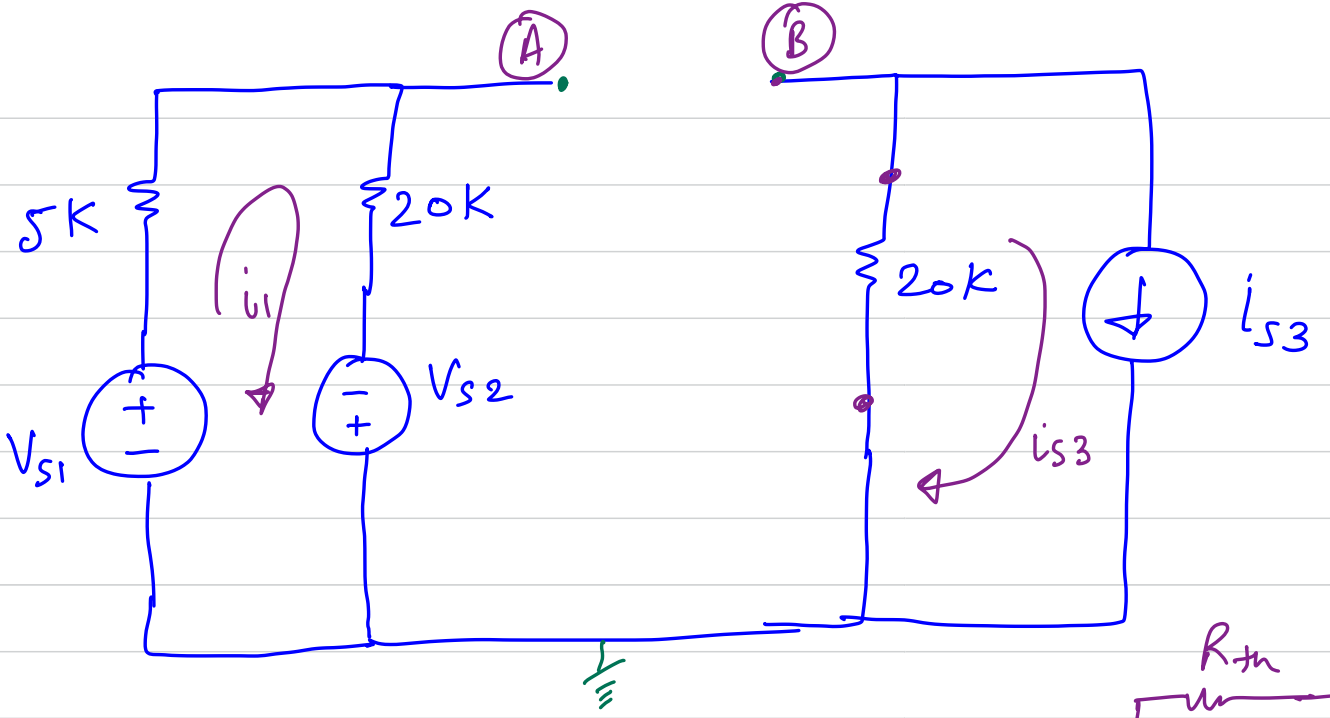
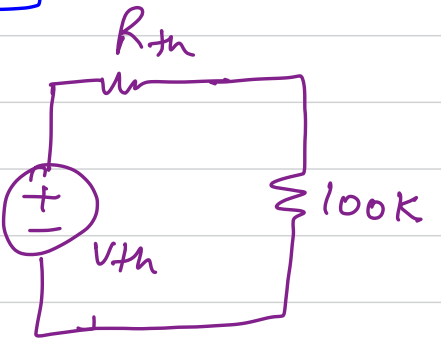
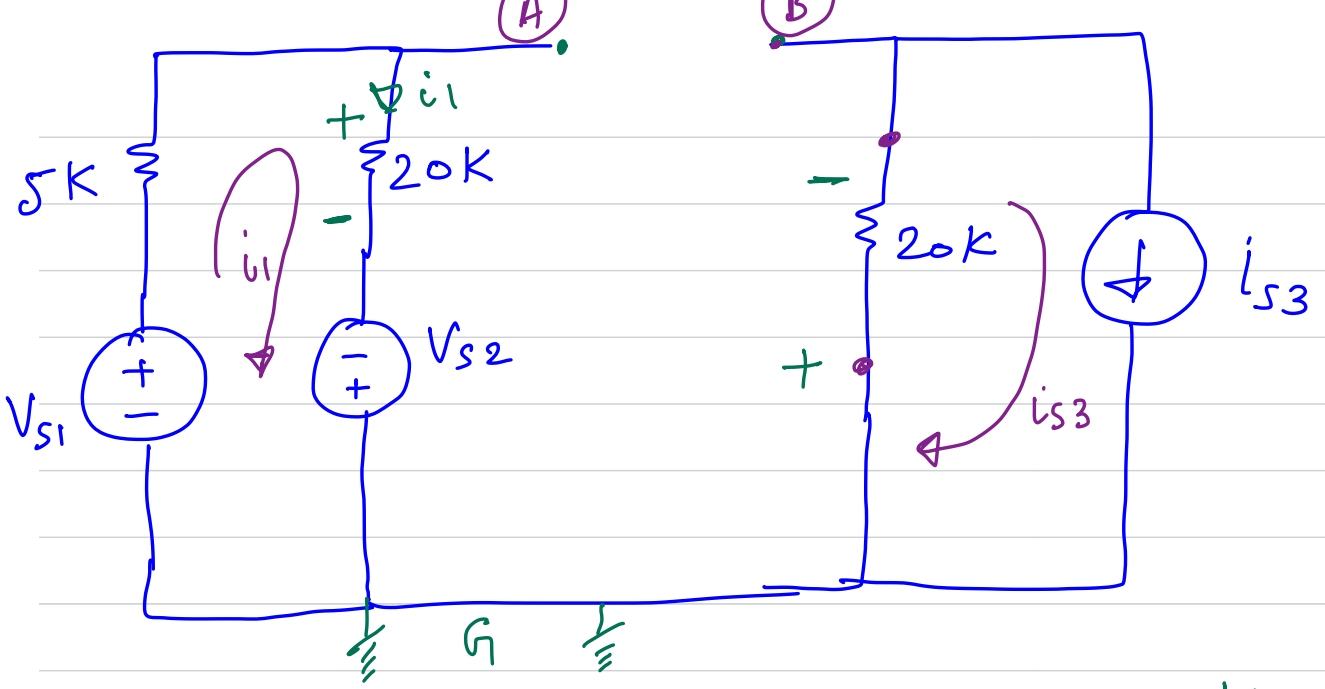
Q



