

Set 01

1.(a) Assumptions for the parameters of an ideal OP-amp -

- i) Infinite open loop gain.
- ii) Infinite input resistance.
- iii) Zero output resistance.

(b) $V_o = \frac{-1}{RC} \int V_i dt$

(c) Because of non-linear I-V characteristic.

(d)
$$\frac{\text{F.B.:-}}{i_D > 0} \quad \frac{\text{R.B.:-}}{V_D \leq V_{DD}}$$

Set 02

1. (a) Same as 1(a) [Set 01]

(b) $V_o = -RC \frac{d}{dt} V_i$

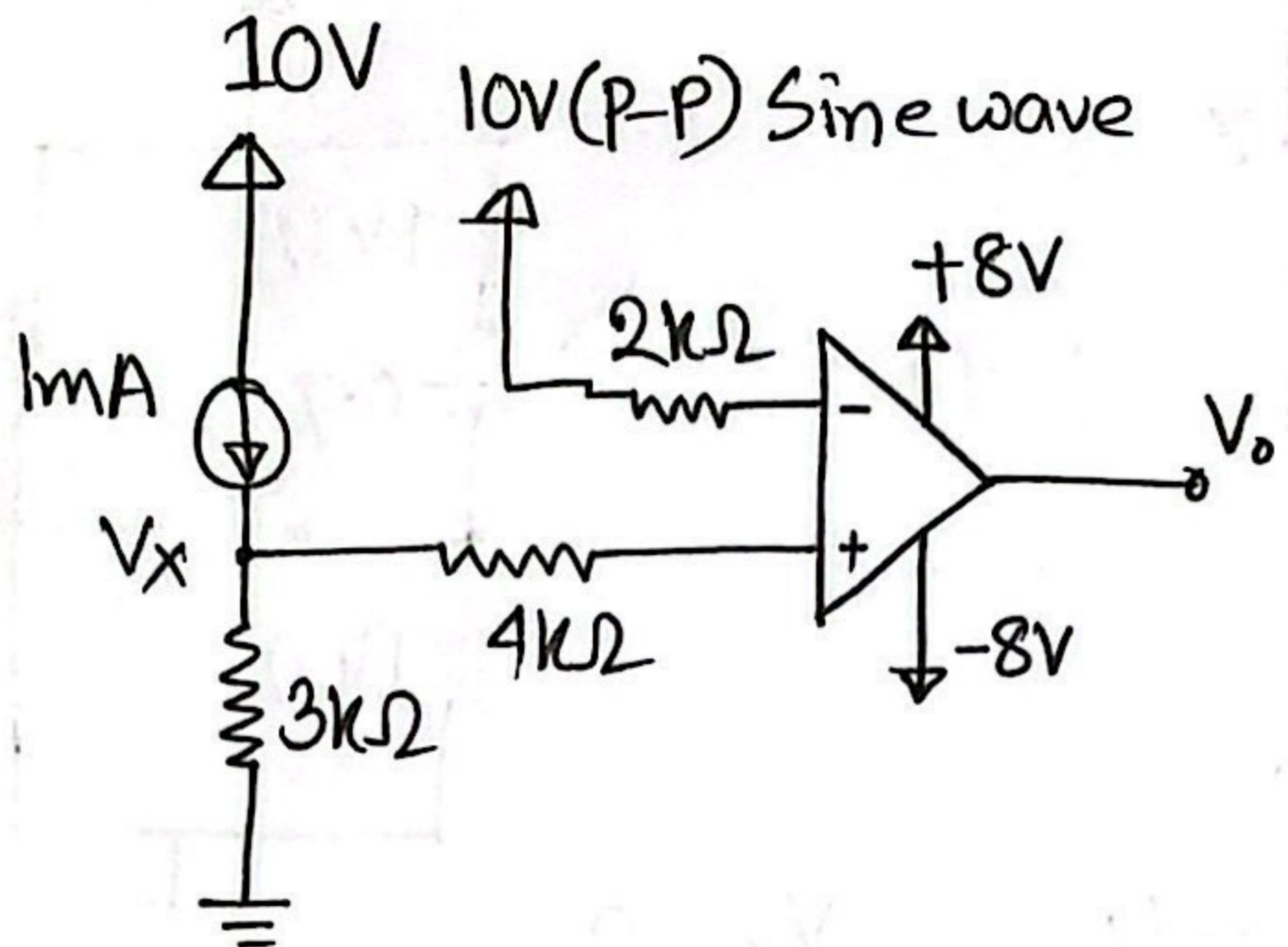
(c) Same as 1(c) [Set 01]

