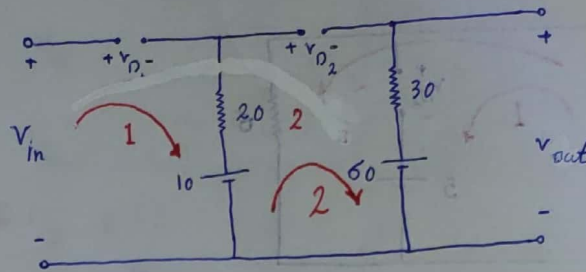


$D_1$  &  $D_2$  off

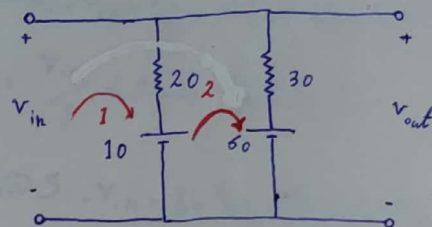


KVL @ 1:  $-V_{in} + V_{D1} + 10 = 0 \rightarrow V_{D1} = V_{in} - 10 \rightarrow V_{in} < 10$  I

KVL @ 2:  $-10 + V_{D2} + 60 = 0 \rightarrow V_{D2} = -50$  II  $V_{in} \in \mathbb{R}$

I  $\cap$  II  $V_{in} < 10$   $V_{out} = 60$

$D_1$  &  $D_2$  on



KVL @ 1:  $-V_{in} + 20(I_1 - I_2) + 10 = 0$  I

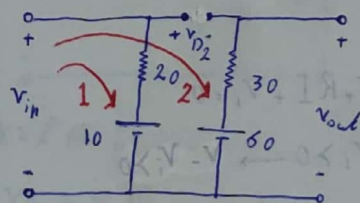
KVL @ 2:  $-10 + 20(I_2 - I_1) + 30I_2 + 60 = 0 \rightarrow I_2 = \frac{V_{in} - 60}{30}$  II

III In I  $I_1 = \frac{V_{in} - 30}{20} > 0 \rightarrow V_{in} > 30$  I

KVL @ 2:  $-V_{in} + 30I_2 + 60 = 0 \Rightarrow 30I_2 = V_{in} - 60 > 0 \rightarrow V_{in} > 60$  II

I  $\cap$  II  $V_{in} > 60$   $V_{out} = V_{in}$

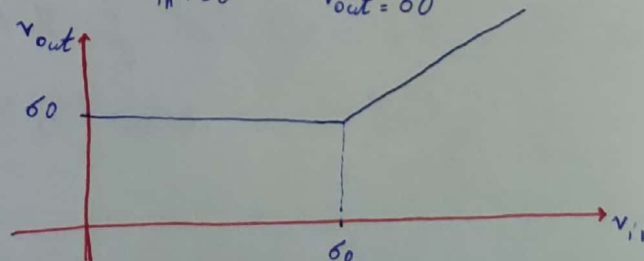
$D_1$  on &  $D_2$  off

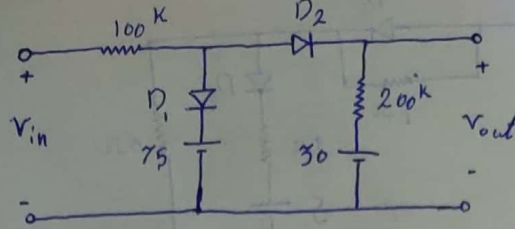


KVL @ 1:  $-V_{in} + 20I + 10 = 0 \rightarrow 20I = V_{in} - 10 > 0 \rightarrow V_{in} > 10$

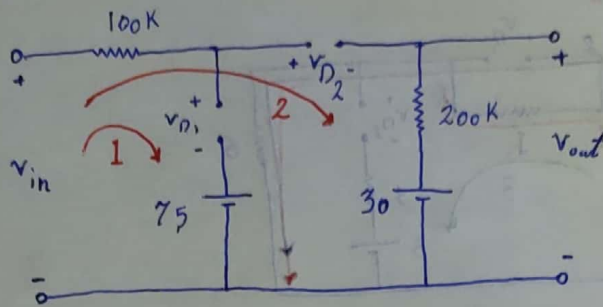
KVL @ 2:  $-V_{in} + V_{D2} + 60 = 0 \rightarrow V_{D2} = V_{in} - 60 < 0 \rightarrow V_{in} < 60$