$$V_{S1} - 5K i_1 - 20K i_1 + V_{S2} = 0$$

$$i_1 = \left(\frac{V_{S1} + V_{S2}}{25K} \right)$$





$$\{V_{AG} = (20k\,i_1 - V_{S2})\}$$

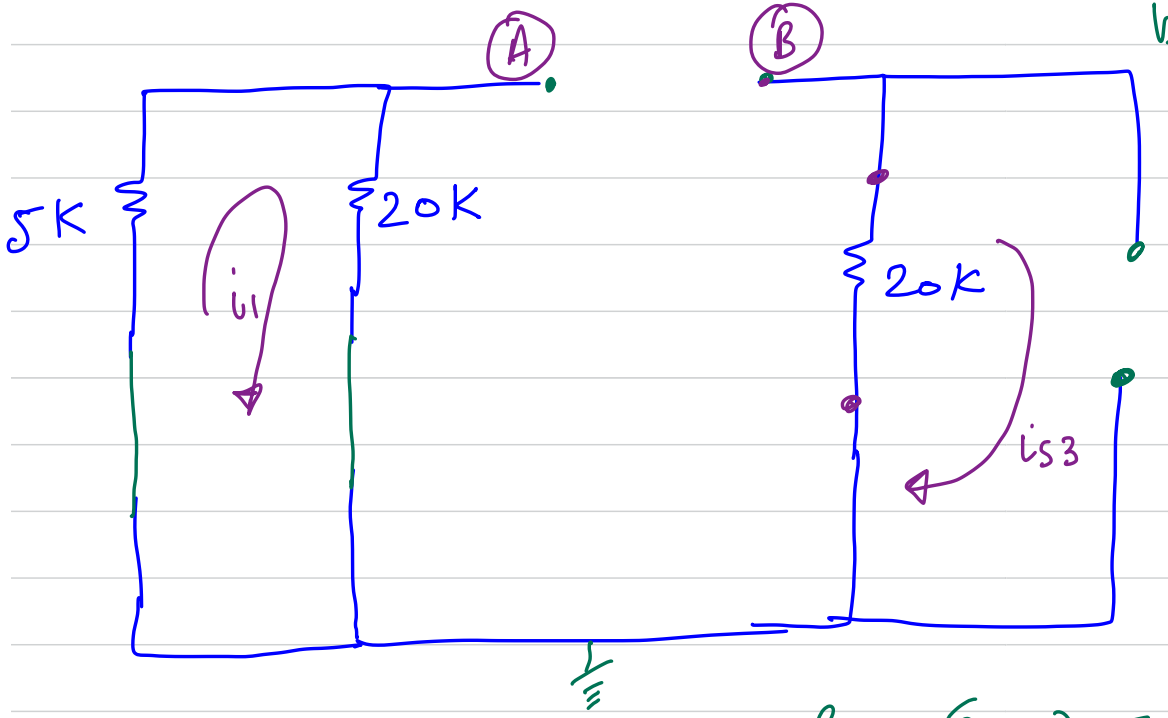
$$V_{AB} = V_{AG} - V_{BG}$$

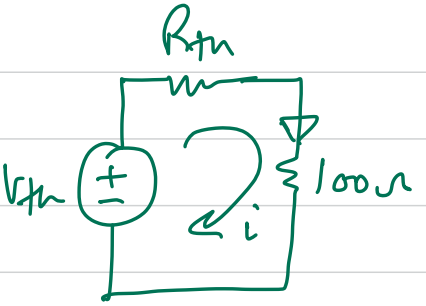
$$V_{BG} = -20k\,i_{S3}$$

