SEMICONDUCTOR
SLOT-B1+TB1

DA-1

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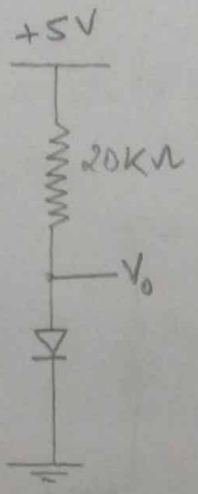
23BEL0014

(1) Find voltage V_o and current through diodes:-

(i)



Here, diode in forward bias get short

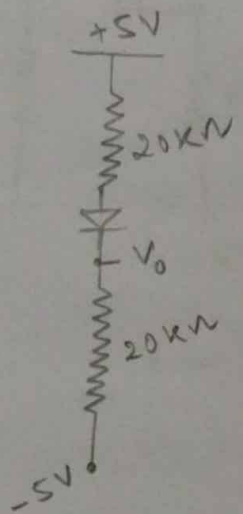
$$\therefore V_o = 0\ V$$ Ans

Now, current

$$i = \frac{5\ V}{20\ K\Omega} = 250\ mA \text{ or } = 0.25\ mA$$

$$i = 0.25mA$$ Ans

(ii)



Here, diode in forward bias get short

$$i = \frac{5-(-5)}{40\times10^3}\ A$$

$$= \frac{10}{40\times10^3} = 0.25\ mA$$ Ans

$$i = 0.25mA$$

Now, voltage across 20KΩ

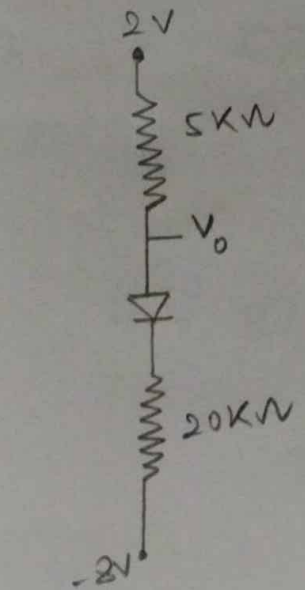
$$5 - V_o = i \times 20K\Omega$$

$$\Rightarrow 5 - V_o = 0.25 \times 20 \times 10^{-3} \times 20^3$$

$$\Rightarrow 5 - V_o = 5$$

$$\therefore V_o = 0\ V$$ Ans

(iii)



Here, diode in forward bias get short

$$i = \frac{2-(-8)}{25\times10^3} = \frac{10}{25\times10^3} = 0.4mA$$

$$\therefore i = 0.4\ mA$$ Ans

Now, Voltage across 5KΩ

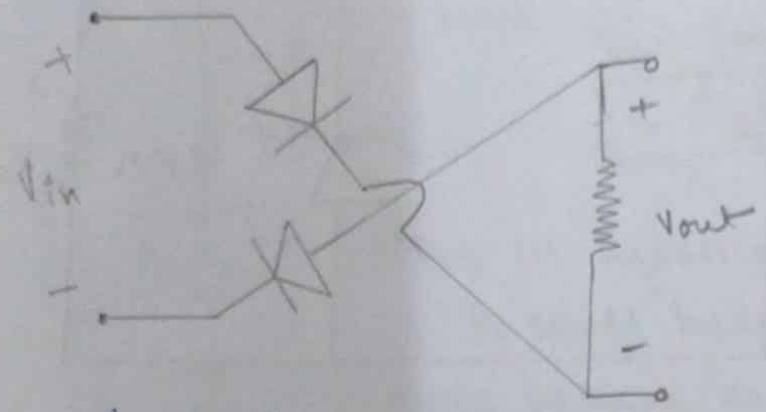
$$\Rightarrow 2 - V_o = i \times 5K\Omega$$

