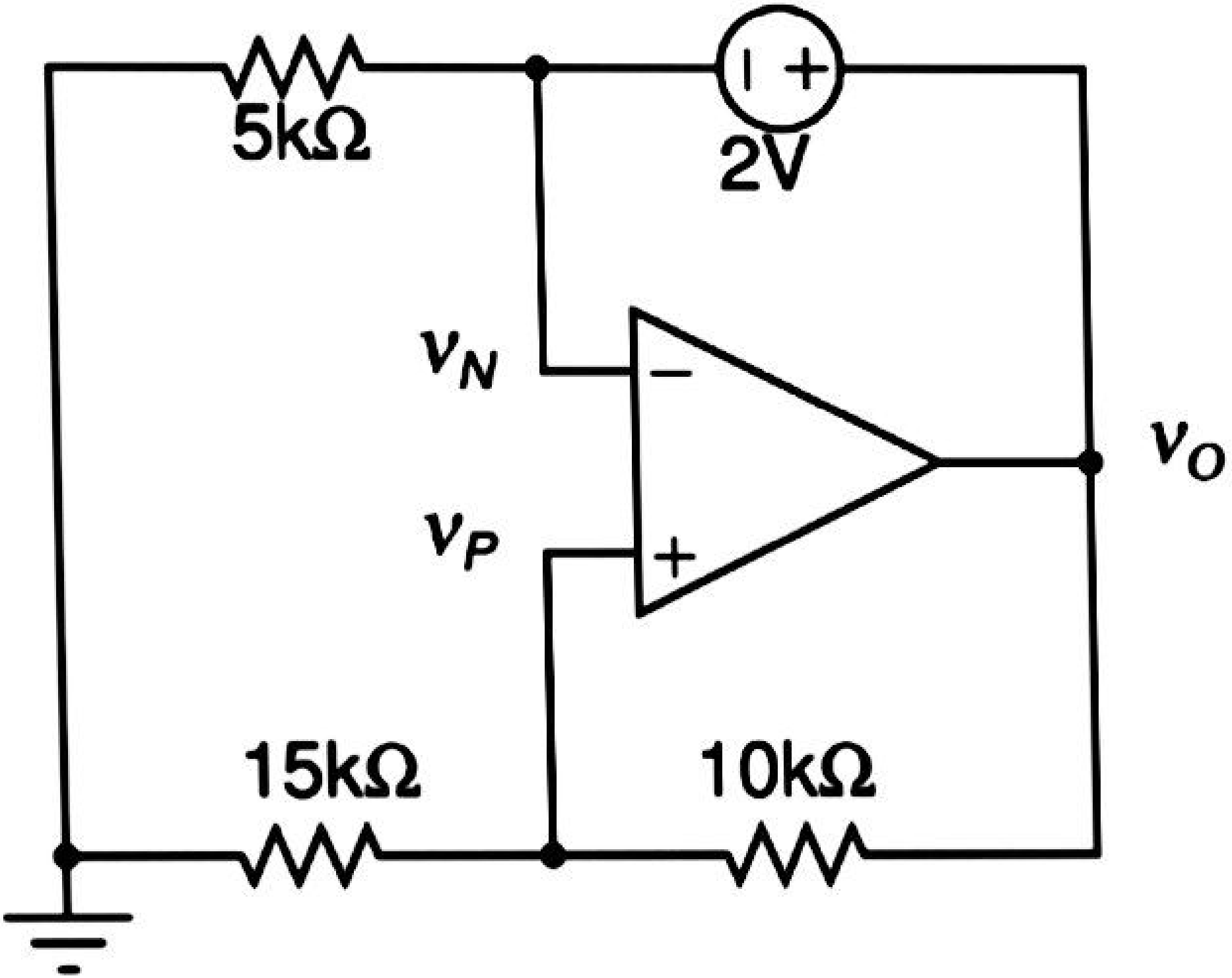
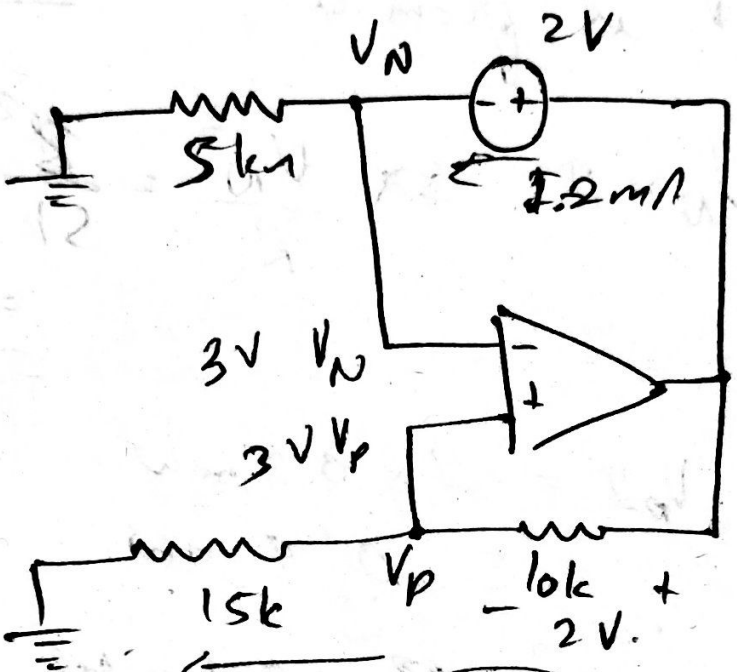