$$V_{th} = V_{AB} = 20k\,\tilde{i_1} - V_{S2} + 20k\,i_{S3}$$

V_{th} ← V_{S1}, V_{S2}, i_{S3}

$$V_{th} = 0.8\,V_{S1} - 0.2\,V_{S2} + 20K\,i_{S3}$$

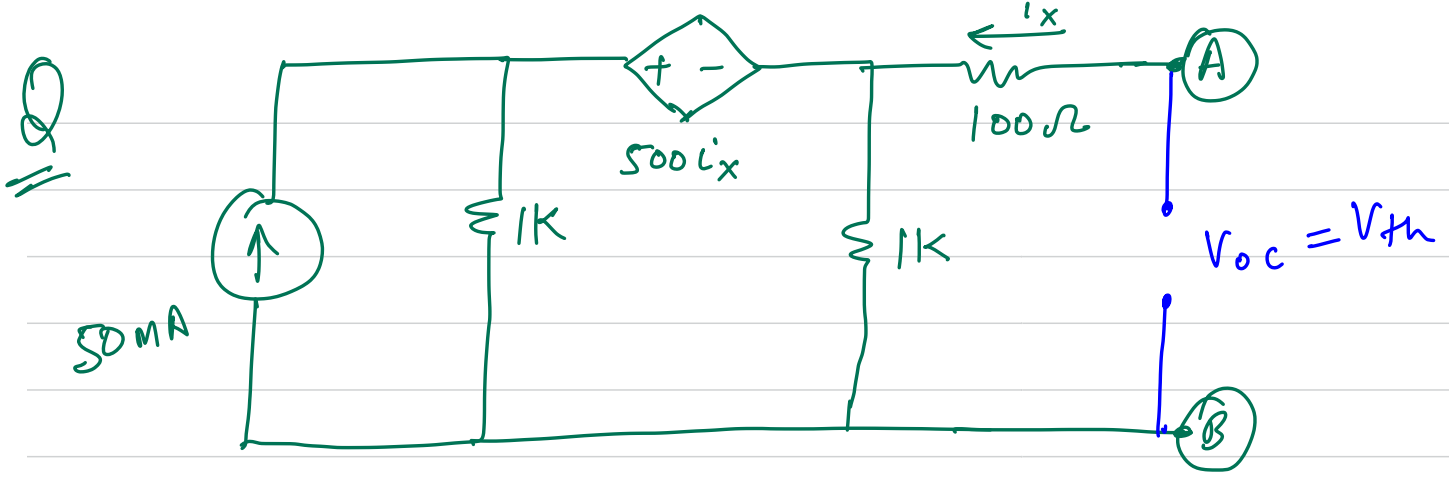




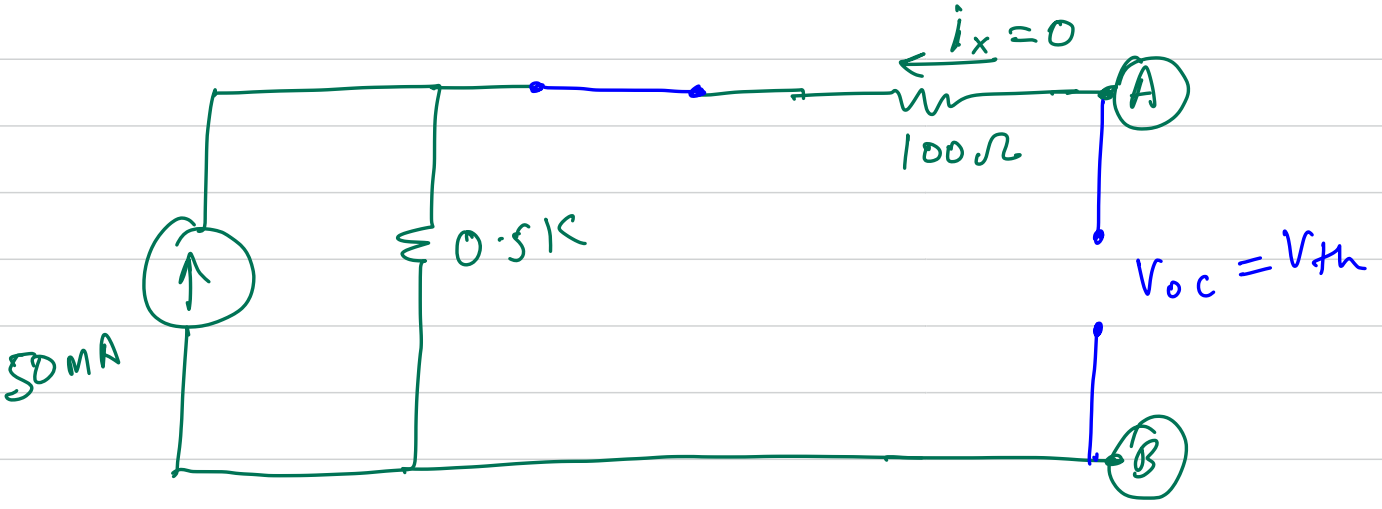
$$i = \frac{V_{th}}{(R_{th} + 100\Omega)}$$