$$\Rightarrow 2 - V_o = 0.4 \times 5 \times 10^3 \times 10^{-3}$$

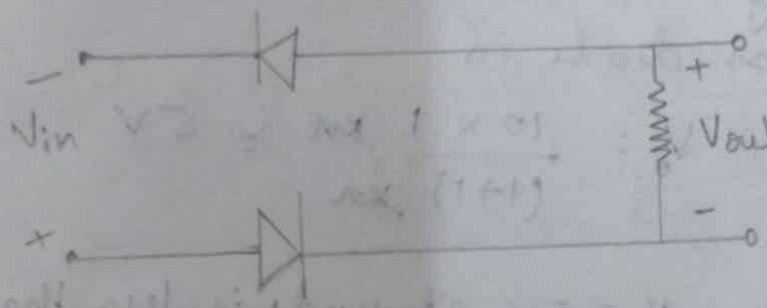
$$\Rightarrow 2 - V_o = 2$$

$$\therefore V_o = 0\ V$$ Ans

② 10 V peak – to-peak sine wave of frequency 1 kHz
Draw input and resulting output



Can be redrawn as

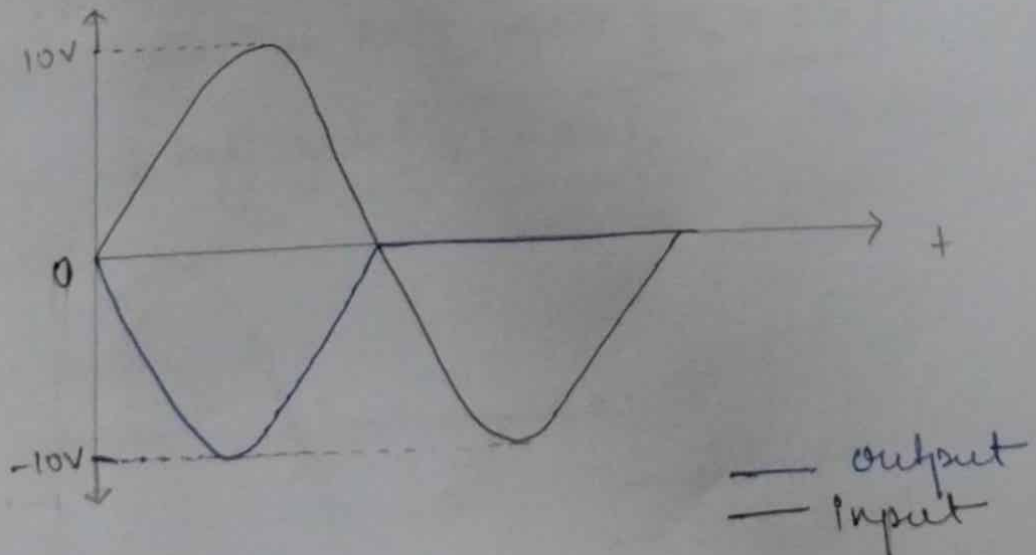


Here, in positive half cycle both the diodes are in forward bias

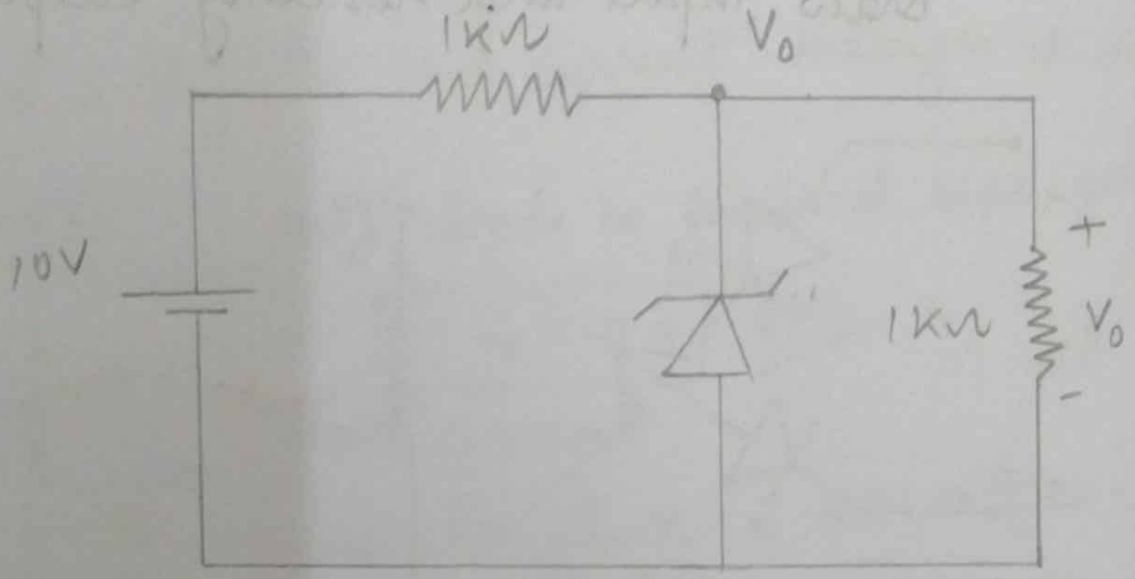
applying KVL, $-V_{out} - V_{in} = 0$ $\therefore V_{in} = -V_{out}$

During, negative half-cycle, both the diodes in reverse bias.

$V_{out} = 0\,V$



(3) Zener diode is ideal with zener breakdown voltage 6V. V_o = ?



Here, assuming zener diode is OFF

Voltage across diode is

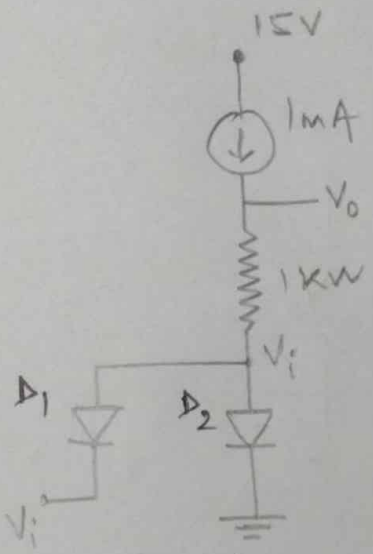
$$V_o = \frac{10 \times 1}{(1+1)} = 5V$$

Since, voltage $V_o = 5V$ at node is less than zener breakdown voltage i.e 6V

Therefore, zener diode will be open and output voltage $\boxed{V_o = 5V}$ will be fixed

