

Example 1 Find the thevenin equivalent circuit for the network of the Figure

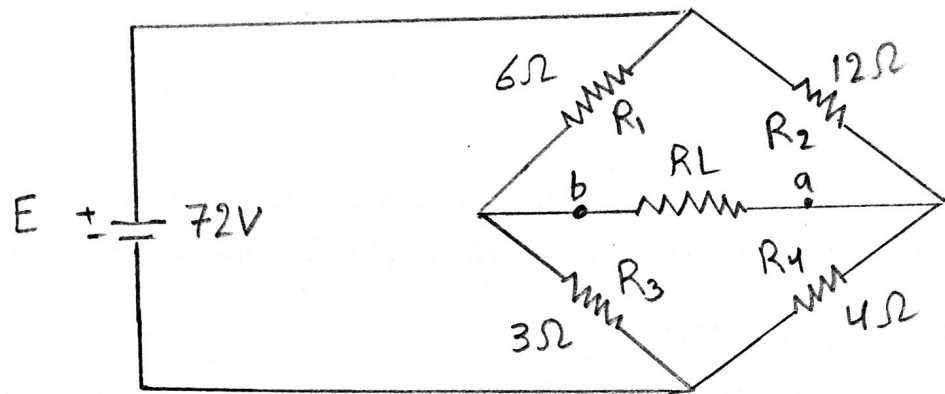


Fig (1)

SOL

1-Apply step 1, 2 in the Figure (2)

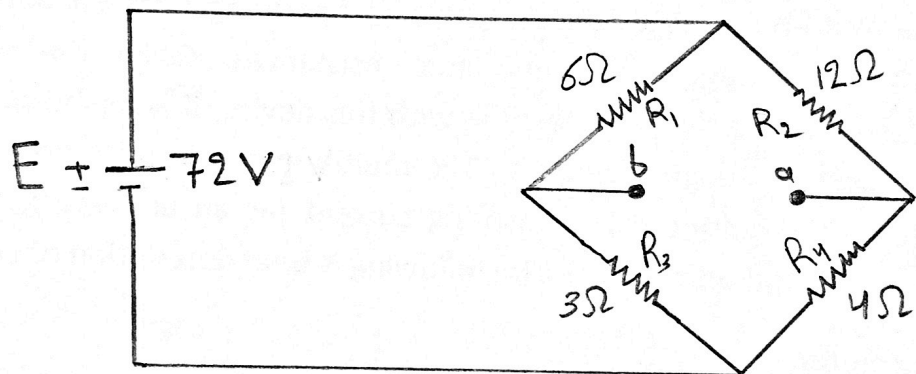


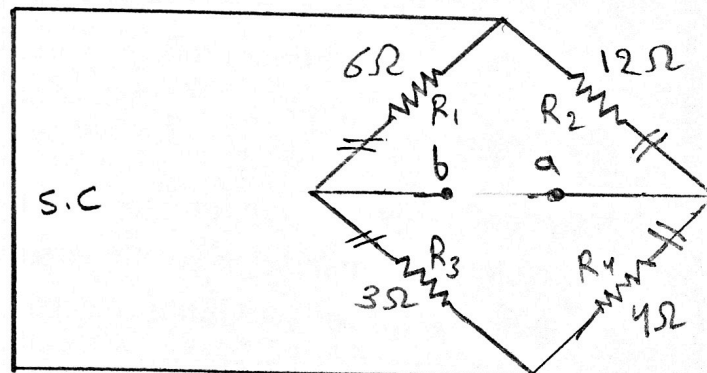
Fig (2)

