Obtaine the terminal equ. of the circuit given in Fig. 1 for the terminal graph given in Fig. 2

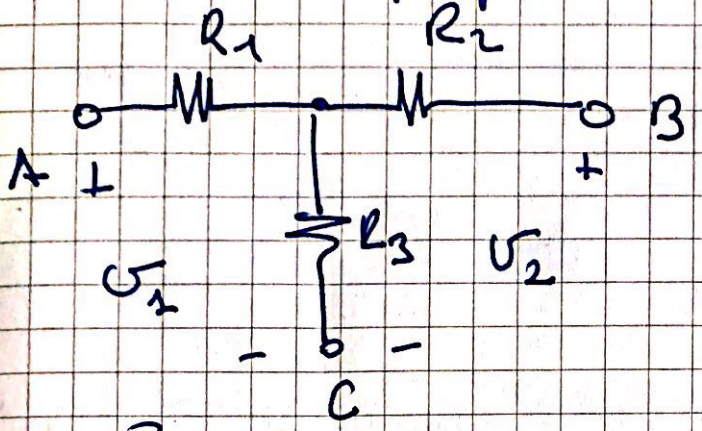


Figure 1.

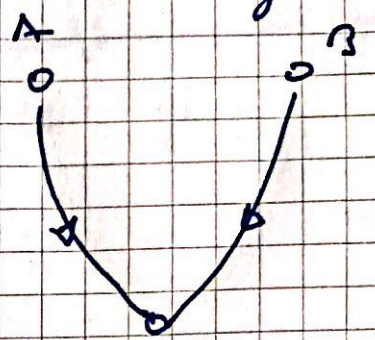
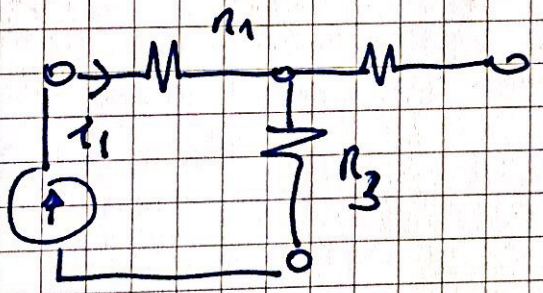


Figure 2.

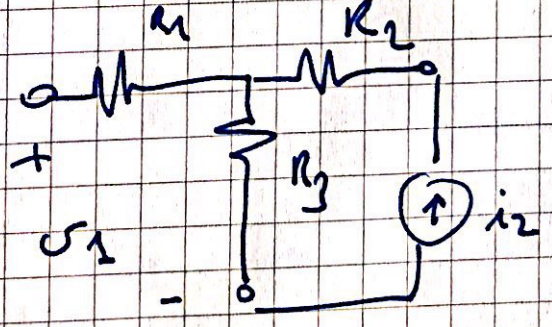
Terminal Equ. $\Rightarrow \begin{vmatrix} v_1 \\ v_2 \end{vmatrix} = \begin{vmatrix} ? \end{vmatrix} \begin{vmatrix} i_1 \\ i_2 \end{vmatrix}$

$$a_{11} = \frac{v_1}{i_1}\Big|_{i_2=0} \qquad a_{12} = \frac{v_1}{i_2}\Big|_{i_1=0} \qquad a_{21} = \frac{v_2}{i_1}\Big|_{i_2=0} \qquad a_{22} = \frac{v_2}{i_2}\Big|_{i_1=0}$$



$v_1 = i_1 (R_1 + R_3)$; $v_2 = R_3 i_1$

$a_{11} = R_1 + R_3$



$v_1 = R_3 i_2$; $v_2 = (R_2 + R_3) i_2$

$a_{12} = R_3$!

$$\begin{vmatrix} v_1 \\ v_2 \end{vmatrix} = \begin{vmatrix} R_1 + R_3 & R_3 \\ R_3 & R_3 + R_2 \end{vmatrix} \begin{vmatrix} i_1 \\ i_2 \end{vmatrix}$$

Obtain the terminal equ. of the circuit given in Fig 1 for the terminal given in Fig. 2.