I  $\cap$  II  $10 < V_{in} < 60$   $V_{out} = 60$





$D_1$  &  $D_2$  off

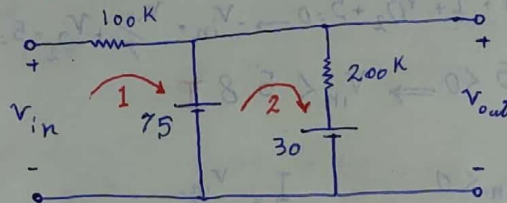


KVL @ 1:  $-V_{in} + V_{D1} + 75 = 0 \rightarrow V_{D1} = V_{in} - 75 < 0 \Rightarrow V_{in} < 75$  I

KVL @ 2:  $-V_{in} + V_{D2} + 30 = 0 \rightarrow V_{D2} = V_{in} - 30 < 0 \Rightarrow V_{in} < 30$  II

I  $\cap$  II  $V_{in} < 30$   $V_{out} = 30$

$D_1$  &  $D_2$  on



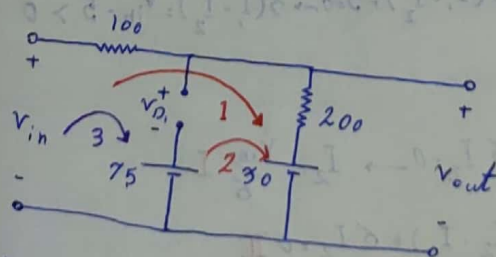
KVL @ 1:  $-V_{in} + 100I_1 + 75 = 0 \rightarrow I_1 = \frac{V_{in} - 75}{100}$

KVL @ 2:  $-75 + 200I_2 + 30 = 0 \rightarrow I_2 = 0.225 > 0 \checkmark$

$I_1 - I_2 > 0 \rightarrow \frac{V_{in} - 75}{100} - 0.225 > 0 \rightarrow V_{in} > 97.5$

$V_{in} > 97.5$   $V_{out} = 75$

$D_1$  off &  $D_2$  on

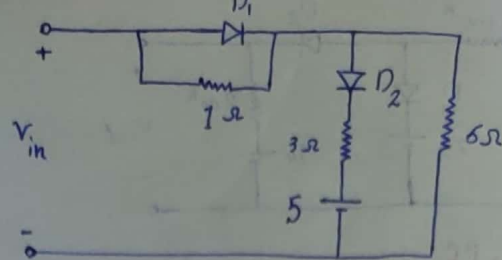


KVL @ 1:  $-V_{in} + 300I_1 + 30 = 0 \rightarrow 300I_1 = V_{in} - 30 > 0 \rightarrow V_{in} > 30$

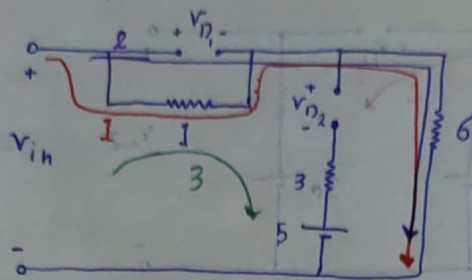
KVL @ 2:  $-75 - V_{D1} + 200I_1 + 30 \rightarrow 100I_1 = \frac{45}{2} + \frac{V_{D1}}{2}$  I

KVL @ 3:  $-V_{in} + 100I_1 + V_{D1} + 75 = 0$  I  $\rightarrow \frac{3}{2}V_{D1} = V_{in} - 97.5 < 0$

$V_{in} < 97.5$   $30 < V_{in} < 97.5$   $V_{out} = V_{in} - 100I_1$



$D_1$  &  $D_2$  off



$$\text{KVL @ 1: } -v_{in} + 1I = 0 \rightarrow I = \frac{v_{in}}{1}$$

$$\text{KVL @ 2: } -v_{in} + v_{D1} + 6I = 0 \Rightarrow v_{D1} = v_{in} - 6I = v_{in} - \frac{6}{1}v_{in}$$

$$v_{D1} = \frac{v_{in}}{1} < 0 \Rightarrow v_{in} < 0 \quad \text{I}$$

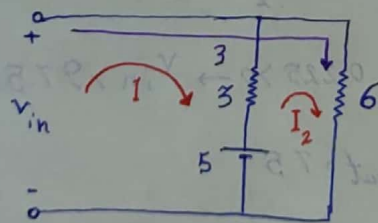
$$\text{KVL @ 3: } -v_{in} + I + v_{D2} + 5 = 0 \rightarrow -v_{in} + \frac{v_{in}}{1} + v_{D2} + 5 = 0$$

$$v_{D2} = \frac{6}{1}v_{in} - 5 < 0 \Rightarrow v_{in} < 5.8 \quad \text{II}$$

$$\text{I} \cap \text{II} \quad v_{in} < 0$$

$$I = \frac{v_{in}}{1}$$

$D_1$  &  $D_2$  ON



$$\text{KVL @ 1: } -v_{in} + 3(I_1 - I_2) + 5 = 0 \rightarrow 3(I_1 - I_2) = v_{in} - 5 > 0$$