$$R_{AB} = (24K) = \left(\frac{5K \times 20K}{25K} + 20K\right)$$

Q

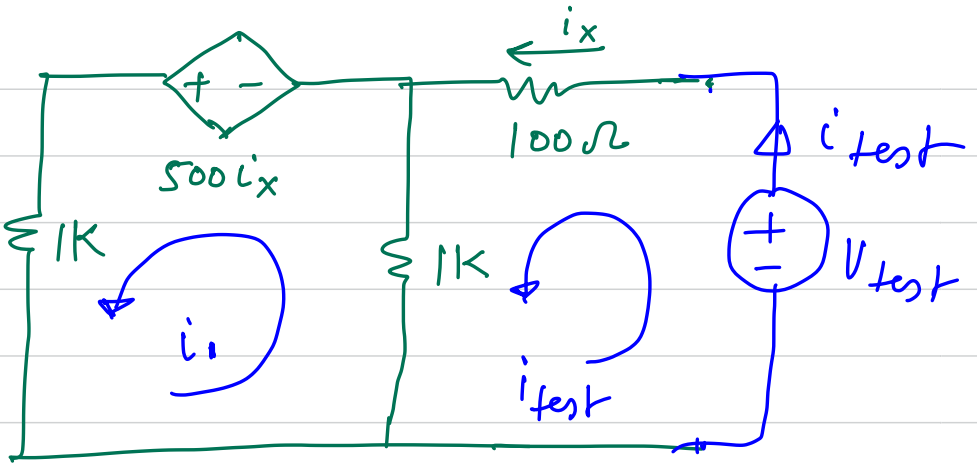


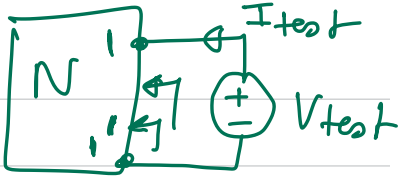
$V_{oc} = V_{th}$



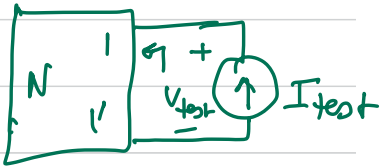
$V_{oc} = (25V)$

$V_{oc} = 50mA \times 0.5K = V_{th}$





$$R_{eq} = \frac{V_{test}}{I_{test}}$$



$$V_{test} - 100\, i_{test} - 1K\,(i_{test} - i_1) = 0$$