5kΩ
2V
v_N
v_P
v_O
15kΩ
10kΩ

(1)



$V_o - V_N = 2V$

$V_o - V_p = 2\ V$

$$I = \frac{V}{R} = \frac{2}{10k} = 0.2\ mA$$

$$V_p \quad \frac{I}{R} = \frac{0.2}{15}$$

$$V_p = IR = 0.2 \times 15 = 3\ V$$

So, $V_N = V_p = 3V$

$V_o - V_N = 2V$

$V_o = 5V$

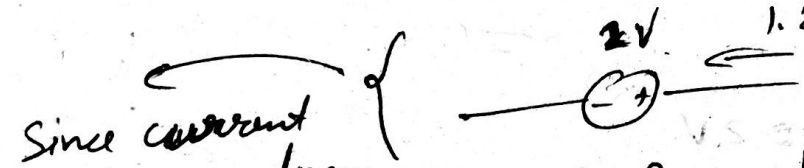
Power :- $P = VI = \frac{V^2}{R} = I^2R$

$$P_{5k\Omega} = \frac{V^2}{R} = \frac{V_p^2}{5k} = \frac{3^2}{5} = 1.8\,mW$$

$$P_{10k} = VI = 2 \times 0.2 = 0.4\,mW$$

$$P_{15k} = VI = V_p \times 0.2 = 3 \times 0.2 = 0.6\,mW.$$

So, $P_R = 1.8 + 0.4 + 0.6$
$= 2.8\,mW \rightarrow$ Dissipated.



Since current is flowing from +ve terminal to -ve terminal

So, Power delivered will be -ve.

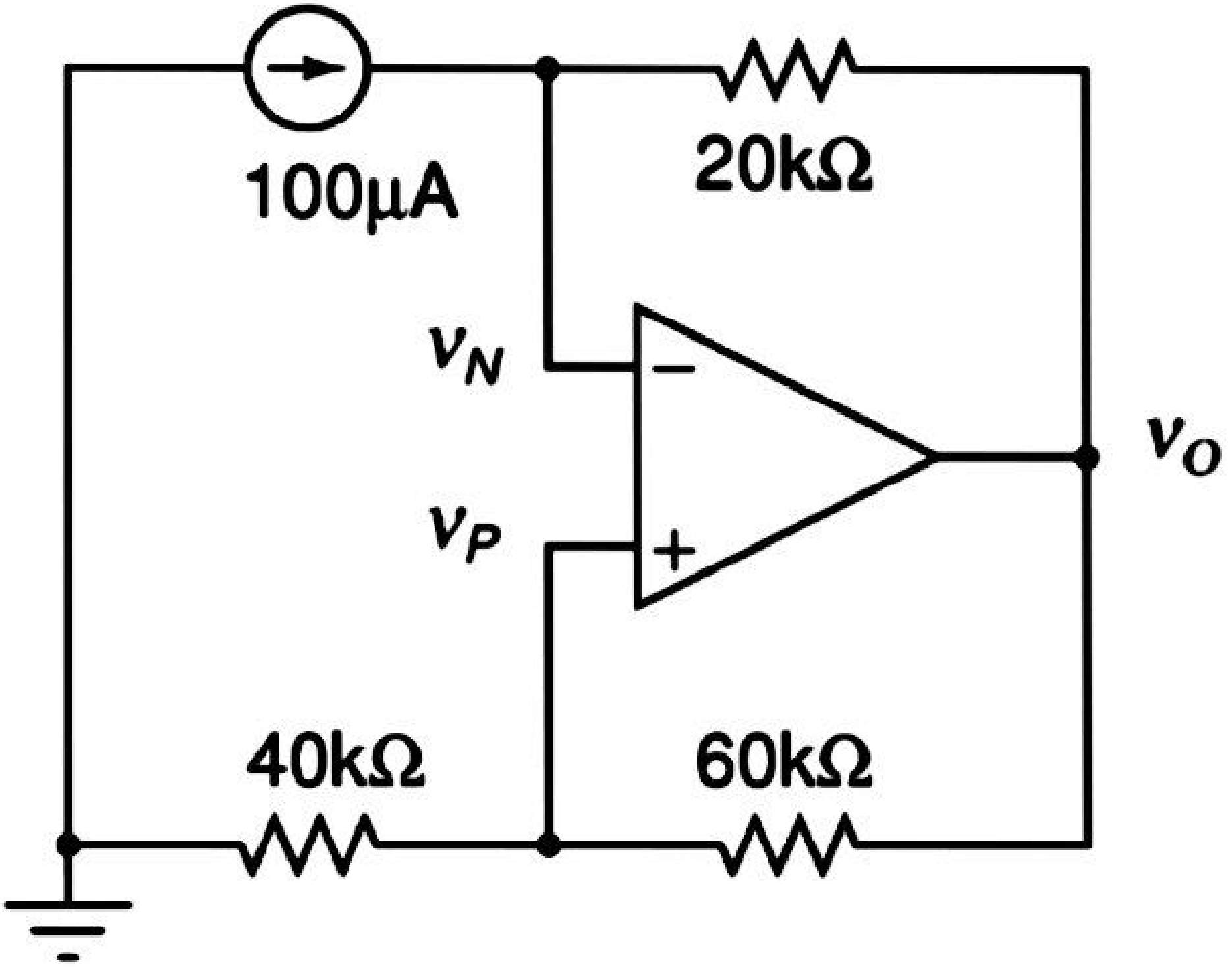
$P_{2V} = VI$
$= 2 \times 1.2$
$= 2.4\,mW$