(d)
$$\frac{\text{F.B.:-}}{i_D > 0} \quad \frac{\text{R.B.:-}}{V_D \leq 0}$$

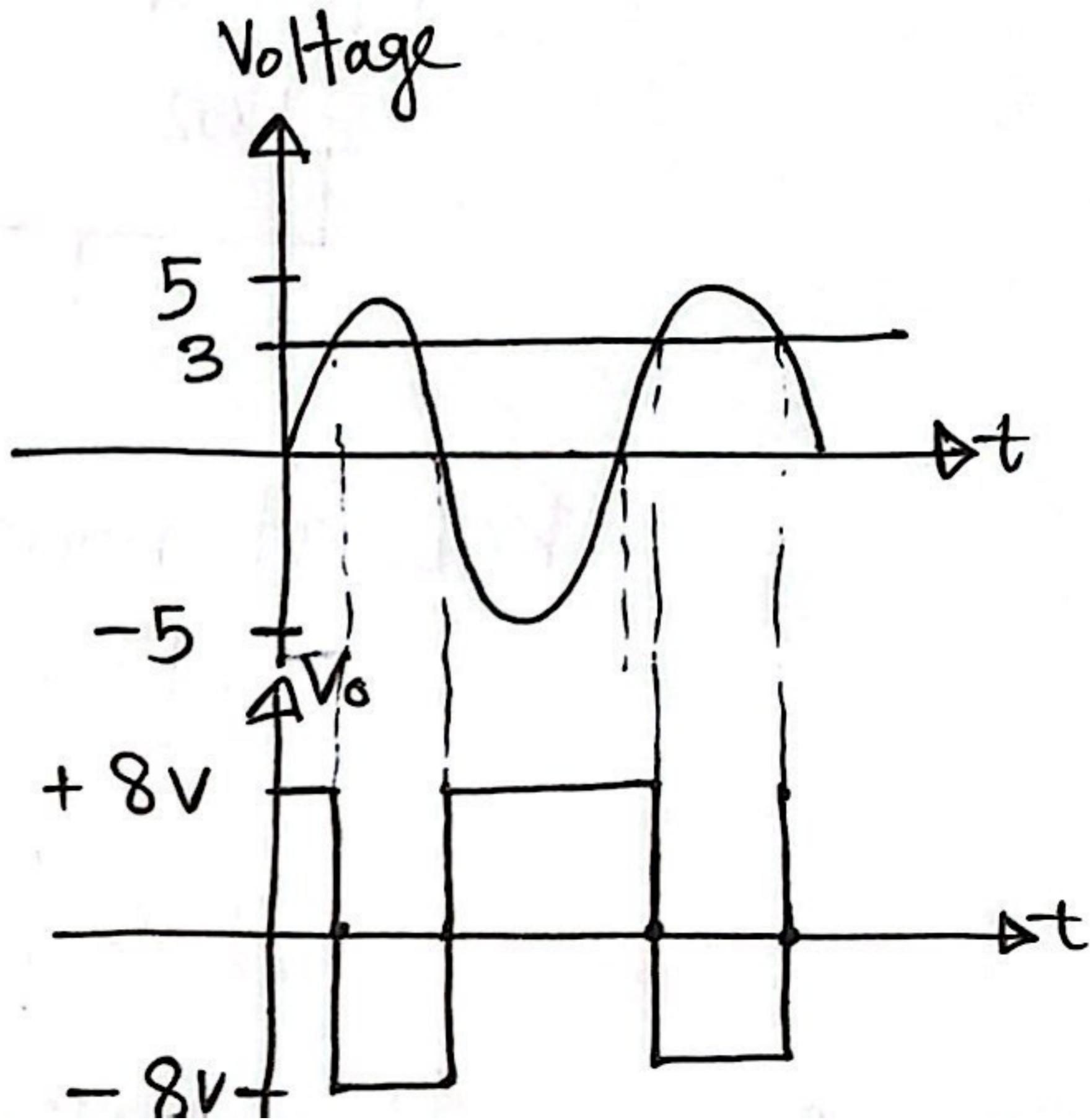
Set-01

Q2

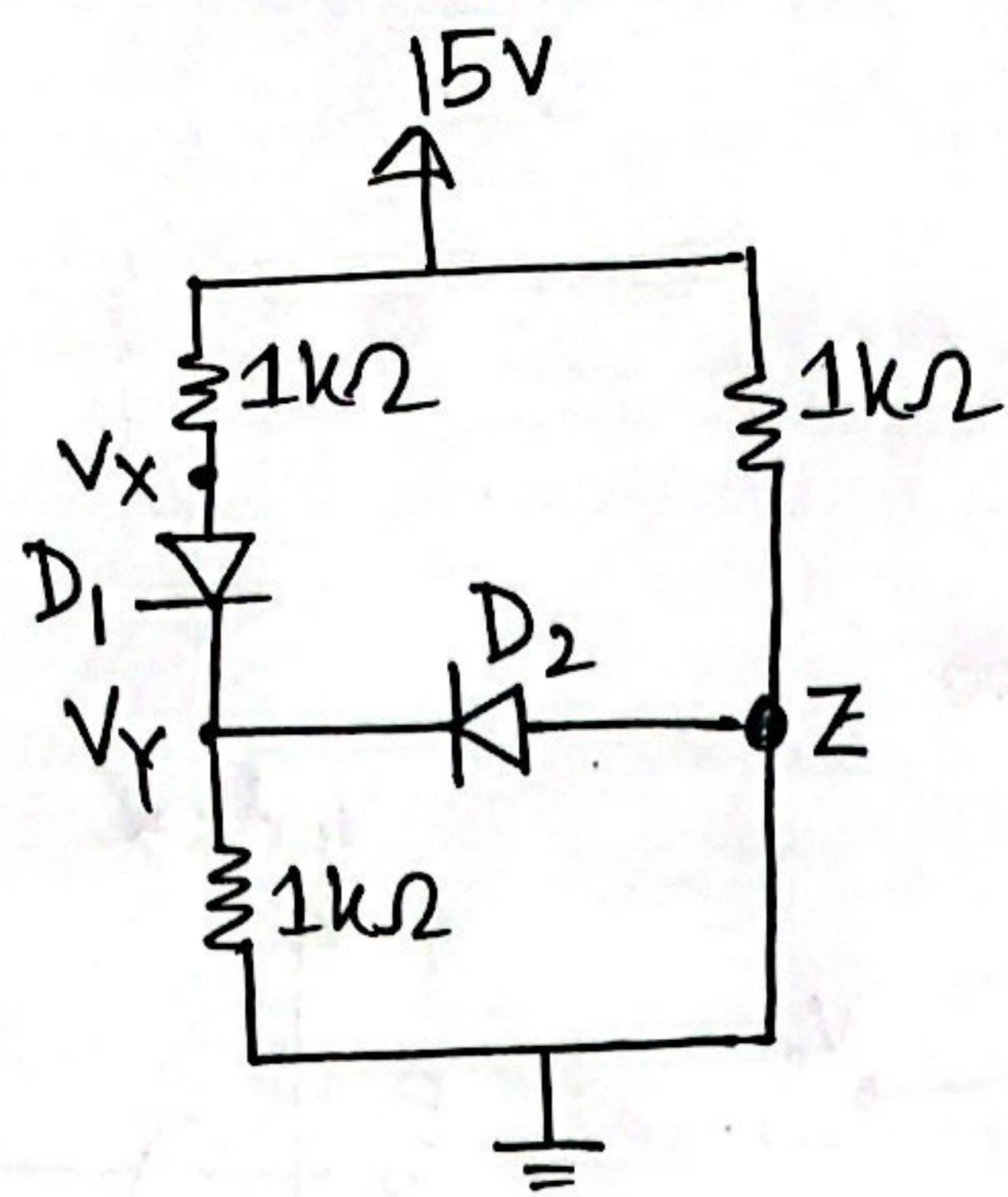
(a)



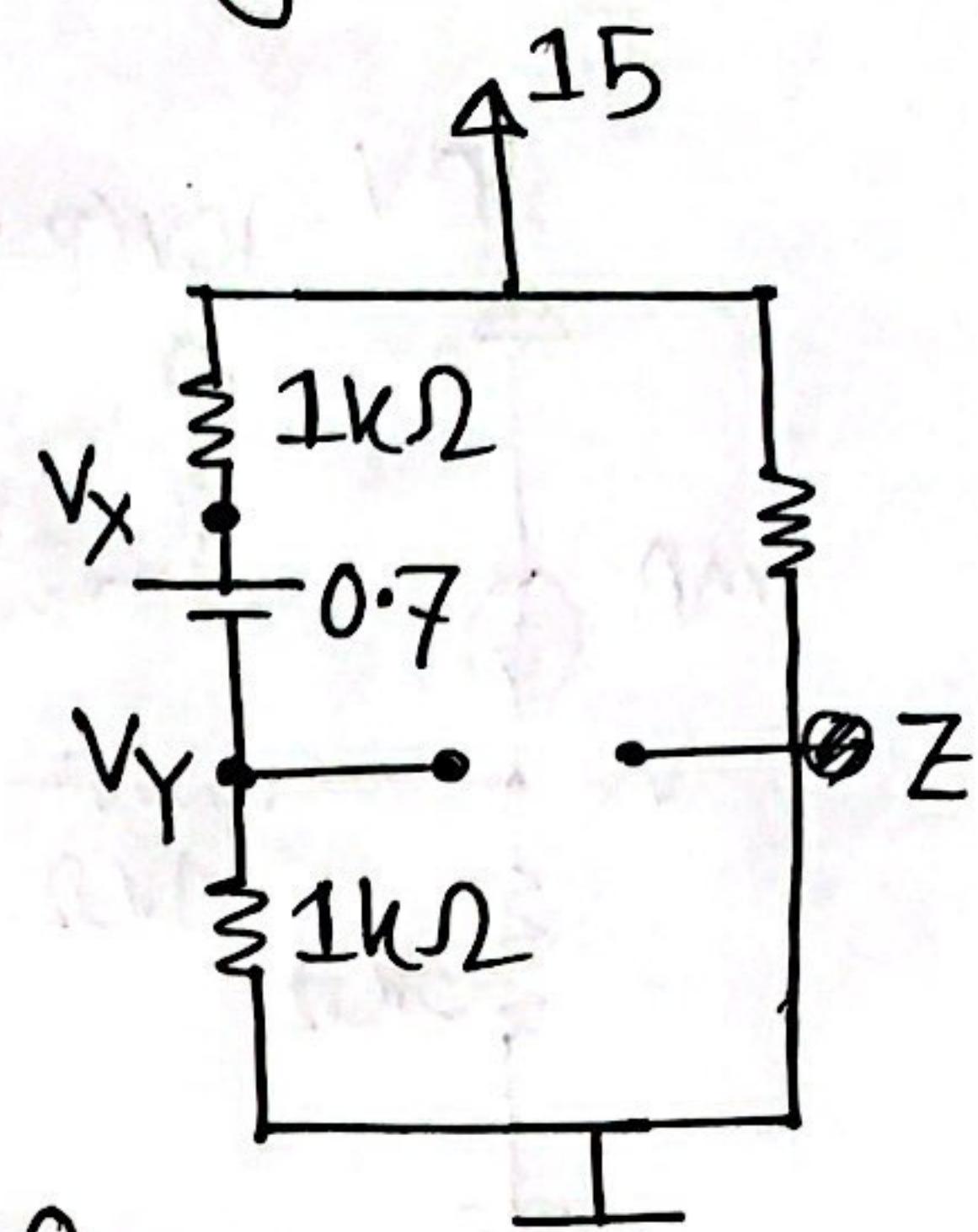
$$V_x = (1 \times 3)V = 3V$$



(b)



Assuming D_1 on and D_2 off



KCL at node Y -

$$\frac{15 - 0.7 - V_Y}{1} = \frac{V_Y - 0}{1}$$

$$\Rightarrow V_Y = 7.15V \quad \therefore V_X = 7.85V$$

Assumption validation:-

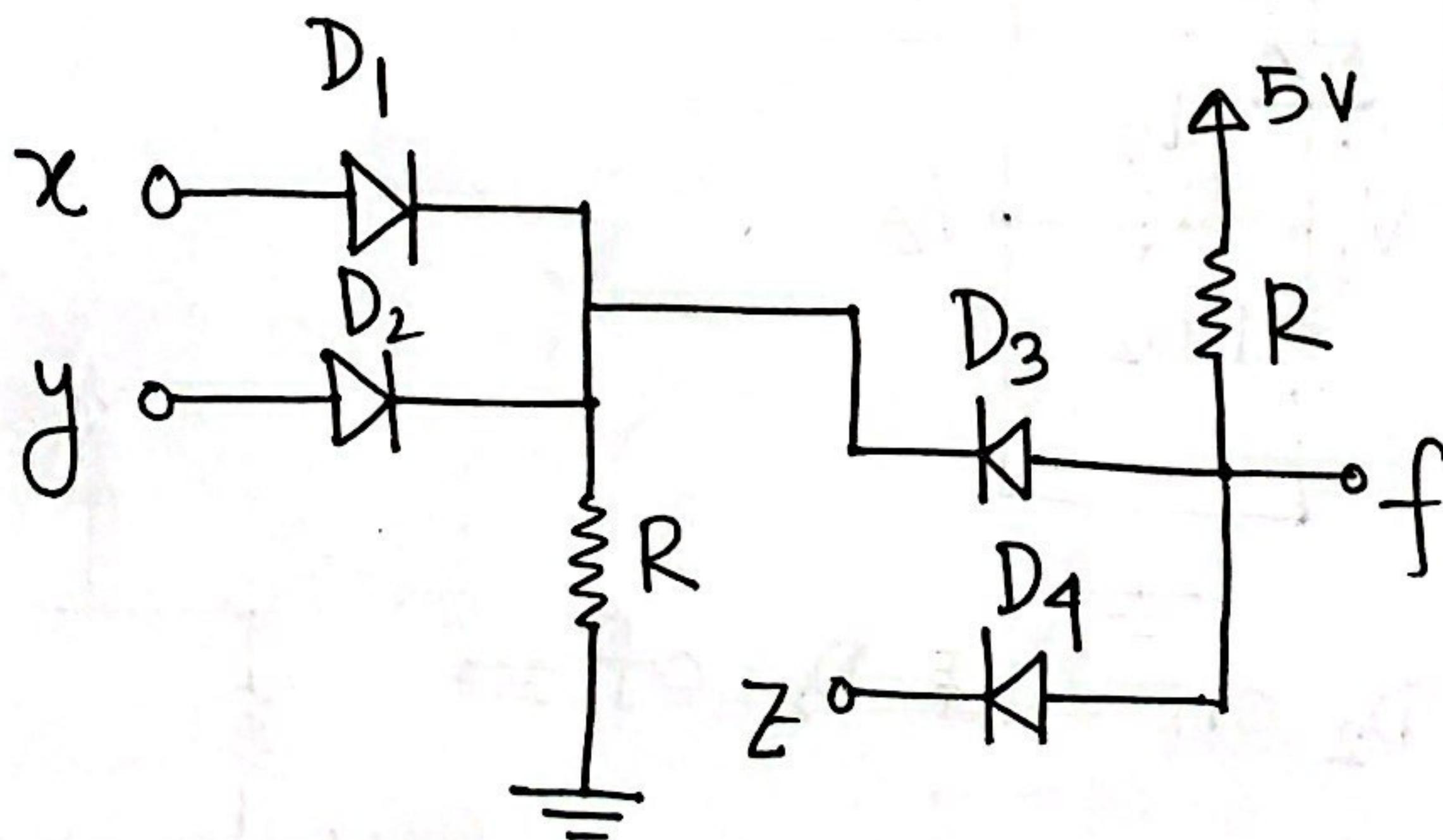
$$I_{D1} = 7.15 \text{ mA}$$

$$I_{D2} = 0 \text{ mA}$$

$$I_{D1} = \frac{15 - 7.15 - 0.7}{1} > 0$$

$$V_{D2} = V_Z - V_Y = 0 - 7.15 < V_{D02}$$

(c)

