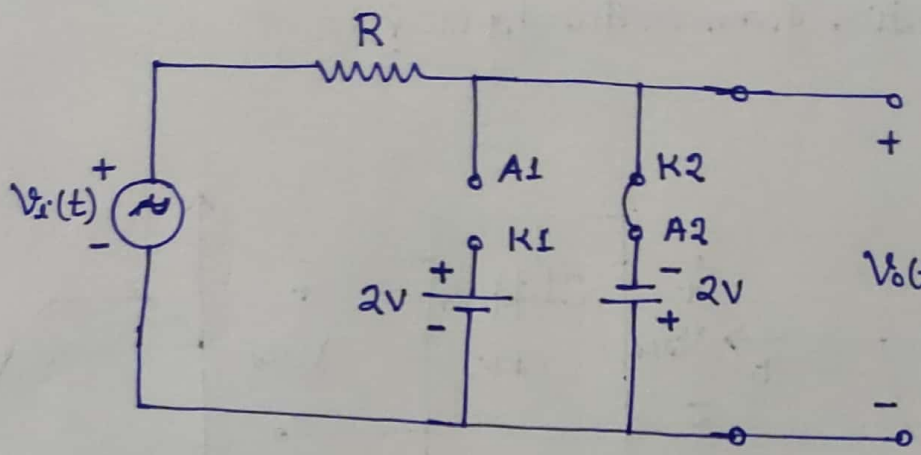
$V_i(t) \geq -2V \Rightarrow$ R.B.

