Ex:
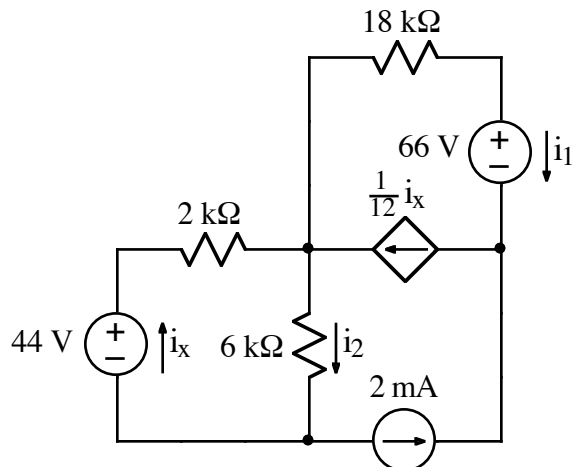

a)   Use the mesh-current method to find i_1 and i_2.
b)   Find the power dissipated by the dependent source.

sol'n: a) $i_b = -2\,mA$ from $2\,mA$ source on outside edge

$i_x = i_c$ (dependent source)

Super mesh for i_a and i_b loops.

i_a , i_b voltage loop for supermesh is
not possible because of $2\,mA$ source.

∴ we only have current eq'n for
source between i_a and i_b loops:

$$\frac{1}{12}i_c \overset{i_x}{=} i_a - i_b = i_a + 2\,mA$$

v-loop for i_c gives

$+44\,V - i_c\, 2k\Omega - i_c\, 6k\Omega + i_b\, 6k\Omega = 0\,V$

or $\quad +i_c(2k\Omega + 6k\Omega) = +44V + (-2mA)6k\Omega$

or $\quad i_c = \dfrac{44V - 12V}{8K\Omega} = 4mA$

From earlier: $\quad \dfrac{1}{12}i_c = i_a + 2mA$

or $\quad i_a = \dfrac{i_c}{12} - 2mA = \dfrac{4mA}{12} - 2mA$

$\quad i_a = -\dfrac{5}{3}mA$

Now we have $\quad i_1 = i_a = -\dfrac{5}{3}mA$

$\quad i_2 = i_c - i_b = 4mA - (-2mA) = 6mA$

b) $\quad p = i \cdot v = \dfrac{1}{12}i_c \cdot V_{dep\ src}$

From i_a v-loop: $\quad -i_a \cdot 18k\Omega - 66V - V_{dep\ src} = 0V$

or $\quad V_{dep\ src} = -i_a \cdot 18k\Omega - 66V$

$\qquad\qquad = -\dfrac{5}{3} \cdot 18k\Omega - 66V = -36V$

$p = \dfrac{1}{12} \cdot 4mA(-36V) = -12\ mW$