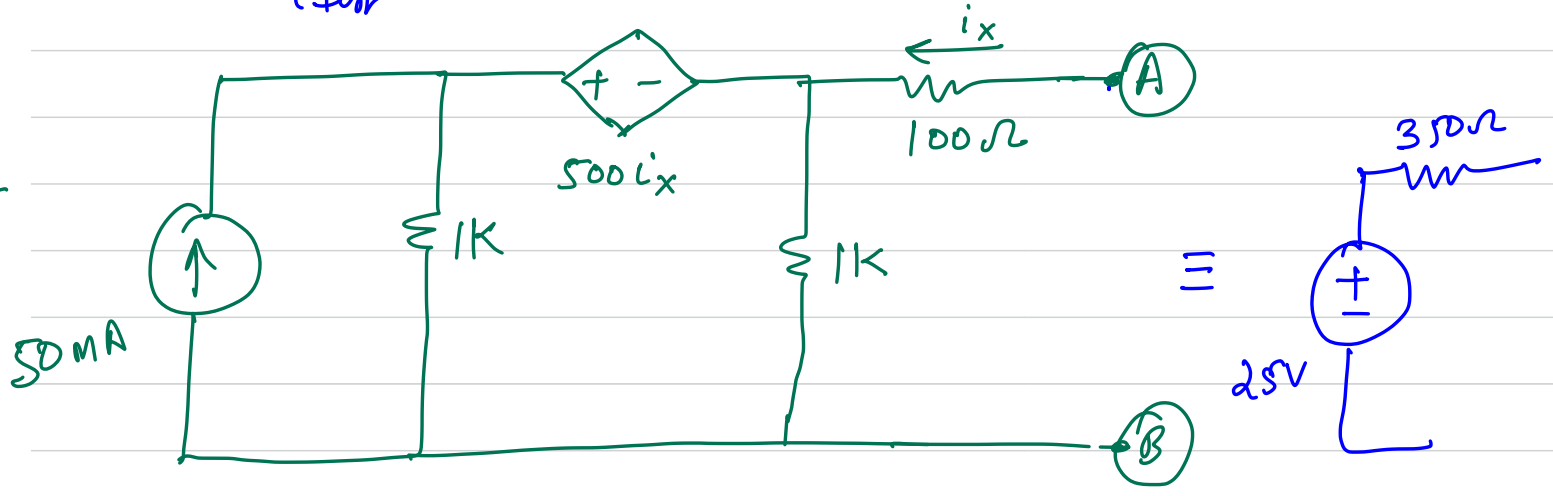
$$R_{eq} = \frac{V_{test}}{I_{test}}$$

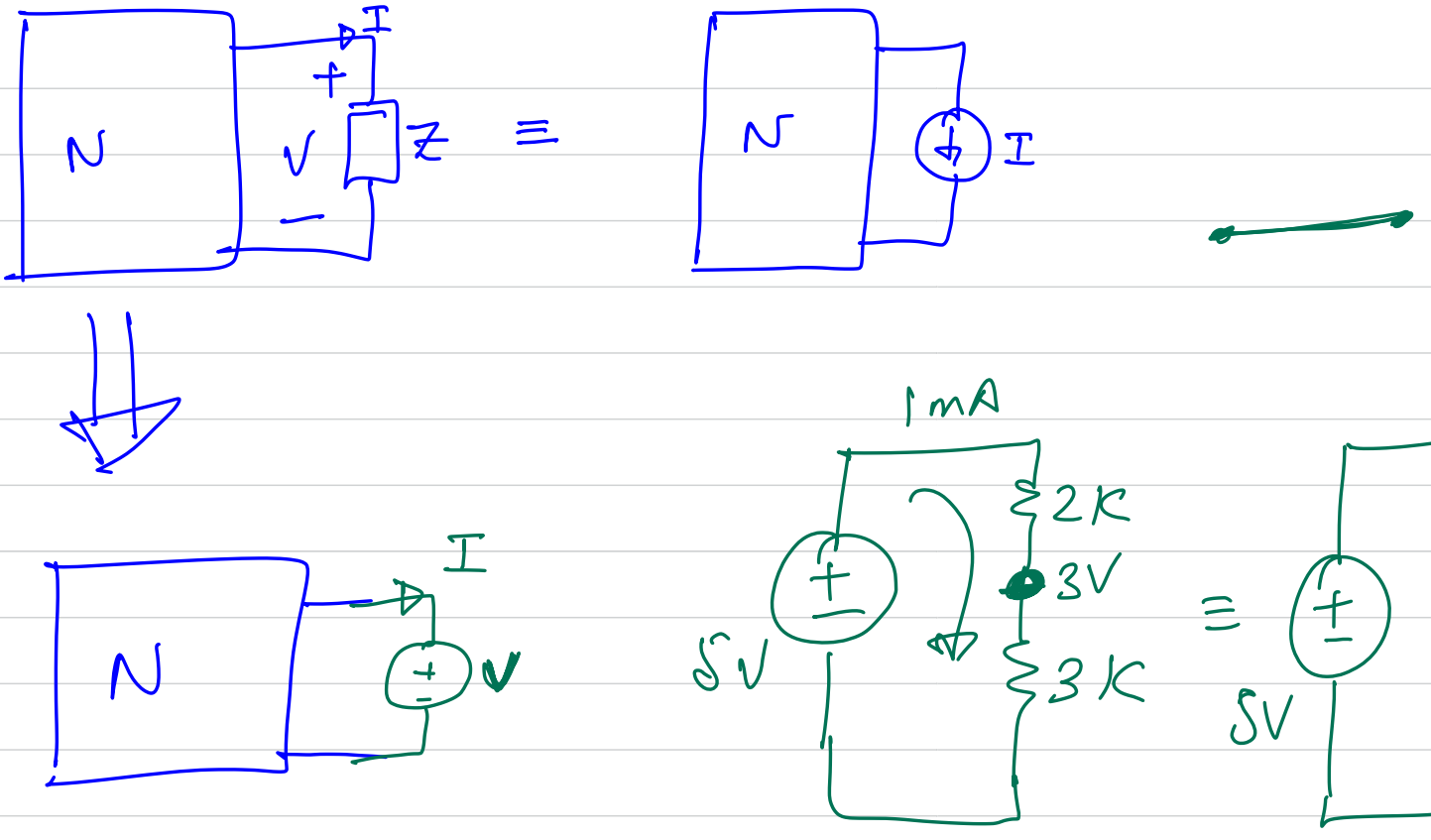
$$-1K\,(i_1 - i_{test}) + 500\, i_{test} - 1K\, i_1 = 0$$

$$R_{eq} = \frac{V_{test}}{i_{test}}$$

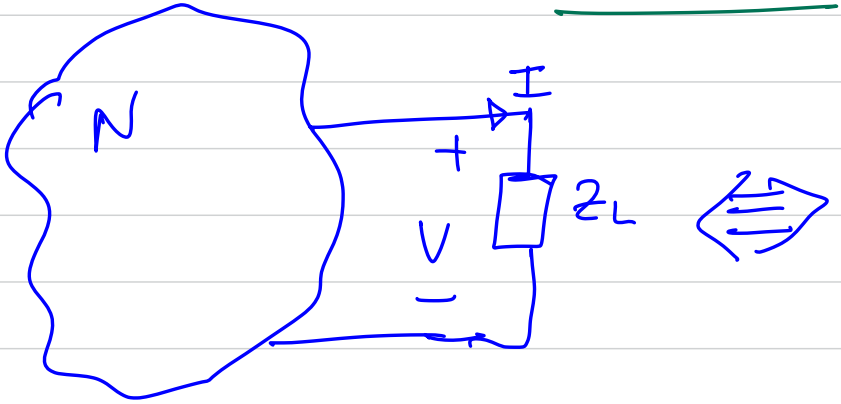
$$\hookrightarrow i_{test} = \left(\frac{4}{3} i_1\right) \Rightarrow i_1 \simeq \frac{3}{4}\, i_{test}$$

