

4-7-12

$$V_a = R_3(i_1 - i_2) \quad \& \quad i_b = i_3 - i_2$$

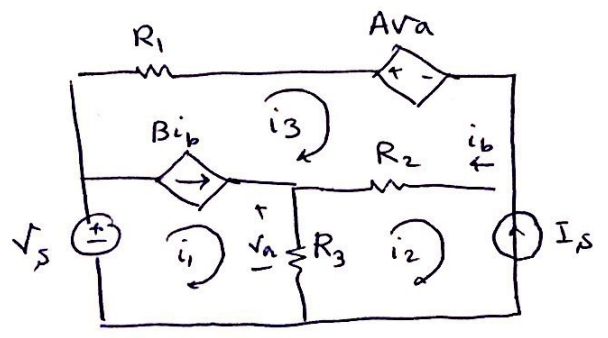
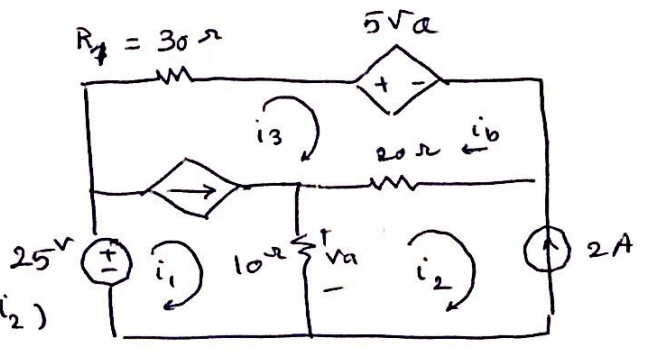
$$i_2 = -I_s \quad \& \quad i_1 - i_3 = B i_b = B(i_3 - i_2)$$

$$\Rightarrow i_1 - (B+1)i_3 = B I_s$$

KVL:

$$R_1 i_3 + A R_3(i_1 - i_2) + R_2(i_3 - i_2)$$

$$+ R_3(i_2 + i_1) - V_s = 0$$



Organizing this equation into the matrix form:

$$\begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & -(B+1) \\ (A+1)R_3 & -(R_2 + (A+1)R_3) & R_1 + R_2 \end{bmatrix} \begin{bmatrix} i_1 \\ i_2 \\ i_3 \end{bmatrix} = \begin{bmatrix} -I_s \\ B I_s \\ V_s \end{bmatrix}$$

With the given values:

$$\begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & -4 \\ 60 & -80 & 50 \end{bmatrix} \begin{bmatrix} i_1 \\ i_2 \\ i_3 \end{bmatrix} = \begin{bmatrix} -2 \\ 6 \\ 25 \end{bmatrix} \Rightarrow$$

$$\begin{bmatrix} i_1 \\ i_2 \\ i_3 \end{bmatrix} = \begin{bmatrix} -0.827 \\ -2 \\ -1.706 \end{bmatrix} \text{ (A)}$$