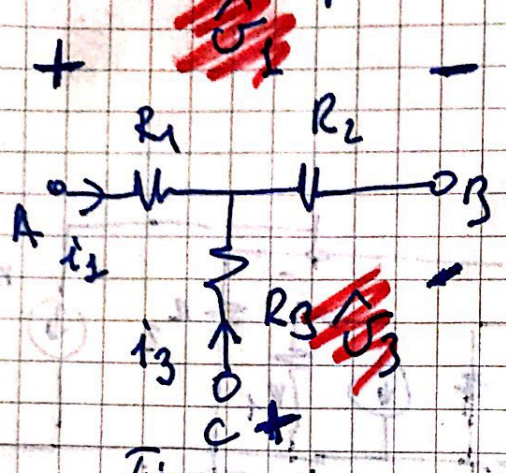


Figure 1.

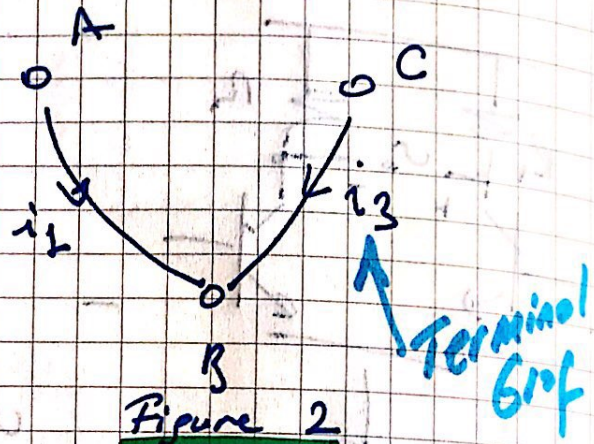
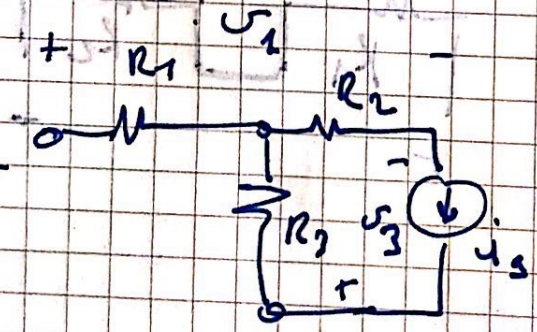


Figure 2

Terminal Equ.

$$\begin{vmatrix} \hat{v}_1 \\ \hat{v}_3 \end{vmatrix} = \begin{vmatrix} ? \end{vmatrix} \begin{vmatrix} i_1 \\ i_3 \end{vmatrix}$$

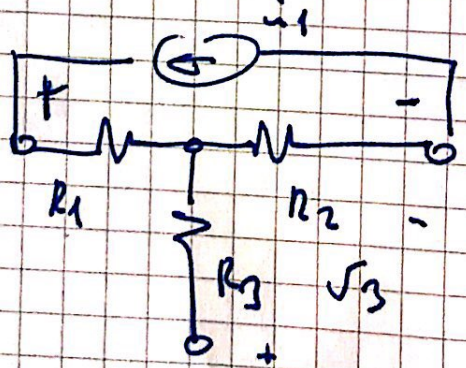
$$o_{11} = \left.\frac{\hat{v}_1}{i_1}\right|_{i_3=0}, \quad o_{12} = \left.\frac{\hat{v}_1}{i_3}\right|_{i_1=0} \quad o_{21} = \left.\frac{\hat{v}_3}{i_1}\right|_{i_3=0} \quad o_{22} = \left.\frac{\hat{v}_3}{i_3}\right|_{i_1=0}$$



$$\hat{v}_3 = (R_3 + R_2)\, i_3$$

$$\hat{v}_2 = R_2\, i_3$$

$$\hat{v}_1 = \hat{v}_2 = R_2\, i_3$$



$$\hat{v}_1 = (R_1 + R_2)\, i_1 \quad ; \quad \hat{v}_3 = R_2\, i_1$$

$$\begin{vmatrix} \hat{v}_1 \\ \hat{v}_3 \end{vmatrix} = \begin{vmatrix} R_1+R_2 & R_2 \\ R_2 & R_3+R_2 \end{vmatrix} \begin{vmatrix} i_1 \\ i_3 \end{vmatrix}$$