$$\frac{V_{tot}}{i_{tot}} = 350\,\Omega = R_{th}$$

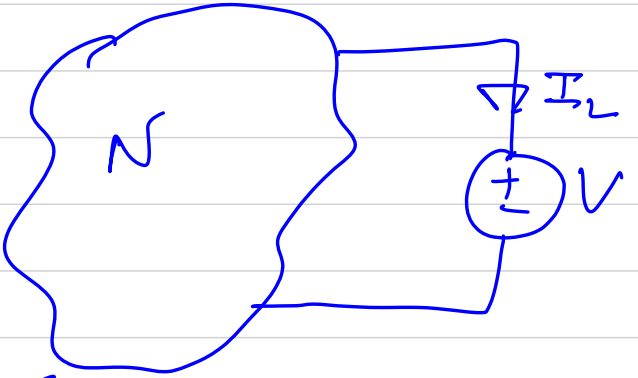


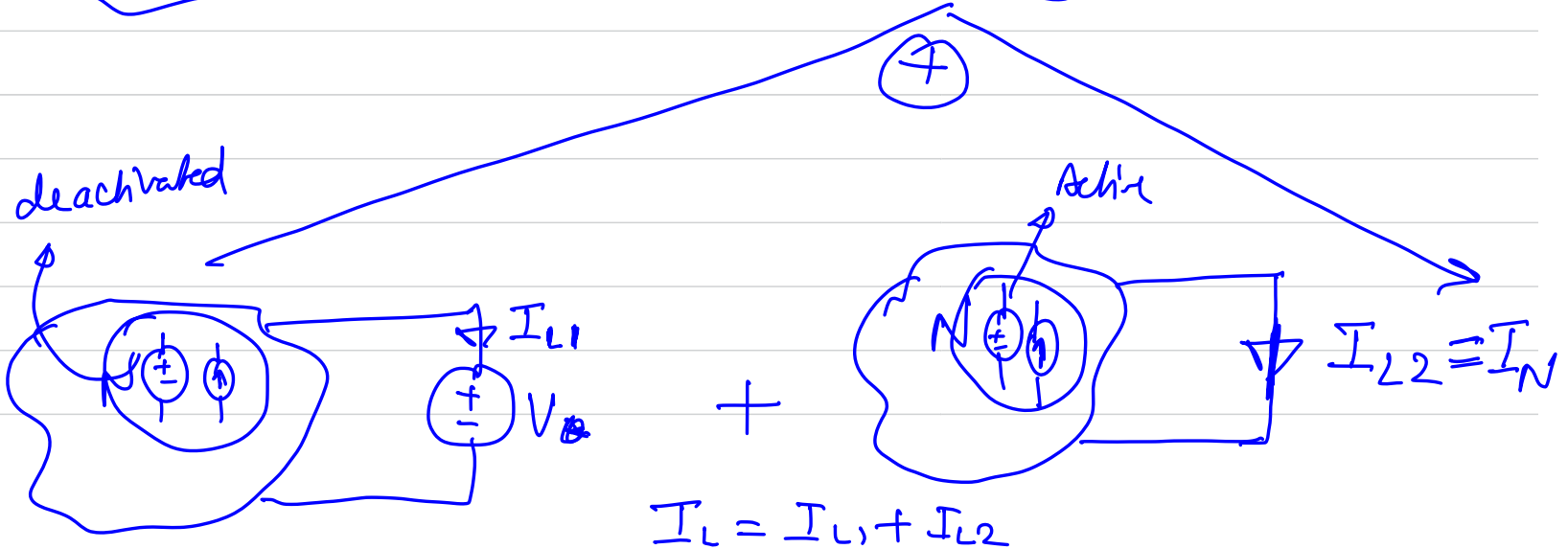

N
I
+
V
−
Z
≡
N
I
N
I
+
V
−
1mA
2K
3V
5V
3K
≡
2K
3V
5V
3V

Norton Theorem

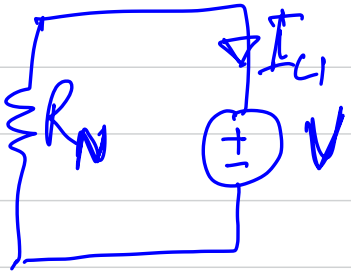


$\Leftrightarrow$





$I_L = I_{L1} + I_{L2}$

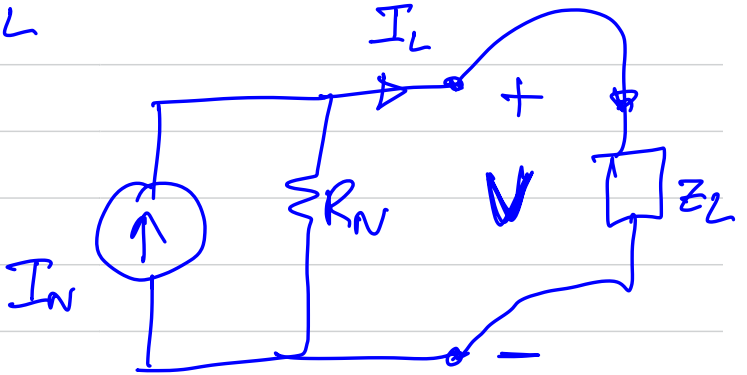


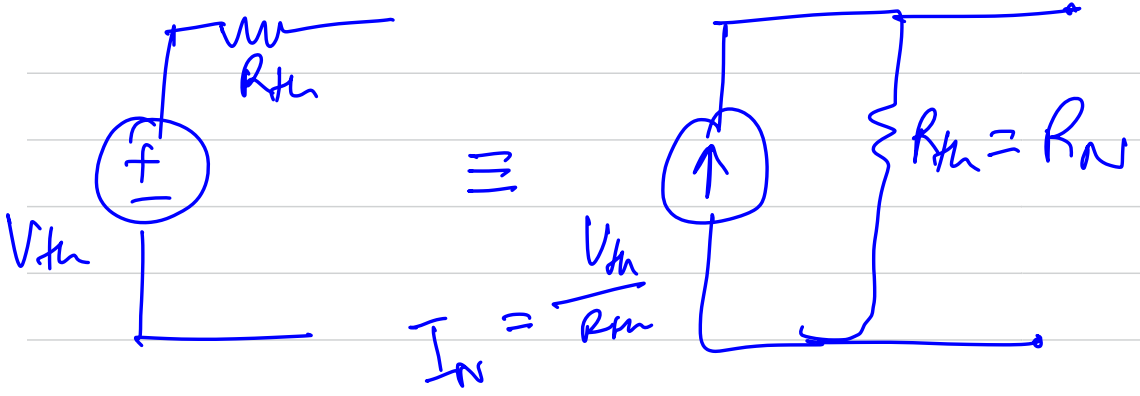
$+$ $\left(I_{L2} = I_N\right)$

$\left(I_{L1} = -\frac{V}{R_N}\right)$

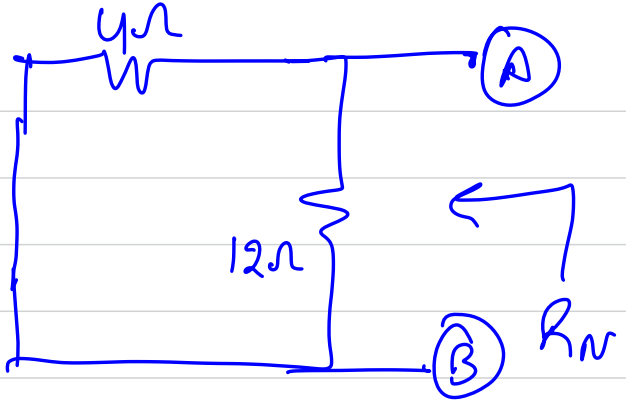
$$I_L = \left(I_N - \frac{V}{R_N}\right) =$$

