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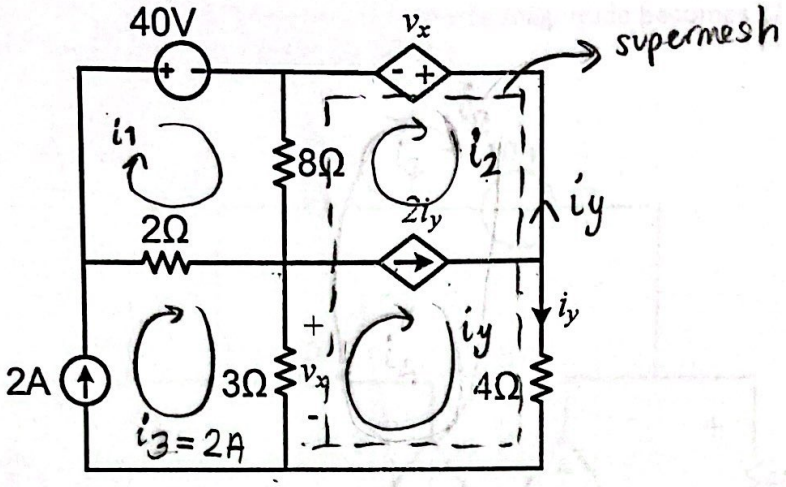
Question 1 (30 pts)

Find the power supplied by the current controlled current source by using mesh analysis.



KVL i_1: $8(i_1-i_2)+2(i_1-i_3)=-40$

KVL supermesh: $-v_x+4i_y+3(i_y-i_3)+8(i_2-i_1)=0$

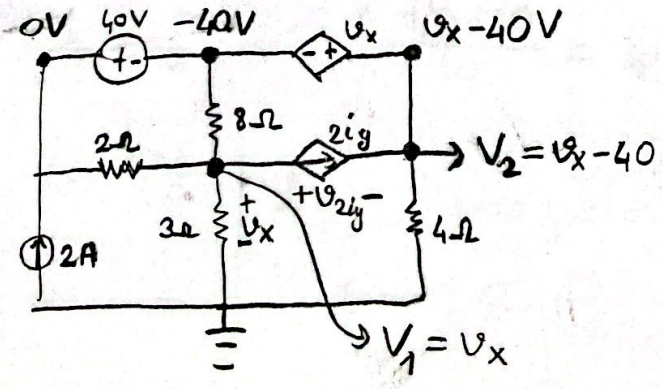
const. eqn: $2i_y = i_y - i_2 \Rightarrow -i_y = i_2$

KVL i_3: $2(i_3-i_1)+3(i_3-i_y)=0$

const. eqn.: $i_3 = 2A$.

$$\begin{bmatrix} 10 & -8 \\ -2 & 3 \end{bmatrix}\begin{bmatrix} i_1 \\ i_2 \end{bmatrix} = \begin{bmatrix} -36 \\ -10 \end{bmatrix} \Rightarrow \left[\begin{array}{cc|c} 0 & 7 & -86 \\ -2 & 3 & -10 \end{array}\right] \Rightarrow \begin{aligned} i_2 &= \tfrac{-86}{7}\,A \\ i_1 &= \tfrac{-94}{7}\,A \\ i_y &= \tfrac{86}{7}\,A \end{aligned}$$

$4i_y+3(i_y-i_3)+8(i_2-i_1) = i_2-3i_3-8i_1 = \frac{-880}{7} = v_x$



$V_{2i_y} = V_x - (V_x - 40) = 40V$

$P_{2i_y} = -V_{2i_y} \cdot 2i_y = \frac{-6880}{7}\,W$

$$\boxed{\frac{6880}{7}\,W}$$