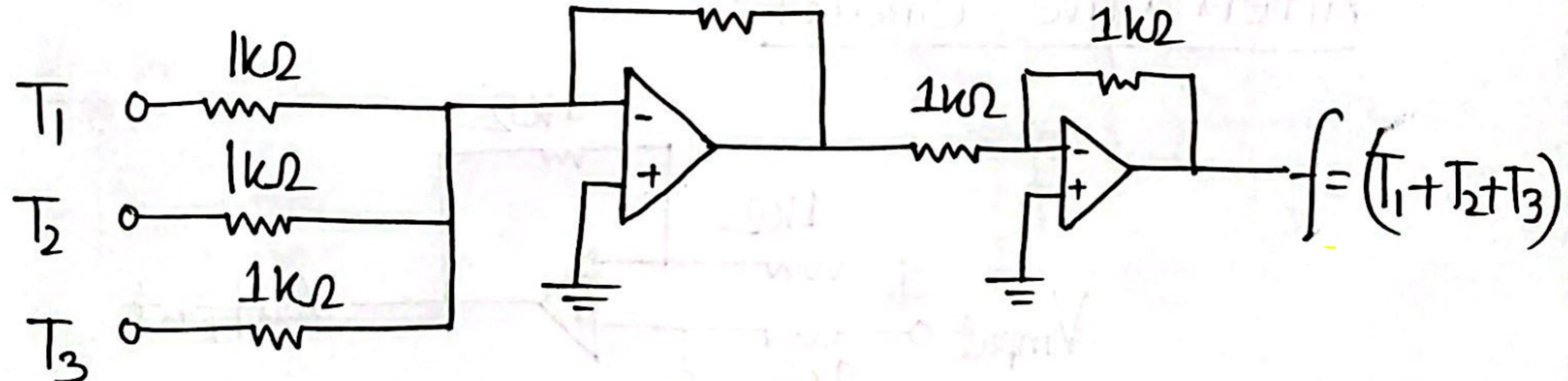
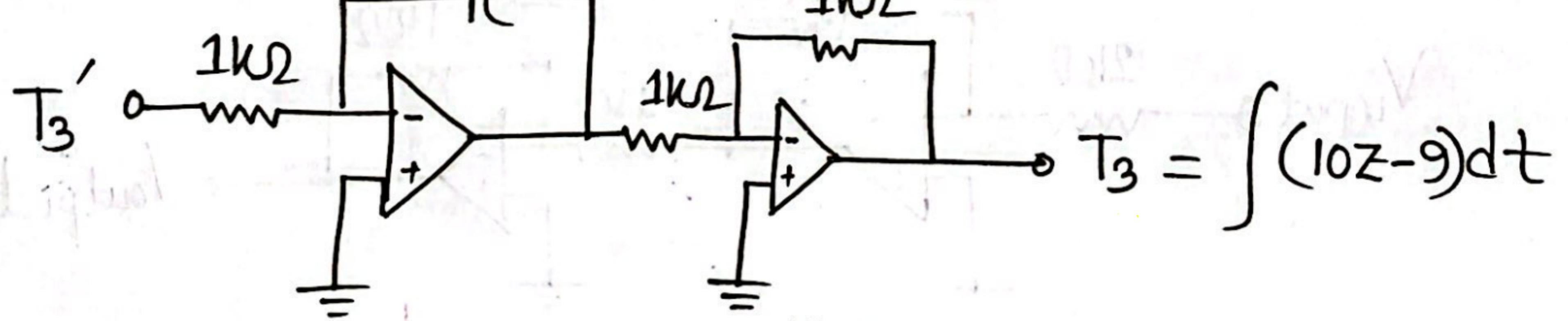
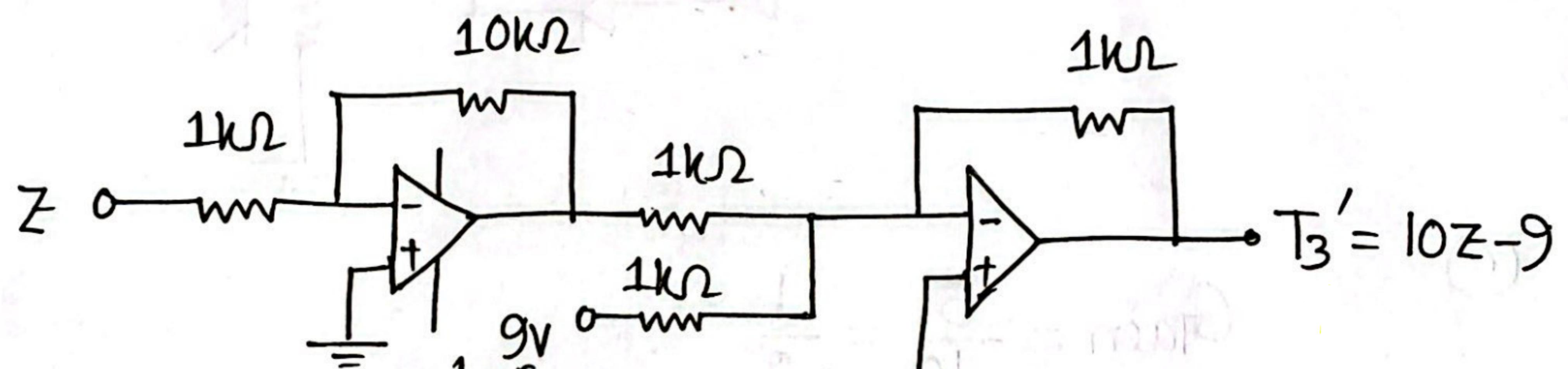
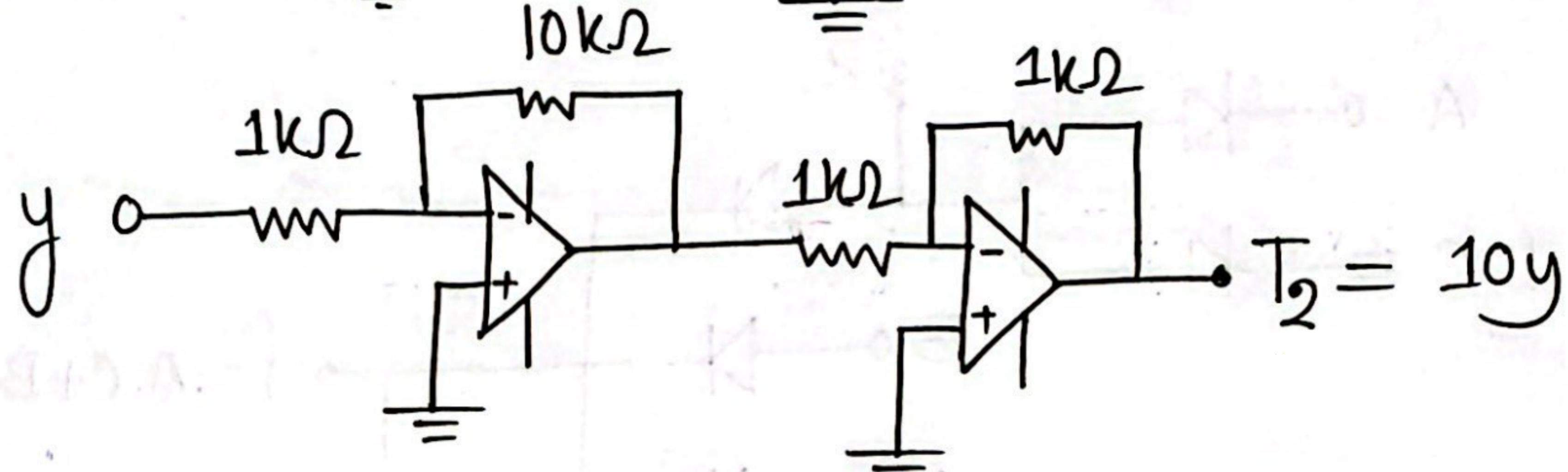
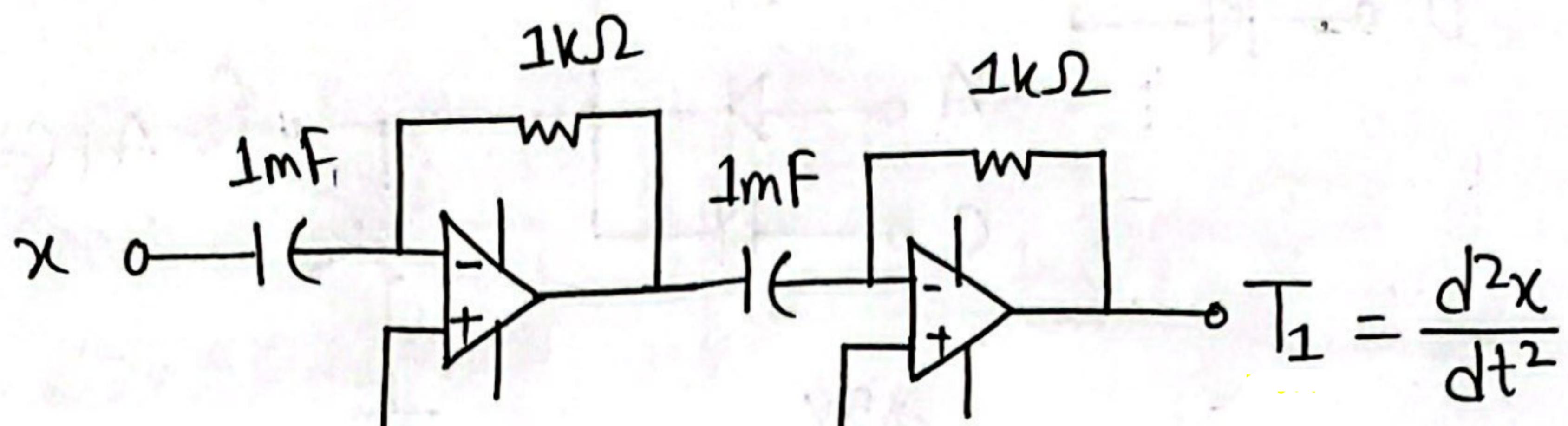


