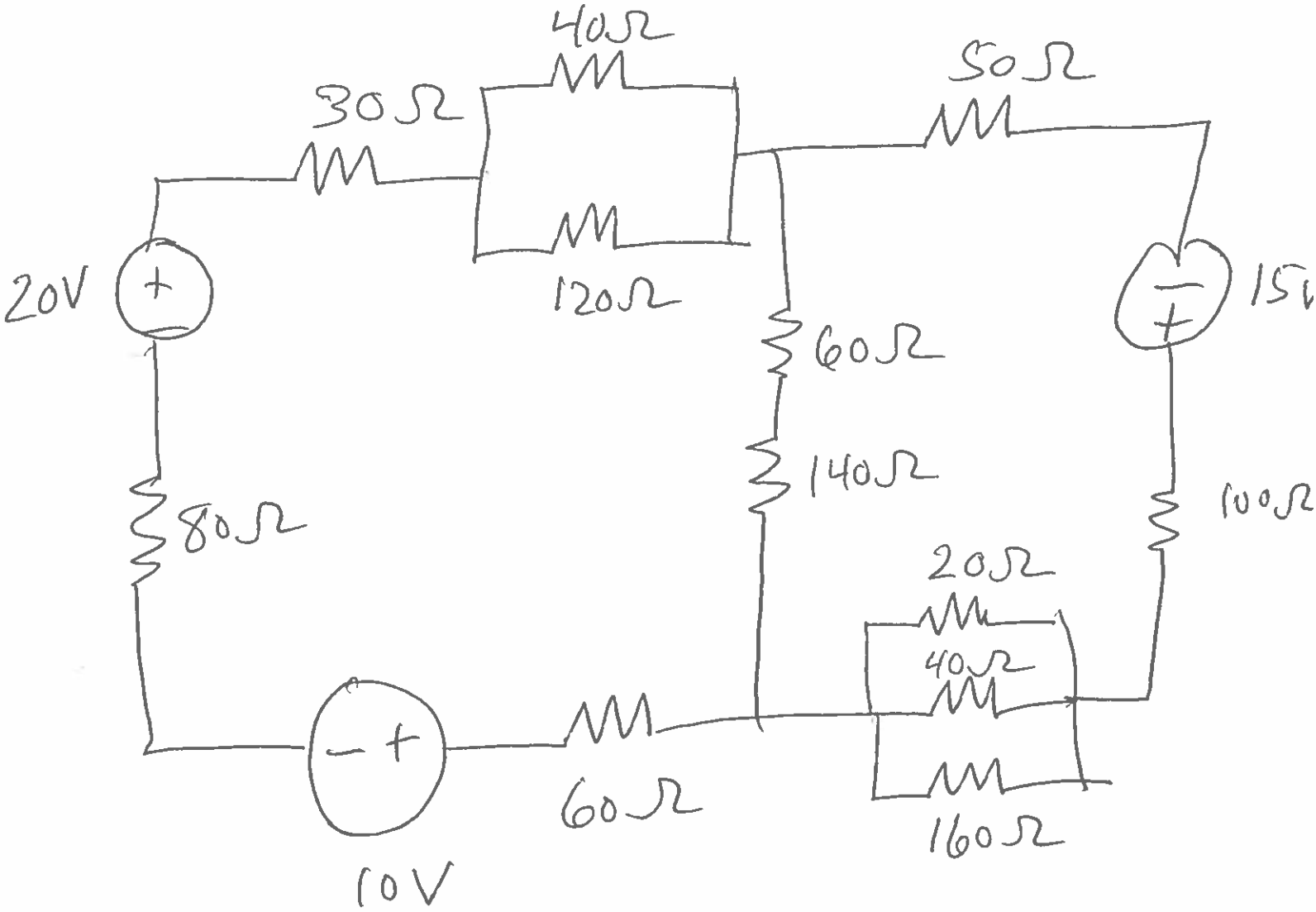
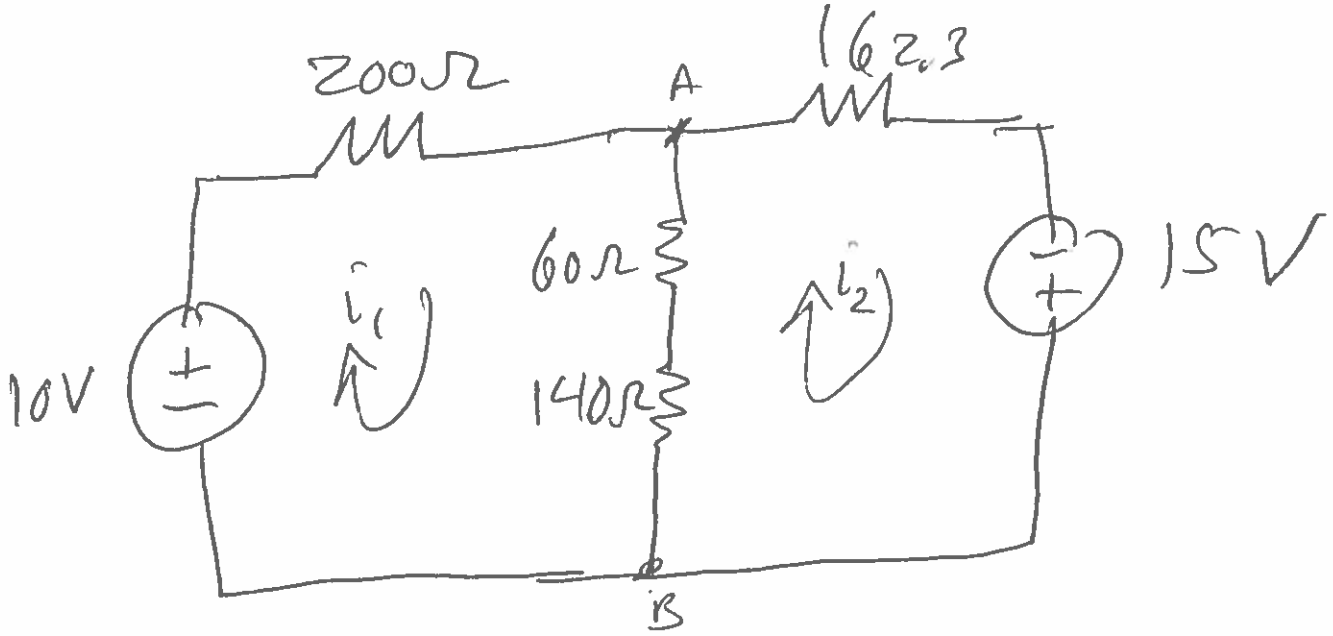