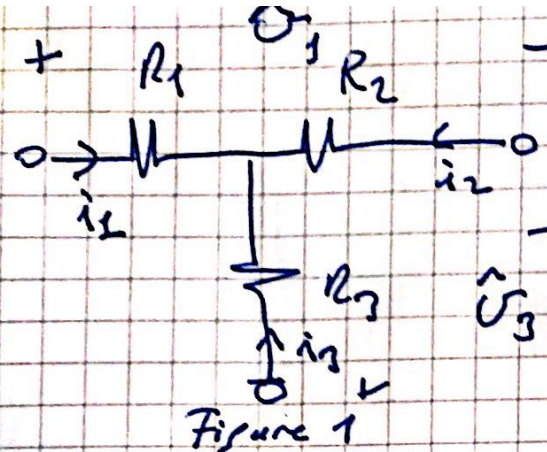


Figure 1

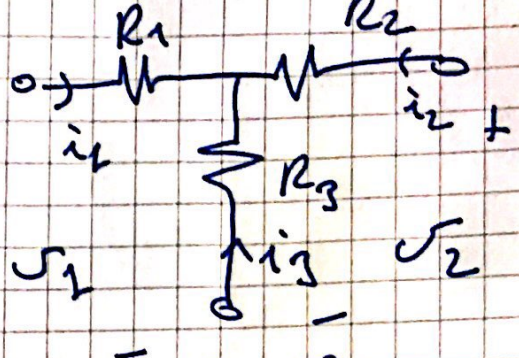


Figure 2.

Obtaine the terminal Equ. of Figure 1 from the terminal equation of Figure 2.

$$v_1 = v_1 - v_2$$

$$\hat{v}_3 = -v_2$$

$$i_1 + i_2 + i_3 = 0$$

$$\begin{vmatrix} \hat{v}_1 \\ \hat{v}_3 \end{vmatrix} = \begin{bmatrix} 1 & -1 \\ 0 & -1 \end{bmatrix} \begin{vmatrix} v_1 \\ v_2 \end{vmatrix} \quad \text{KVL}$$

$$\begin{vmatrix} i_1 \\ i_2 \end{vmatrix} = \begin{bmatrix} 1 & 0 \\ -1 & -1 \end{bmatrix} \begin{vmatrix} i_1 \\ i_3 \end{vmatrix} \quad \text{KCL}$$

$$\begin{vmatrix} \hat{v}_1 \\ \hat{v}_3 \end{vmatrix} = \begin{bmatrix} 1 & -1 \\ 0 & -1 \end{bmatrix} \begin{vmatrix} v_1 \\ v_2 \end{vmatrix}$$

$$= \begin{bmatrix} 1 & -1 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} R_1+R_3 & R_3 \\ R_3 & R_3+R_2 \end{bmatrix} \begin{vmatrix} v_1 \\ i_2 \end{vmatrix}$$

$$= \begin{bmatrix} 1 & -1 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} R_1+R_3 & R_3 \\ R_3 & R_3+R_2 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ -1 & -1 \end{bmatrix} \begin{vmatrix} i_1 \\ i_3 \end{vmatrix}$$

$$= \begin{vmatrix} R_1+R_2 & R_2 \\ R_2 & R_3+R_2 \end{vmatrix} \begin{vmatrix} i_1 \\ i_3 \end{vmatrix}$$