$$f = (x|y) \cdot z \quad \text{or} \quad f = (x+y) \cdot z$$

Q3

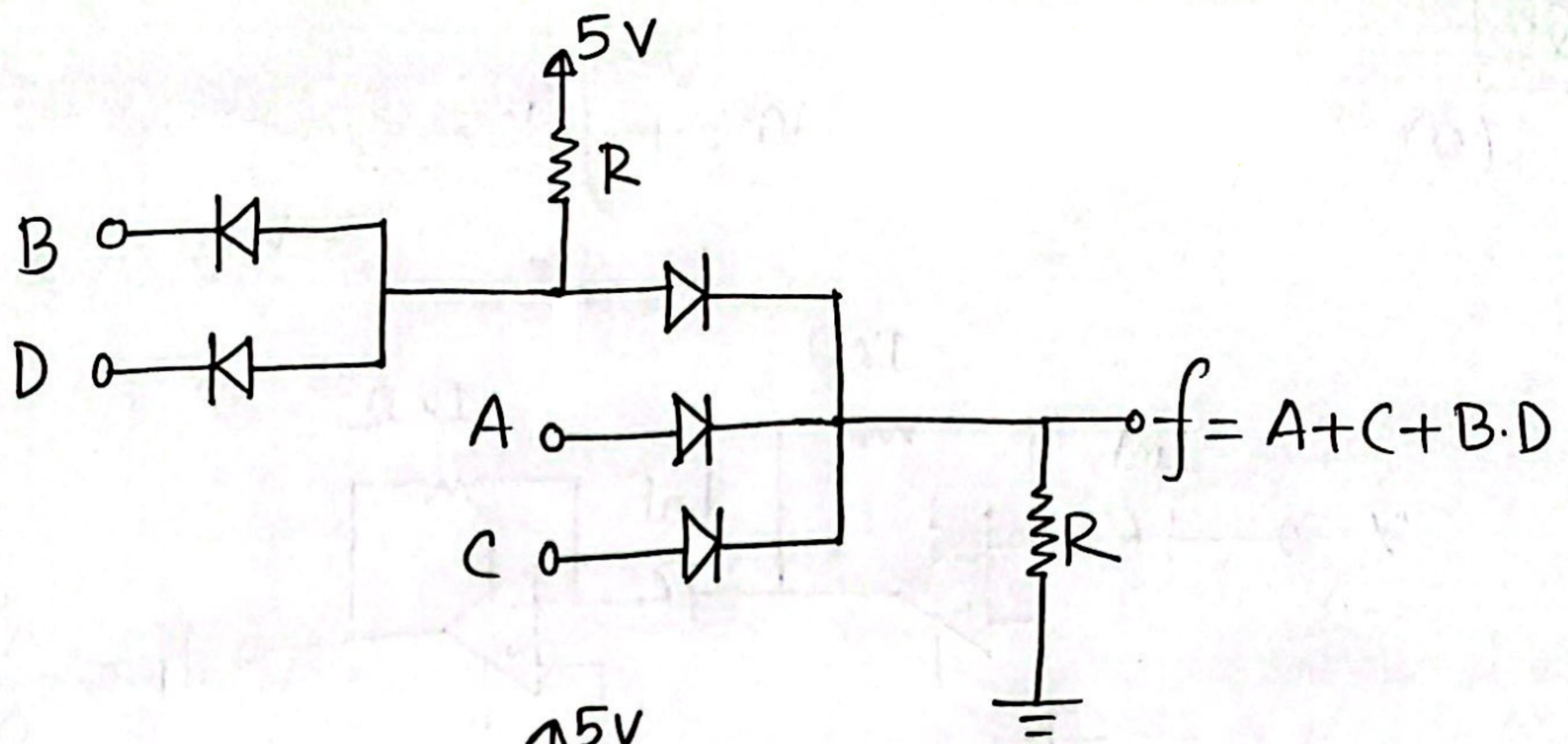
(a)

$$f = \frac{d^2x}{dt^2} + 10y + \int (10z - 9) dt \rightarrow T_3'$$

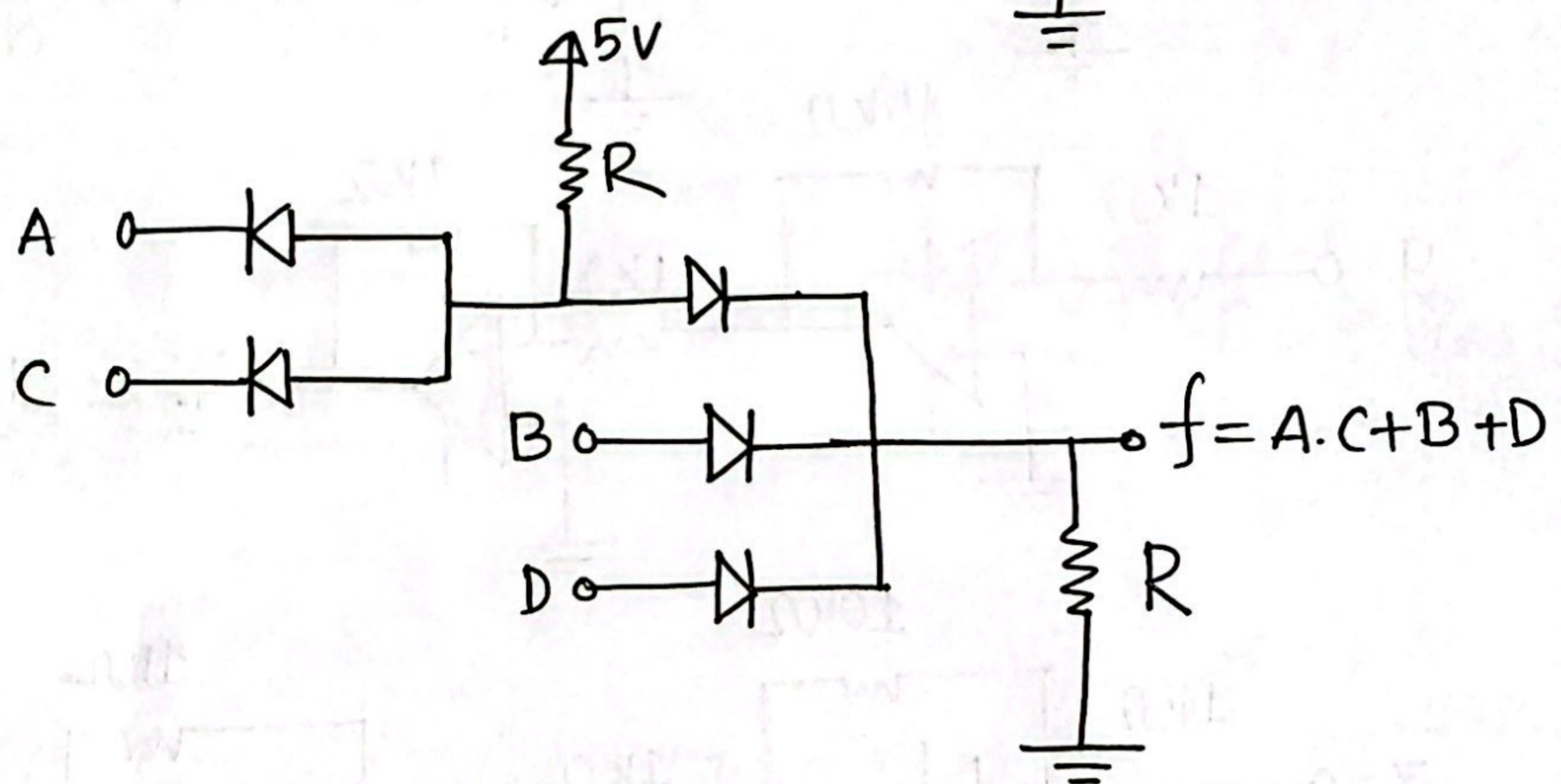


(b)

1.