$\left(R_N = R_{Th}\right) =$



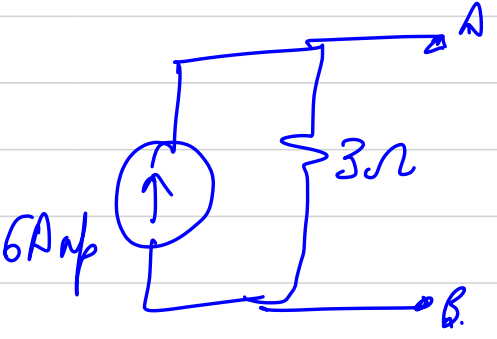

R_{th}
V_{th}
$\equiv$
$I_N = \frac{V_{th}}{R_{th}}$
$R_{th} = R_N$

Q

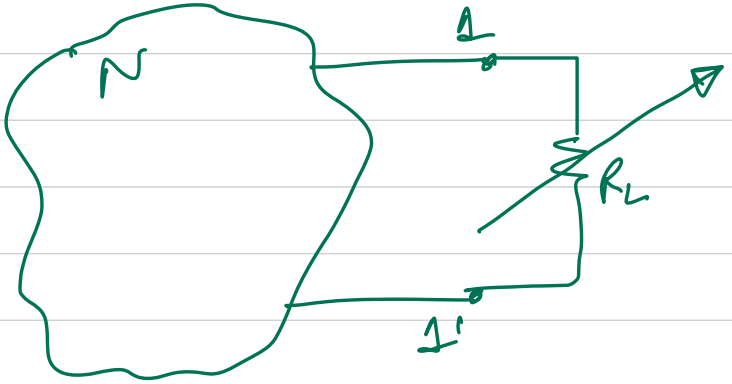


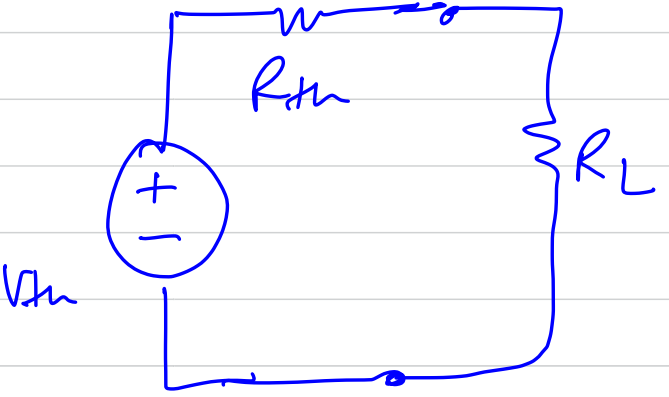
$I_N = 6\,Amp$

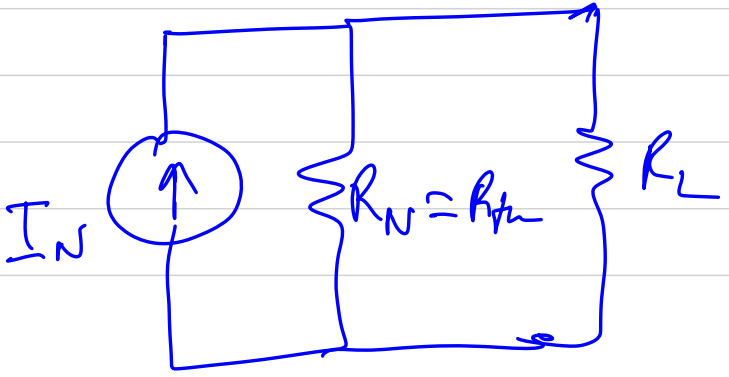
$R_N = 4 \| 12\Omega = 3\Omega$

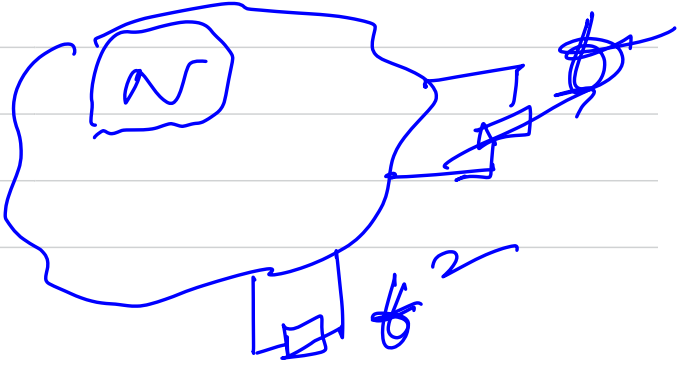


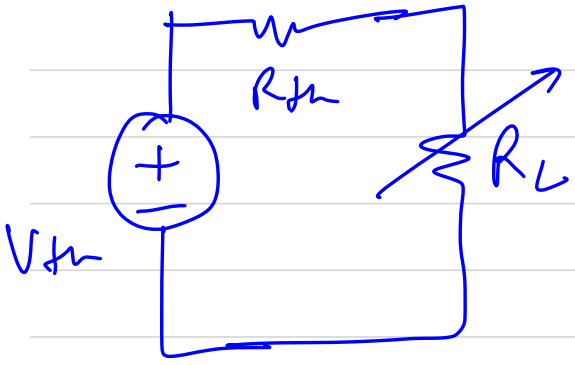
Maximum Power Transfer











$$P_{RL} = V_{RL} \cdot i_{RL}$$

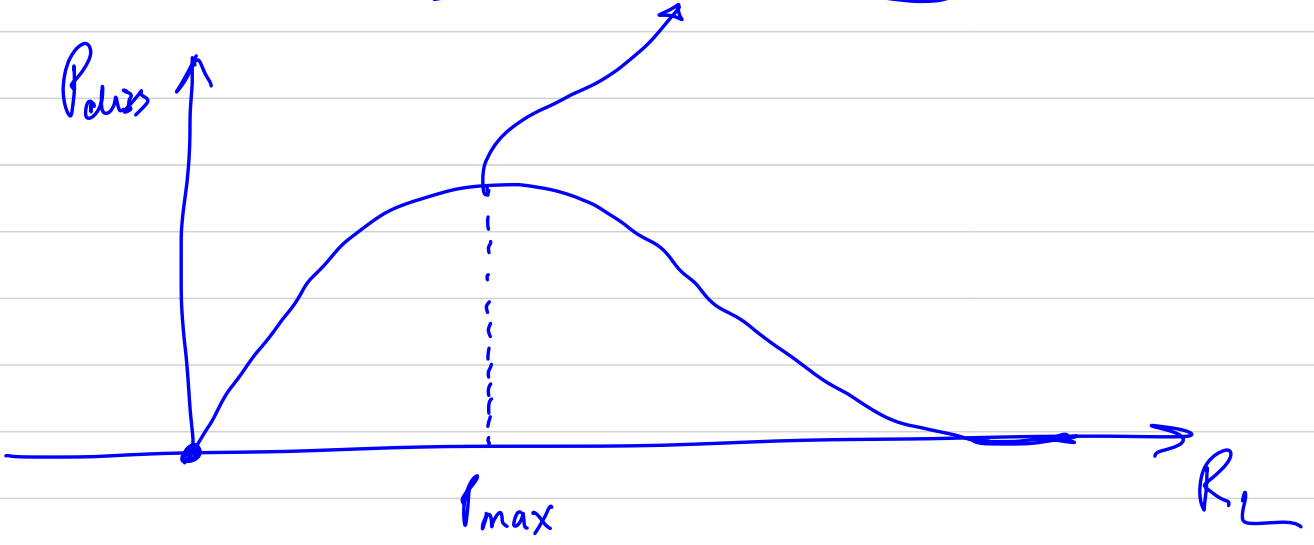