$$v_{in} > 5 \quad \text{III}$$

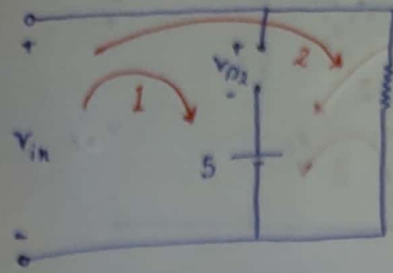
$$\text{KVL @ 3: } -v_{in} + 6I_2 = 0 \rightarrow I_2 = \frac{v_{in}}{6} \quad \text{I}$$

$$\text{KVL @ 2: } -5 + 3(I_2 - I_1) + 6I_2 = 0 \quad \text{II}$$

$$\text{I} \cap \text{II} \quad I_1 = \frac{v_{in}}{2} - \frac{5}{3} > 0 \rightarrow v_{in} > 3.3 \quad \text{IV}$$

$$\text{III} \cap \text{IV} \quad v_{in} > 5 \quad I = \frac{v_{in}}{2} - \frac{5}{3}$$

$D_1$  ON &  $D_2$  OFF

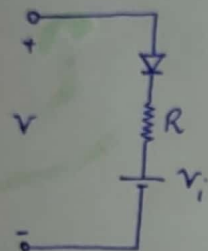


KVL @ 1:  $-V_{in} + V_{D2} + 5 \cdot 0 = 0 \rightarrow V_{D2} = V_{in} - 5 \Rightarrow V_{in} < 5$  I

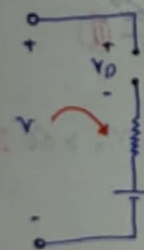
KVL @ 2:  $V_{in} + 6I \cdot 0 = 0 \Rightarrow 6I, V_{in} > 0 \rightarrow V_{in} > 0$  II

I & II  $0 < V_{in} < 5$

$I = \frac{V_{in}}{6}$



D OFF

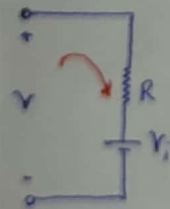


KVL:  $-V + V_D + V_i = 0$

$V_D = V - V_i < 0 \rightarrow V < V_i$

$I = 0$  when  $V < V_i$

D ON



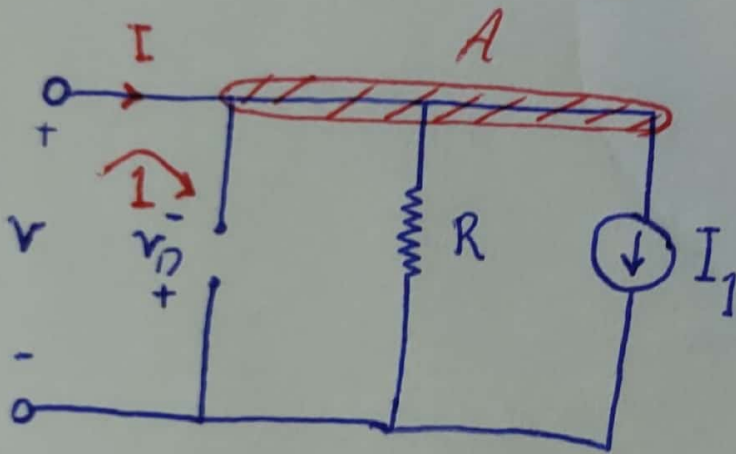
KVL:  $-V + RI + V_i = 0$

$RI + V - V_i > 0 \rightarrow V > V_i$

$I = \frac{V - V_i}{R}$  when  $V > V_i$

D off

5

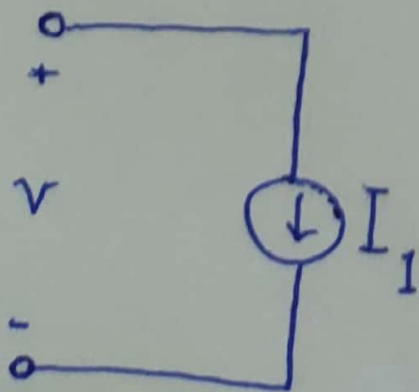


KCL @ A:  $I_1 - I + \frac{v}{R} \Rightarrow I = \frac{v}{R} + I_1$

KVL @ 1:  $-v - v_D = 0 \Rightarrow v_D = -v < 0 \Rightarrow v > 0$

$I = \frac{v}{R} + I_1$  when  $v > 0$

D ON



$I = I_1$  when  $v < 0$