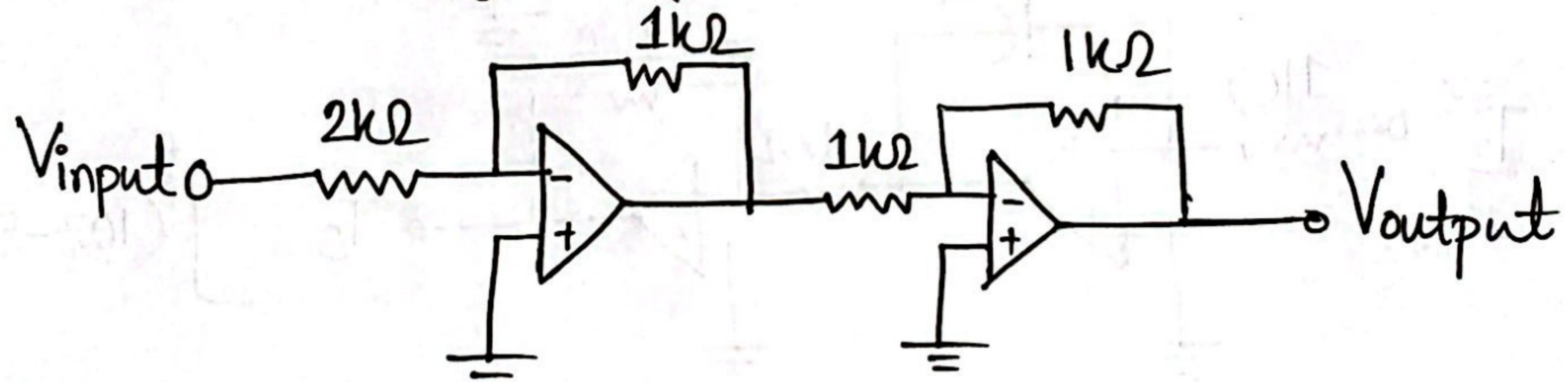
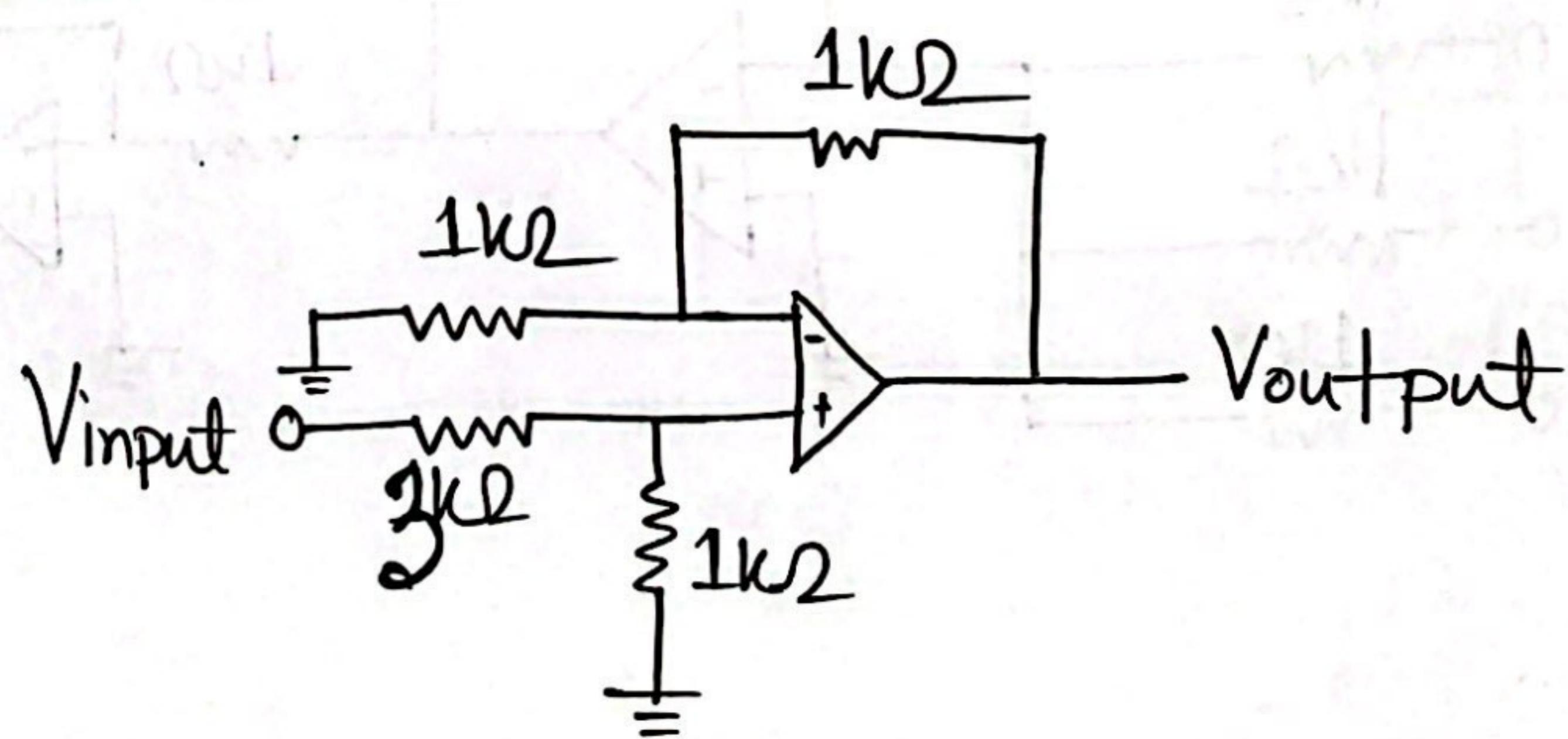


2.



(c)

$$Gain = \frac{5}{10} = \frac{1}{2}$$

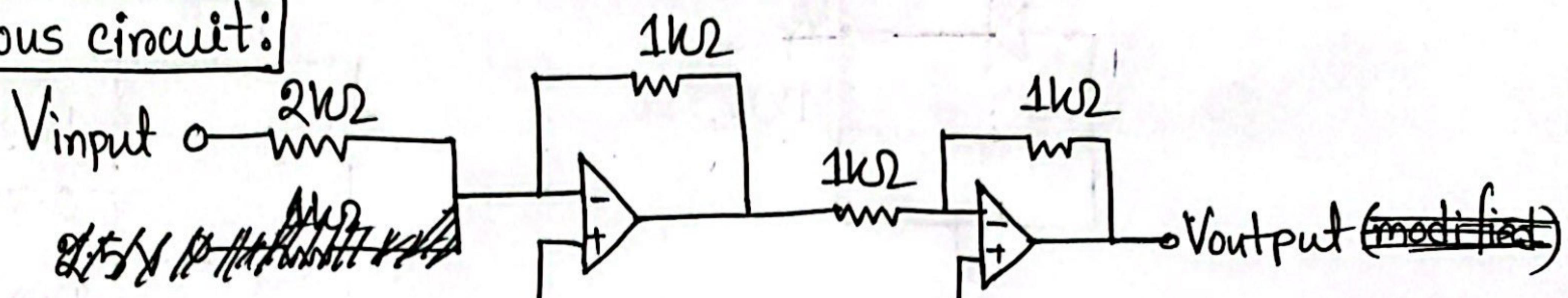
Alternative circuit:-

(d)

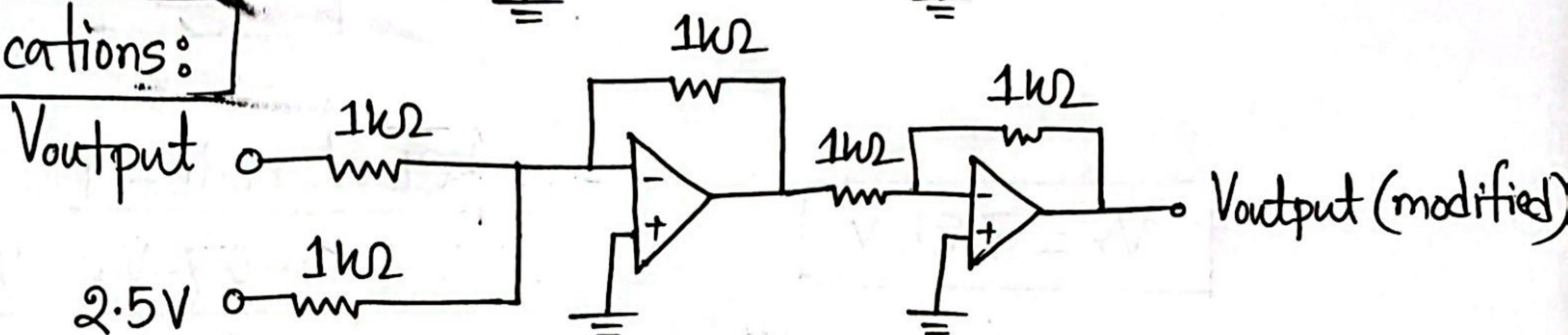
$$V_{\text{output(modified)}} = 2.5 + V_{\text{output}}$$

A possible modification -

Previous circuit:

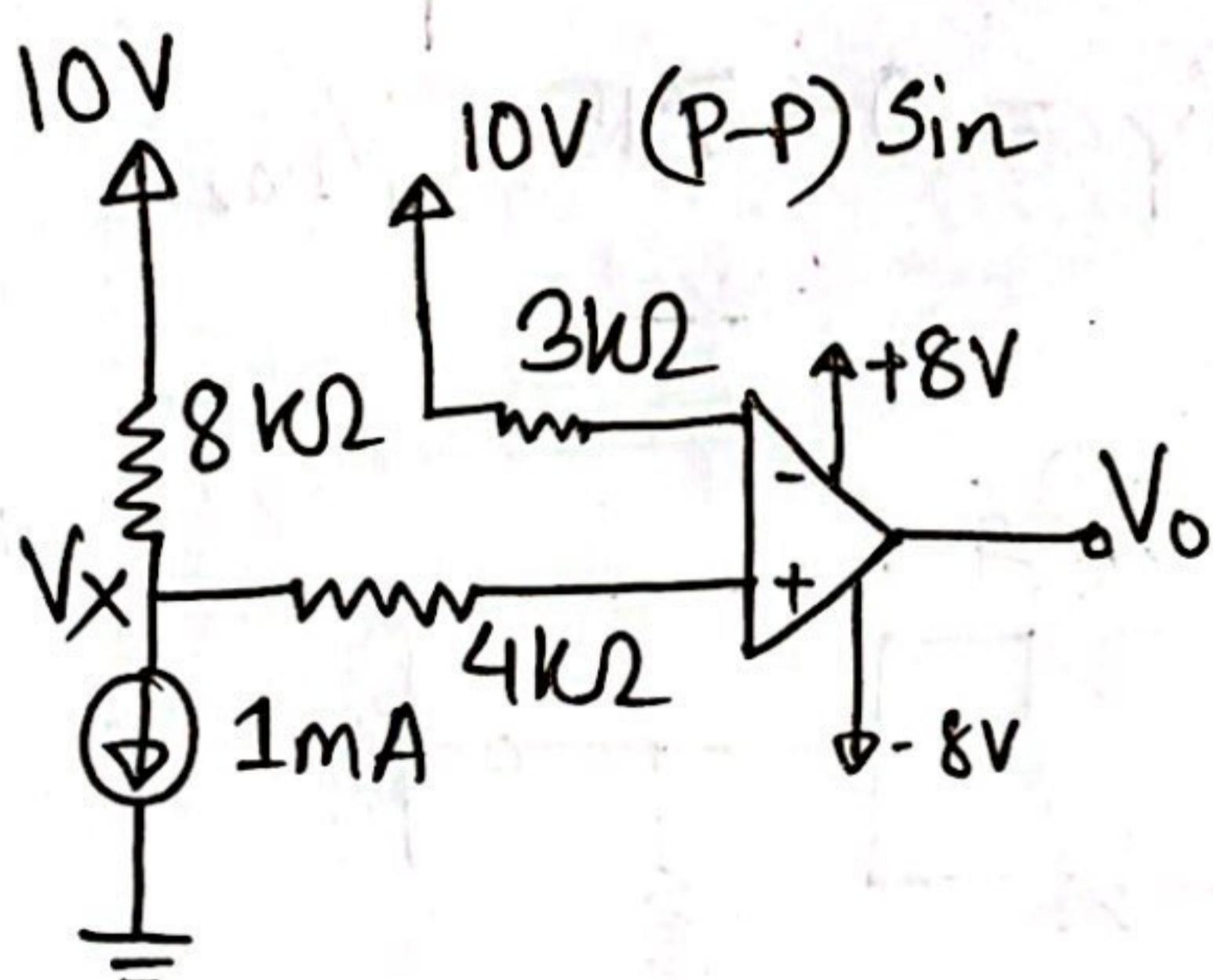


modifications:



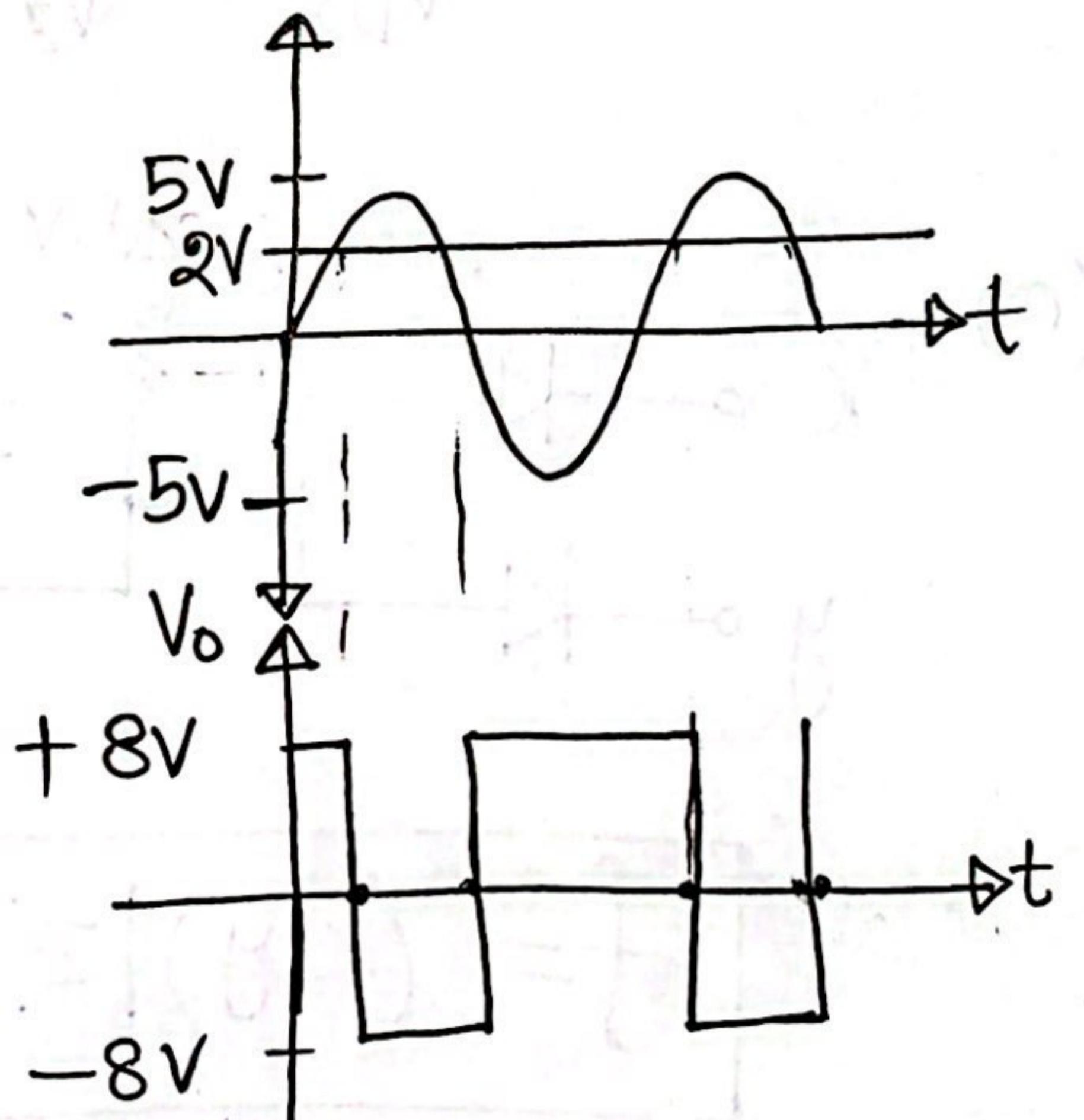
Set 02

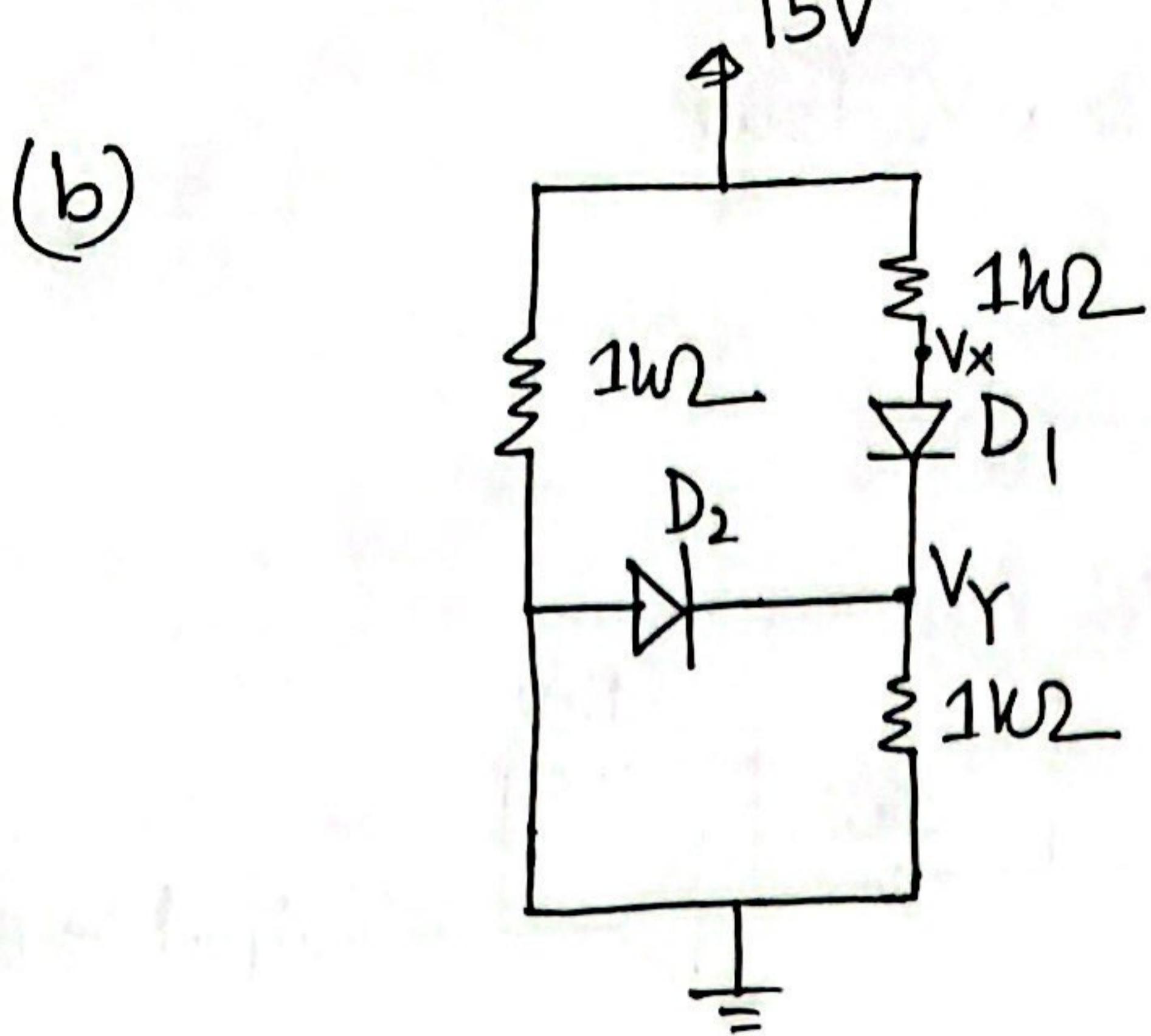
2. (a)