$$\equiv \frac{V_{th}}{(R_{th}+R_L)} \cdot \frac{V_{th} R_L}{(R_L+R_{th})}$$

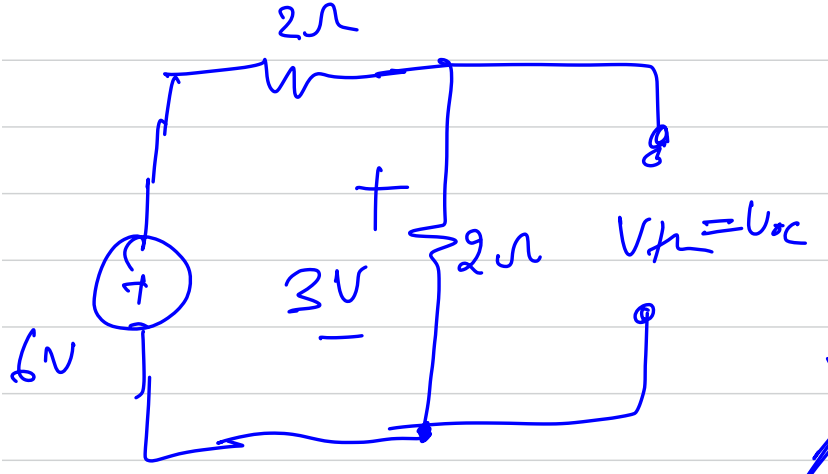
$$P_{RL} \equiv \frac{V_{th}^2 R_L}{(R_{th}+R_L)^2}$$

$$\frac{dP_{RL}}{dR_L} \equiv \frac{(V_{th})^2 \left\{ (R_L+R_{th})^2 - 2R_L(R_L+R_{th}) \right\}}{(R_L+R_{th})^4} = 0$$

$(R_L = R_{th})$

$$P_{max} = \frac{V_{th}^2 R_L}{(R_L + R_{th})^2} = \left\{\left(\frac{V_{th}^2}{4R_{th}}\right)\right\}$$





max power

$$P_{RL} = \frac{V_{th}^2}{4R_L} = \frac{9}{4 \times 1}$$

$$P_{max} = (9/4)$$