3. Find R_{th}

$$R_1 \parallel R_3 = \frac{6 \times 3}{6 + 3} = 2 \Omega$$

$$R_2 \parallel R_4 = \frac{12 \times 4}{12 + 4} = 3 \Omega$$

$$R_{th} = 2 \Omega + 3 \Omega = 5 \Omega$$



4- Find E_{th}

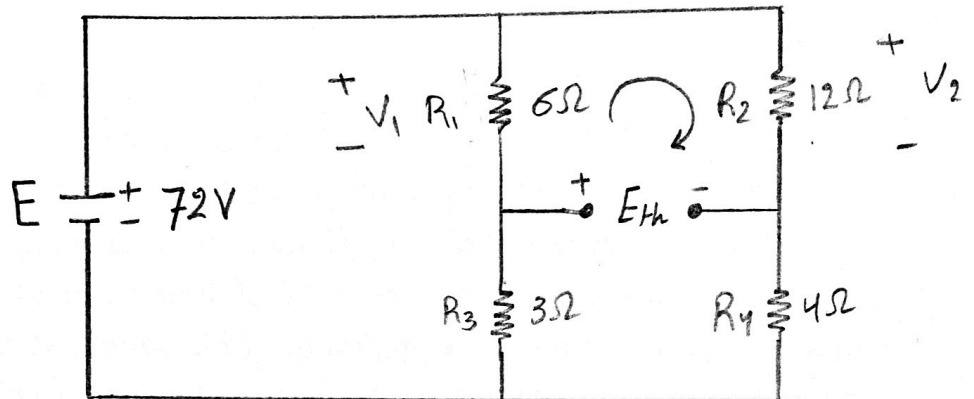
$$V_1 = \frac{R_1 E}{R_1 + R_3} = \frac{6 * 72}{9} = 48V$$

$$V_2 = \frac{R_2 E}{R_2 + R_4} = \frac{12 * 72}{16} = 54V$$

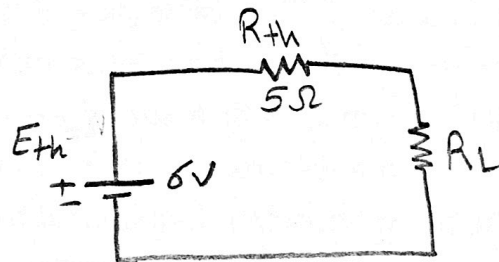
∴ using KVL

$$E_{th} + V_1 - V_2 = 0$$

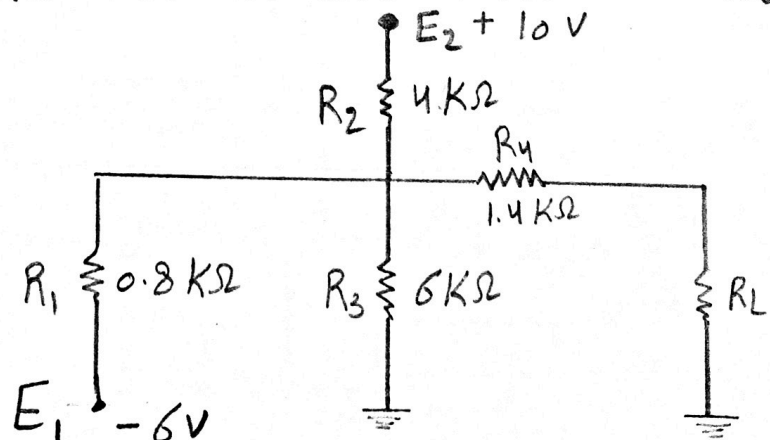
$$\begin{aligned} E_{th} &= -V_1 + V_2 \\ &= -48 + 54 \\ &= 6V \end{aligned}$$



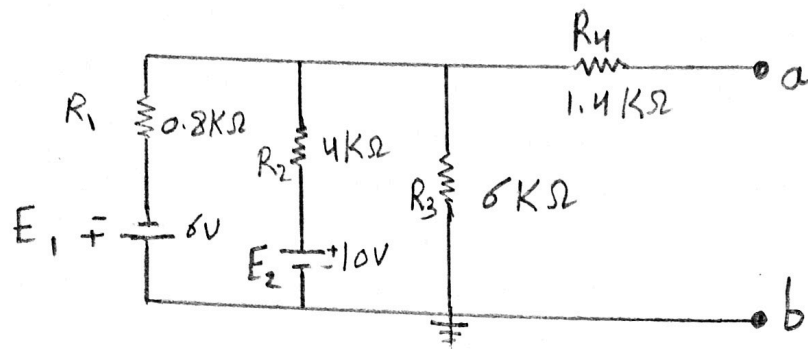
5- Draw the Thevenin equivalent circuit



Example 2 ∴ Find the thevenin circuit for the network



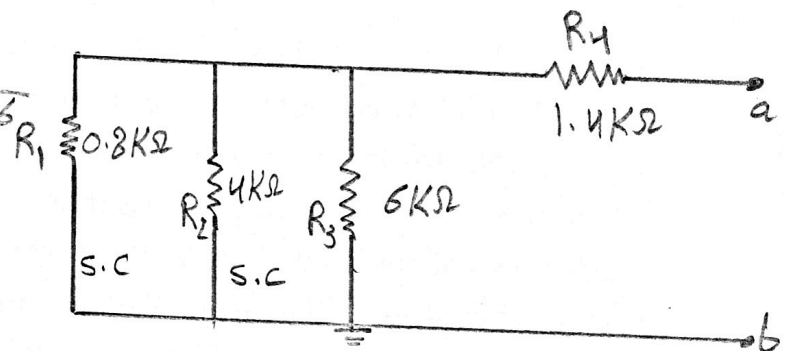
SOL The network is redrawn and step 1 and step 2 applied as shown in the figure