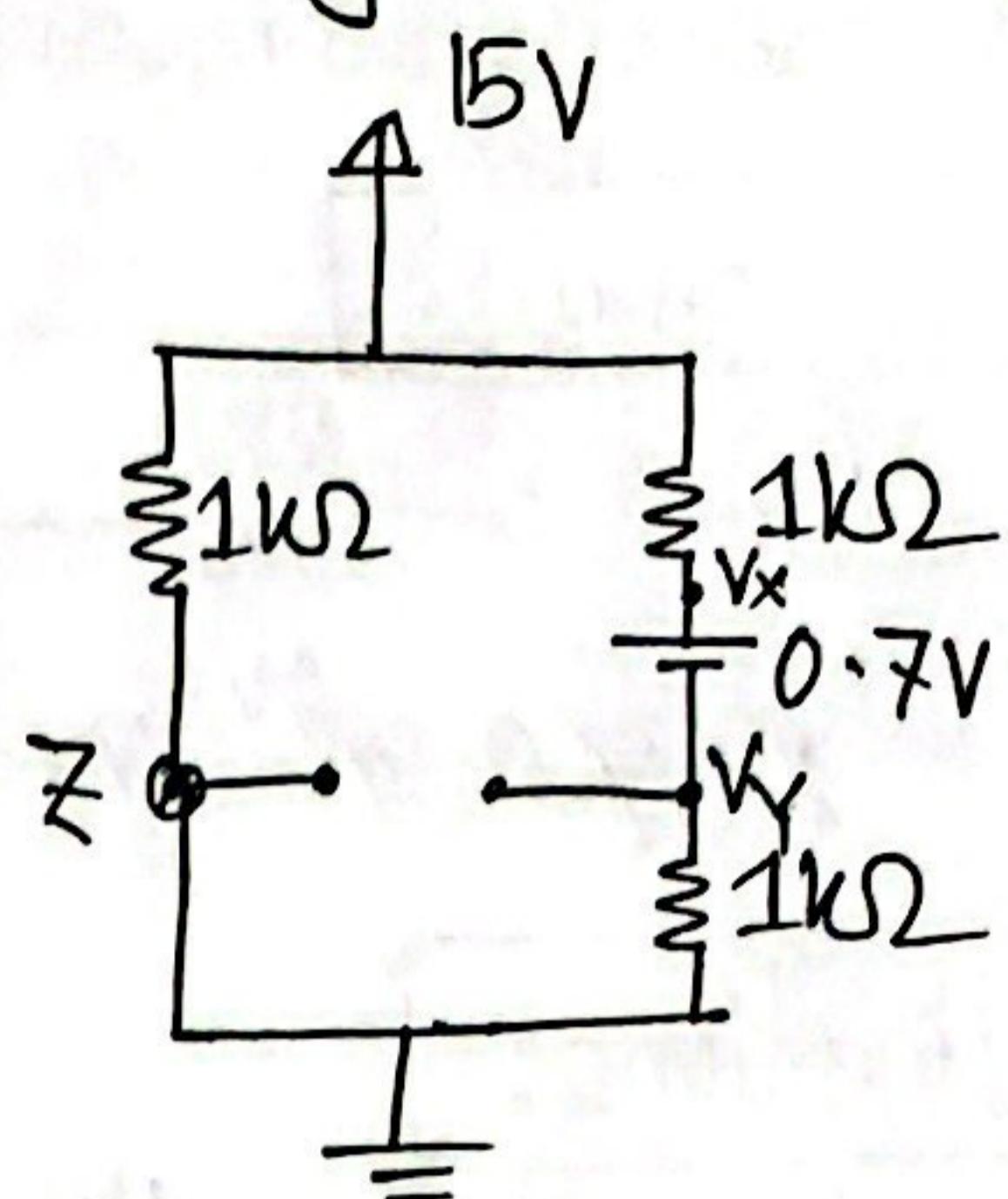
$$\frac{10 - V_x}{8} = 1$$

$$\Rightarrow V_x = 2V$$





Assuming D_1 on and D_2 off



KCL at node - Y

$$\frac{15 - 0.7 - V_Y}{1} = \frac{V_Y - 0}{1}$$

$$\Rightarrow V_Y = 7.15 \text{ V}$$

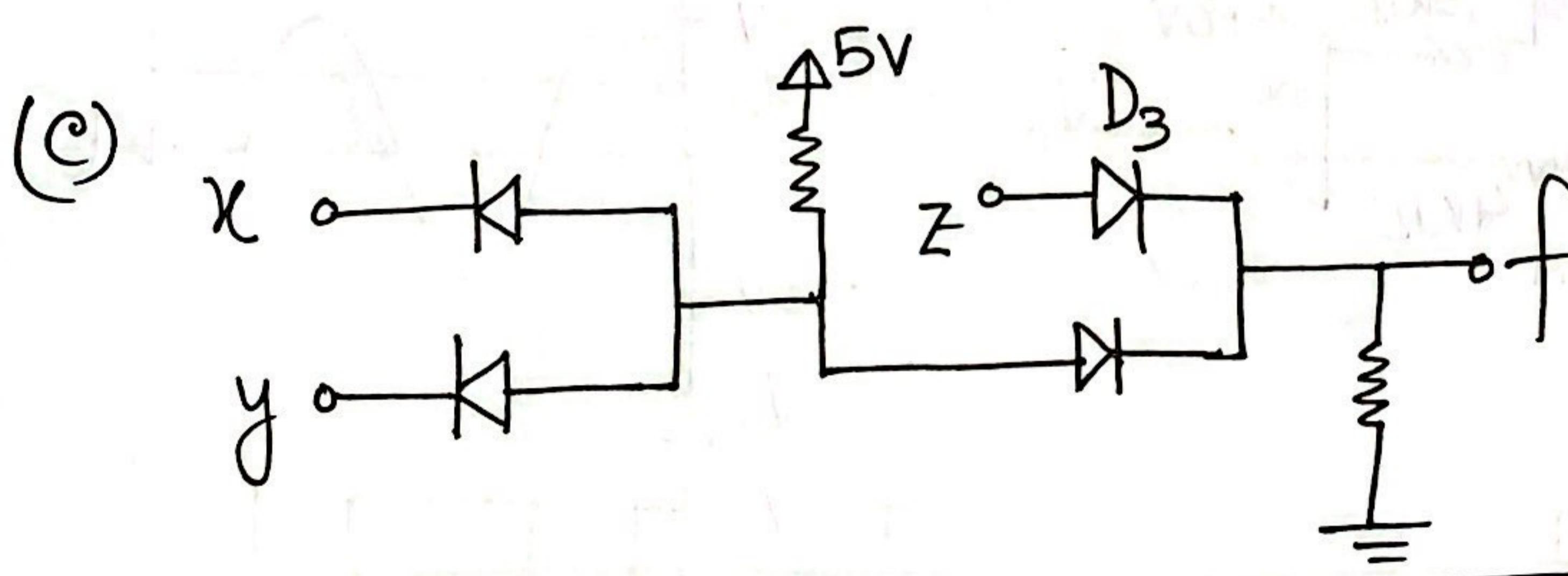
Assumption Validation:-

$$I_{D1} = \frac{15 - 7.15 - 0.7}{1} > 0$$

$$V_{D2} = V_Z - V_Y = 0 - 7.15 < V_{D_{02}}$$

$$I_{D1} = 7.15 \text{ mA}$$

$$I_{D2} = 0 \text{ mA}$$



$$f = (x \cdot y) | z$$

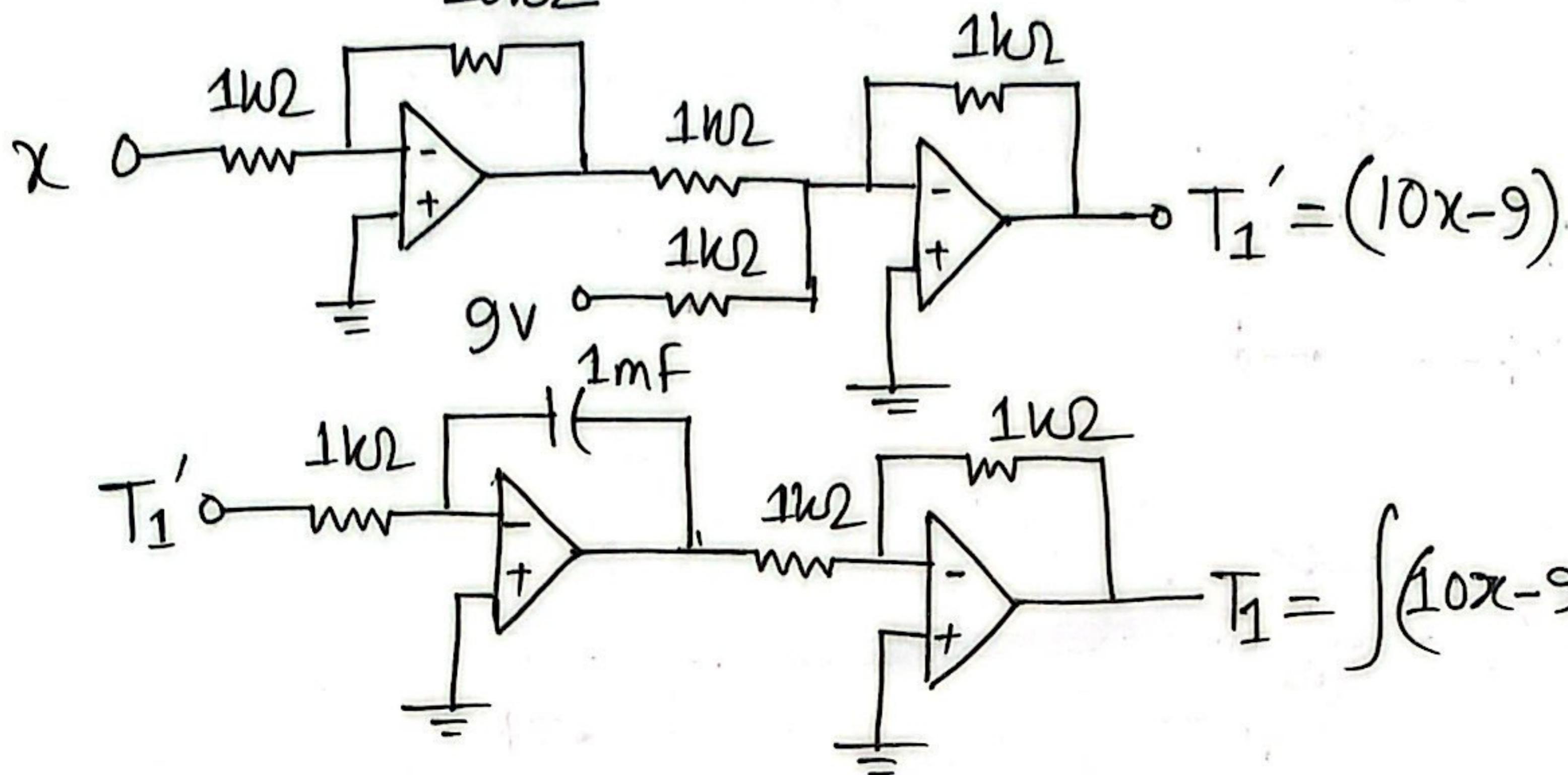
on

$$f = (x \cdot y) + z$$

Q3

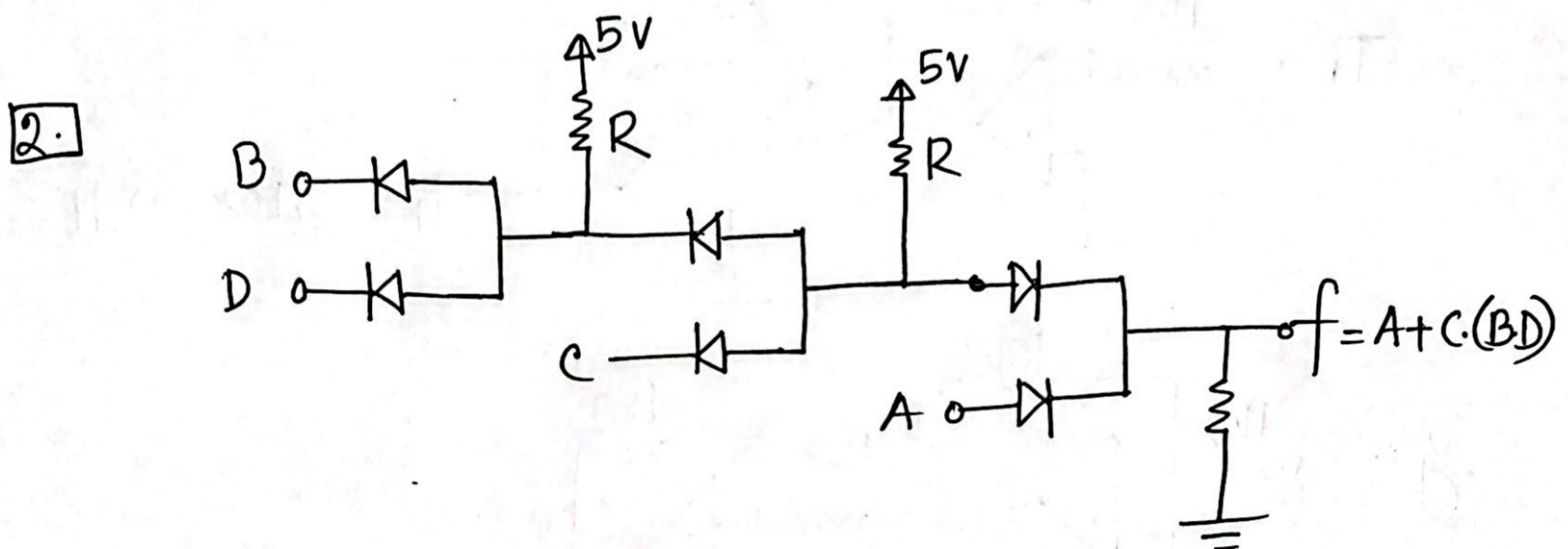