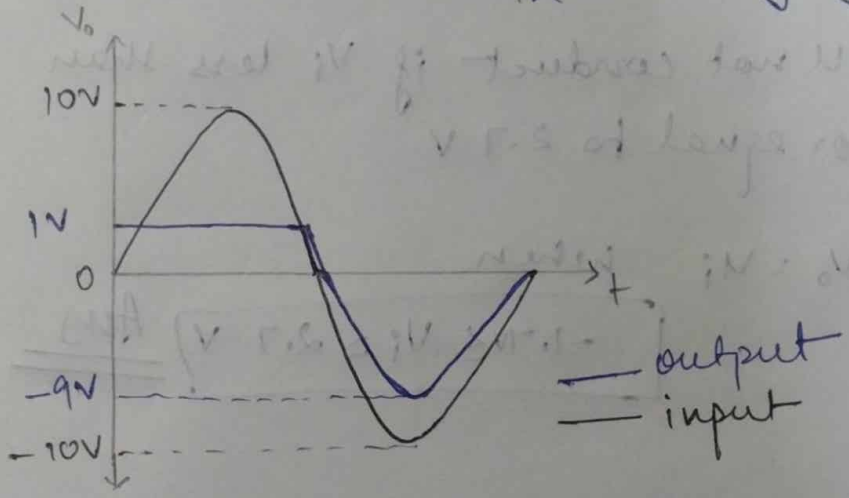
Ans

(4) V_i = Sinusoid 10V & frequency 1KHz

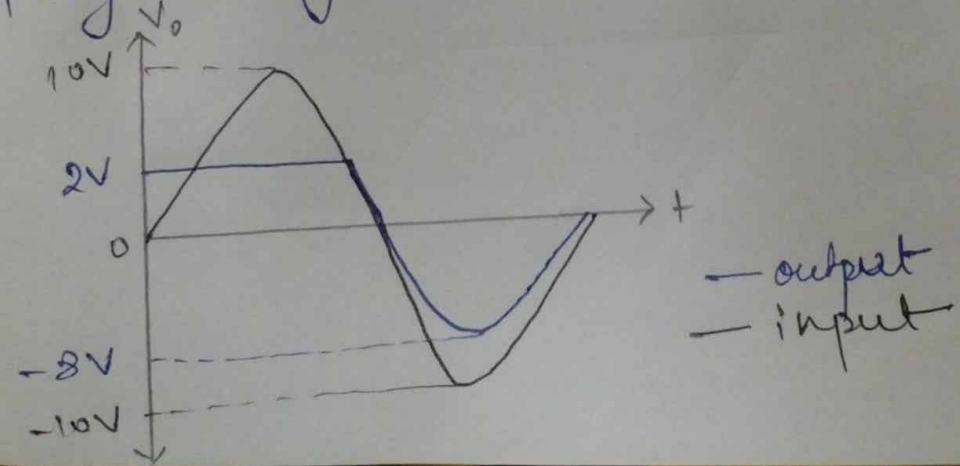


Here, In positive half cycle.
D_2 will become short
Now, $V_o = 1mA \times 1K\Omega$
$\boxed{V_o = 1V}$ for +ve half cycle

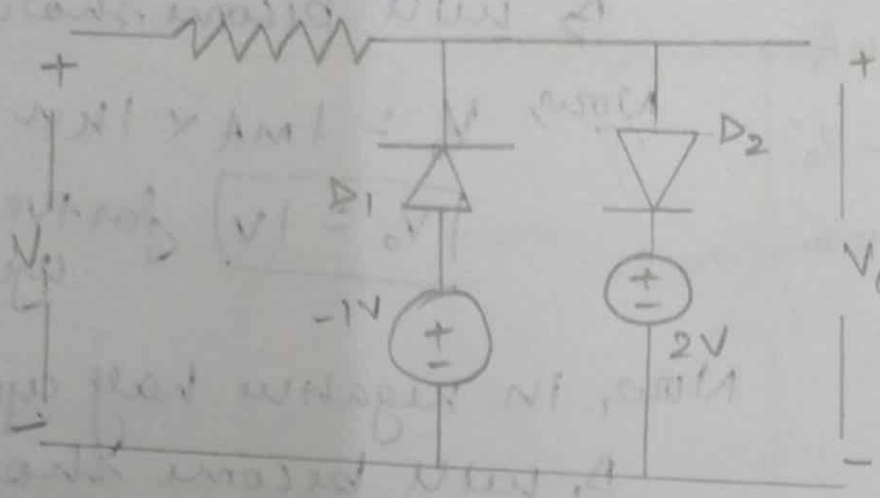
Now, in negative half cycle
D_1 will become short
Now, voltage across 1KΩ
$V_o - V_i = 1V$,
$\therefore V_o = 1 + V_i = 1 - 10 = -9V$
$\boxed{\therefore V_o = -9V}$
in -ve half cycle.



Replace 1KΩ with 2KΩ then,
for, positive half cycle $\boxed{V_o = 2V}$
In, negative half cycle $\boxed{V_o = -8V}$



(5) D_1 & D_2 silicon diode of 0.7 V



Sol^{n}: Range of voltage for which $V_o = V_i$

Case-I D_1 will not conduct if V_i is greater or equal −1.7 V

Case-II D_2 will not conduct if V_i less than or equal to 2.7 V

∴ for $V_o = V_i$ when

$$-1.7\text{V} \leq V_i \leq 2.7\text{ V}$$

Ans