3- Find R_{th}

$$R_1 \parallel R_2 \parallel R_3 = \frac{0.8 \times 4 \times 6}{0.8 \times 4 + 0.8 \times 6 + 4 \times 6} = 0.6 K\Omega$$

$$R_{th} = R_4 + 0.6 = 1.4 + 0.6 = 2 K\Omega$$



4- Find $E_{th} = E'_{th} - E''_{th}$

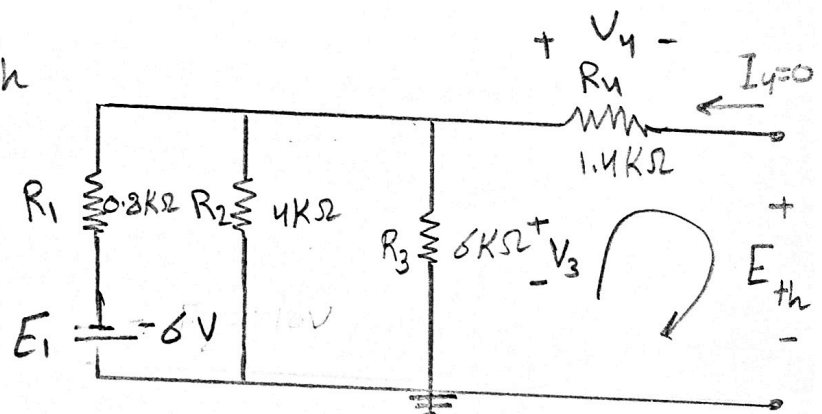
the open circuit requires that $V_4 = I_4 R_4 = 0$

Apply KVL

$$E'_{th} = V_3$$

$$V_3 = \frac{R' E_1}{R'_T}$$

$$V_3 = \frac{2.4 \times 6}{3.2} = 4.5 V$$



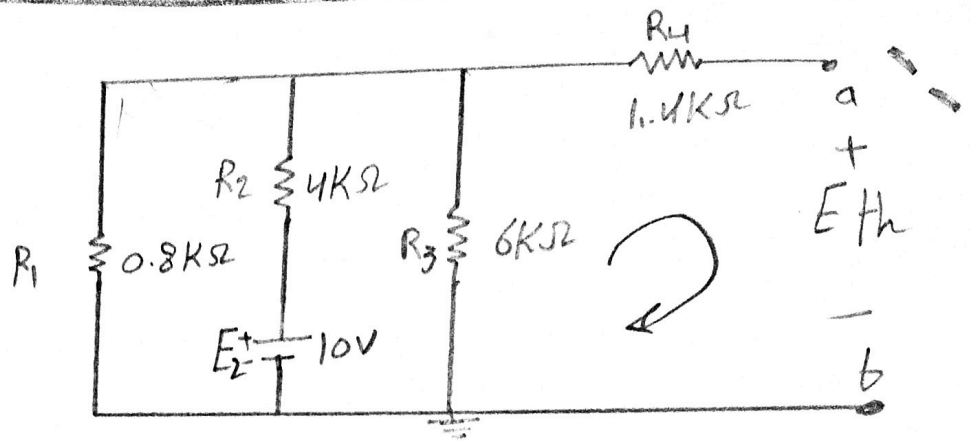
$$R' = R_2 \parallel R_3 = 2.4 K\Omega$$

$$R'_T = 2.4 + 0.8 = 3.2 K\Omega$$

Apply KVL

$$E''_{th} = V_3$$

$$V_3 = \frac{R' E_2}{R'_T}$$

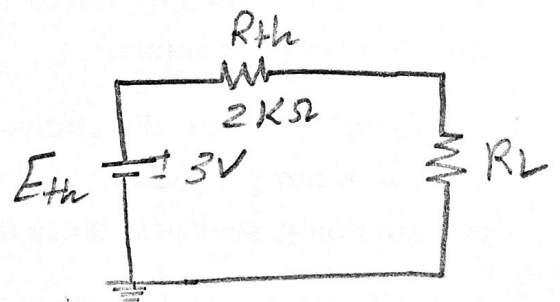


$$R' = R_1 \parallel R_3 = 0.706 K\Omega$$

$$R'_T = R_2 + 0.706 = 4.706 K\Omega$$

$$V_3 = \frac{0.706 * 10}{4.706}$$

$$= 1.5 V$$



$$\therefore E_{th} = E'_{th} - E''_{th}$$

$$= 4.5 - 1.5$$

$$= 3V$$