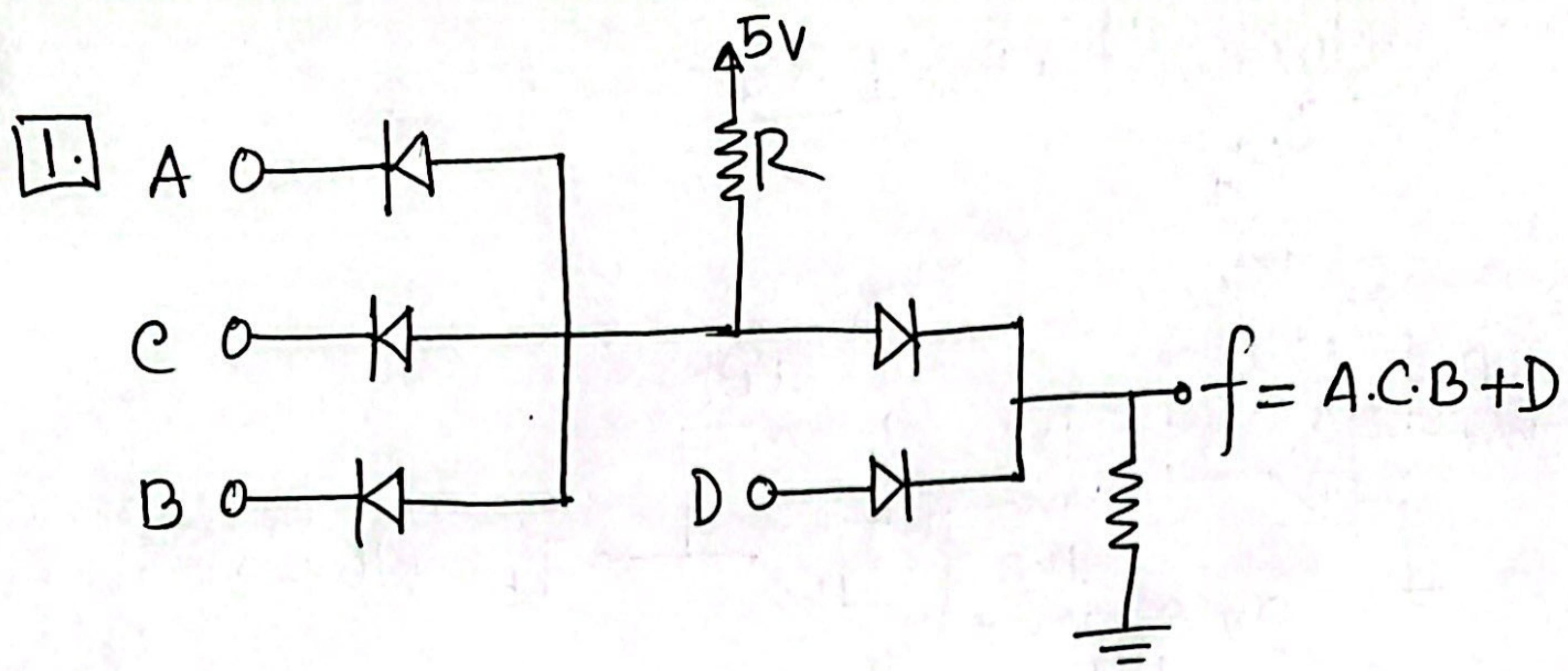
$$f = \int \underbrace{(10x-9)}_{\rightarrow T_1'} dt + 10y + \frac{d^2 z}{dt^2}$$

10W2



A circuit diagram showing a non-inverting operational amplifier configuration. The input signal y_o is connected to the non-inverting input ($+$) through a $1k\Omega$ resistor. The inverting input ($-$) is grounded. The output signal is taken from the output terminal, which is also connected to the inverting input through a $10k\Omega$ feedback resistor.

102



(c) Same as 3(c) [Set 01]

(d) $V_{\text{output}} = -2.5 + V_{\text{output}} \text{ (mod)}$

modifications:-