Step2: when $V_i(t) > 2V$



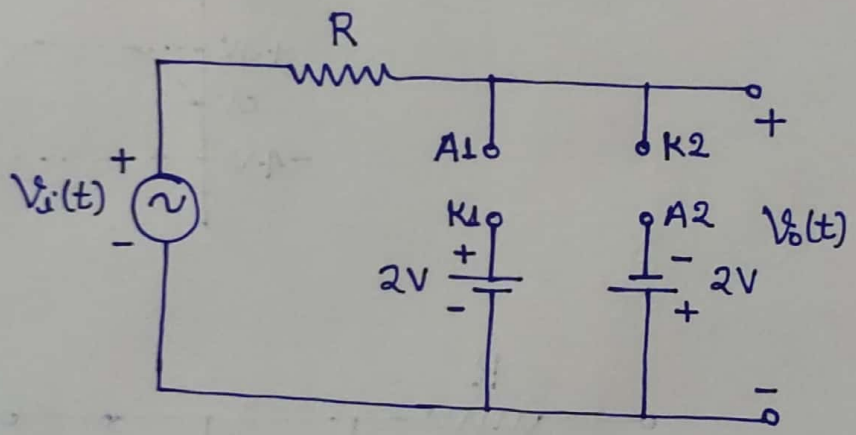

$V_o(t) = 2V$

**Step3:** When $V_i < -2V$



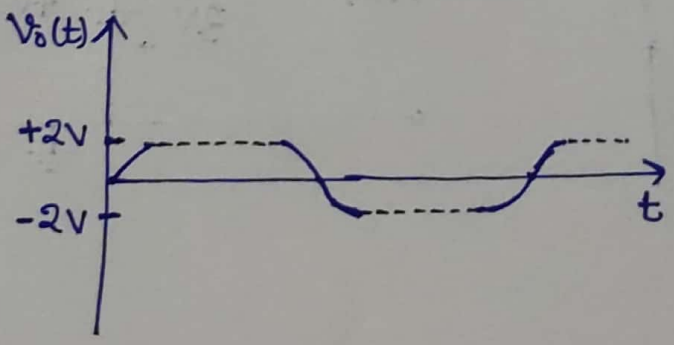

$V_o(t) = -2V$

**Step 4:** When $-2V < V_i < +2V$

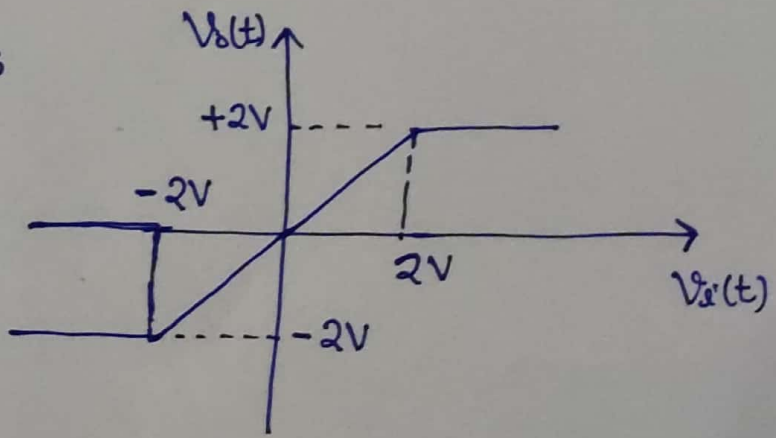



$V_o(t) = V_i(t)$

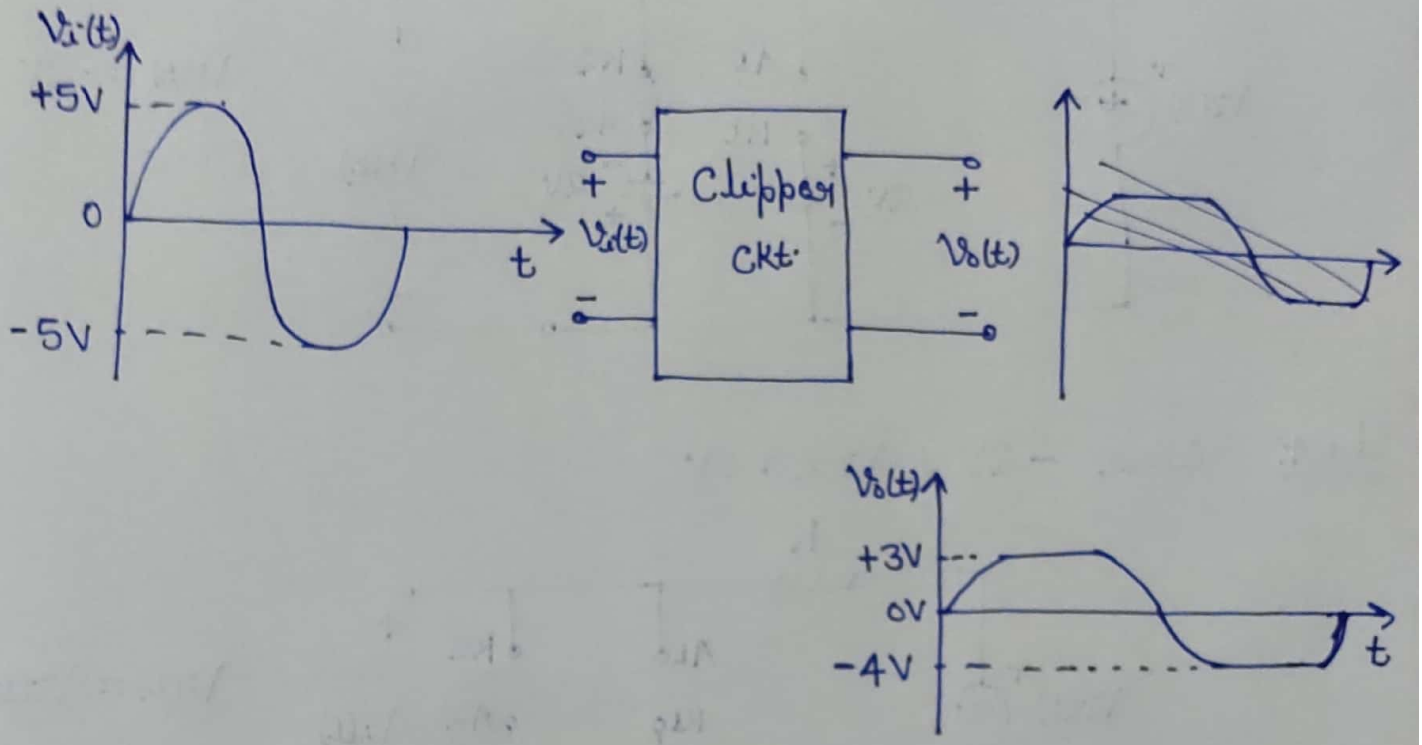
**Step 5:** Plot $V_o(t)$



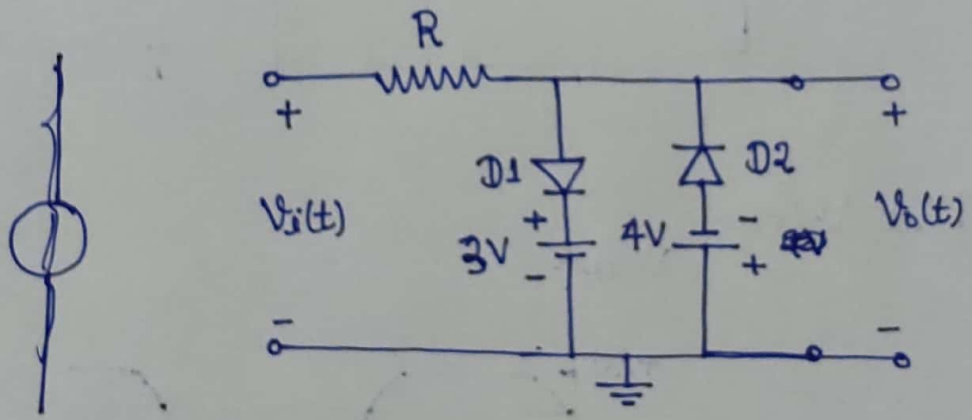

**Step6:** Transfer Characteristics



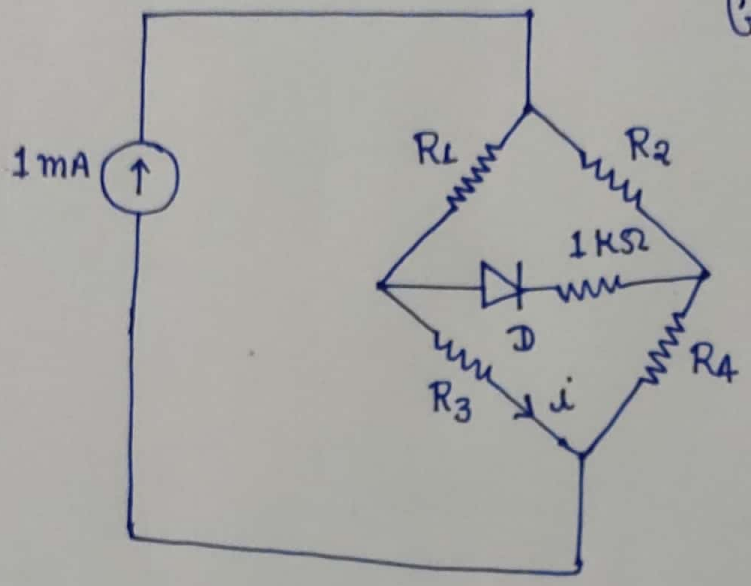