$P_{dissipated}$

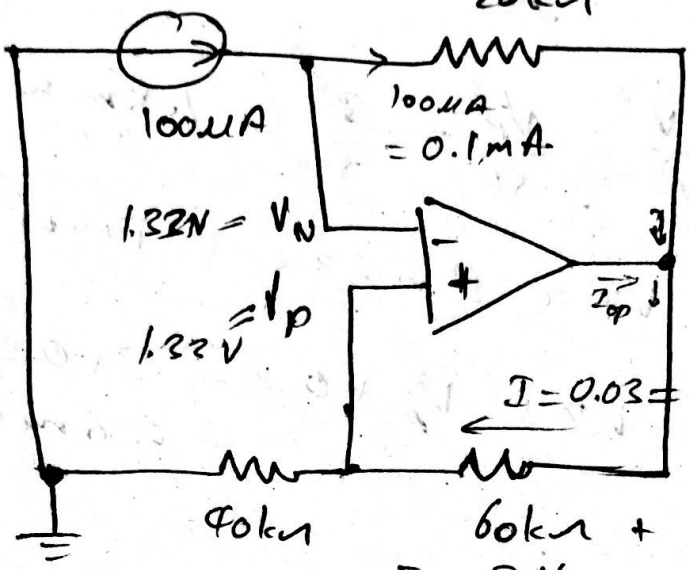
$P_{delivered} = -2.4\,mW$

$P_{Total\ [deliv\ dissipated]} = 2.8 + 2.4$
$= 5.2\,mW$

$P_{delivered\ by\ op\ amp} = VI$
$= 5 \times (1.2 + 0.2)$
$= 7\,mW.$


100μA
20kΩ
v_N
v_P
v_O
40kΩ
60kΩ

(2)



$V_{20k} = I \times R = 100 \times 10^{-6} \times 20 \times 10^{3}$

$= 2V.$

$V_o - V_N = 2V$

$V_N = V_p$ → Virtual gnd

So, $V_o - V_p = 2V$

$I = \frac{V}{R} = \frac{2}{60} = 0.033mA$

$V_p = IR$

$= 0.03 \times 40$

$= \frac{1}{30} \times 40 = 1.33V.$

$V_o = 2 + V_N$

$= 2 + 1.33$

$= 3.33V$

Power

$P_{20k} = VI$

$= 2 \times 100 \times 10^{-6}$

$= 200\ \mu W$

$= 0.2\ mW$

$P_{60k} = VI$

$= 2 \times \frac{1}{30} = \frac{1}{15} = 0.066\ mW$

$P_{40} = VI$

$= V_p \times \frac{1}{30}$

$= 1.33 \times \frac{1}{30}$

$= 0.0443\ mW$

So, $P_R = 0.2 + 0.066 + 0.0443$

$= 0.3103\ mW.$

Now, Power by 100μA source

$V = V_N = 1.33V$

$I = 600\mu A$

So, $P = 1.33 \times 100\ \mu A$

$= 1.33 \times 10^{-4} W$

$= 0.133\ mW.$

$I_{op} + 0.03 = 0.1$

$\boxed{I_{op} = 0.07\ mA}$

So, $P_{delivered\ by\ opamp} = V_o \times I_{op}$

$= 0.2331\ mW$