Q. 4:- Determine the clipper circuit corresponding to the input-Output ~~Comb~~ combination given in the figure?




Sol:



Q. 5: In the given circuit, $V_\gamma = 0.7V$. Find the current through 4Ω resistor?




Given that

$R_1 = 2\ K\Omega$

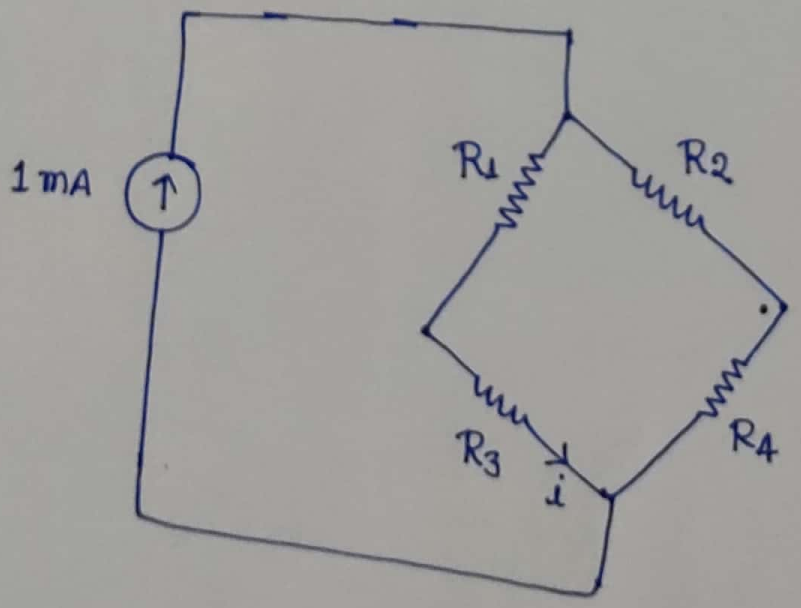
$R_2 = 3\ K\Omega$

$R_3 = 4\ K\Omega$

$R_4 = 6\ K\Omega$

Sol:

$\frac{R_1}{R_2} = \frac{R_3}{R_4} \Rightarrow$ Balance bridge




$i = \frac{9}{15} \times 1\ mA$

$= \frac{3}{5}\ mA$

$= 0.6\ mA$