$P_{140\Omega} = ?$

$$\frac{1}{40\Omega} + \frac{1}{120\Omega} = \frac{3+1}{120\Omega} = \frac{4}{120\Omega} = \frac{1}{30\Omega}$$

$$\frac{1}{20\Omega} + \frac{1}{40\Omega} + \frac{1}{160\Omega} = \frac{8+4+1}{160} = \frac{13}{160\Omega}$$

$$\frac{160}{13}\Omega + 150\Omega = 162.3$$




$$+10V = i_1(200\Omega + 60\Omega + 140\Omega) - i_2(60\Omega + 140\Omega)$$

$$+15V = i_2(140\Omega + 60\Omega + 162.3\Omega) - i_1(60\Omega + 140\Omega)$$

$$10V = i_1(400\Omega) - i_2(200\Omega)$$

$$15V = -i_1(200\Omega) + i_2(362.3\Omega)$$

$$10V = i_1(400\Omega) - i_2(200\Omega)$$

$$30V = -i_1(400\Omega) + i_2(724.6\Omega)$$

$$40V = 524.6\Omega\, i_2$$

$$i_2 = \frac{40V}{524.6\Omega} = 0.0762A$$

$$i_1 = \frac{10V + (.0762A)(200\Omega)}{400\Omega}$$

$$i_1 = 0.0631A$$

$$P_{140\Omega} = i^2R \qquad i = i_2 - i_1$$

$$i = .0762A - 0.0631A$$

$$P_{140\Omega} = (0.0131A)^2(140\Omega) \qquad i = 0.0131A$$

$$\boxed{P = 0.0240W}$$

$$\Delta V_{A\to B} = 60\Omega(-i_1 + i_2) + 140\Omega(-i_1 + i_2)$$

$$= 200\Omega\,(i_2 - i_1)$$

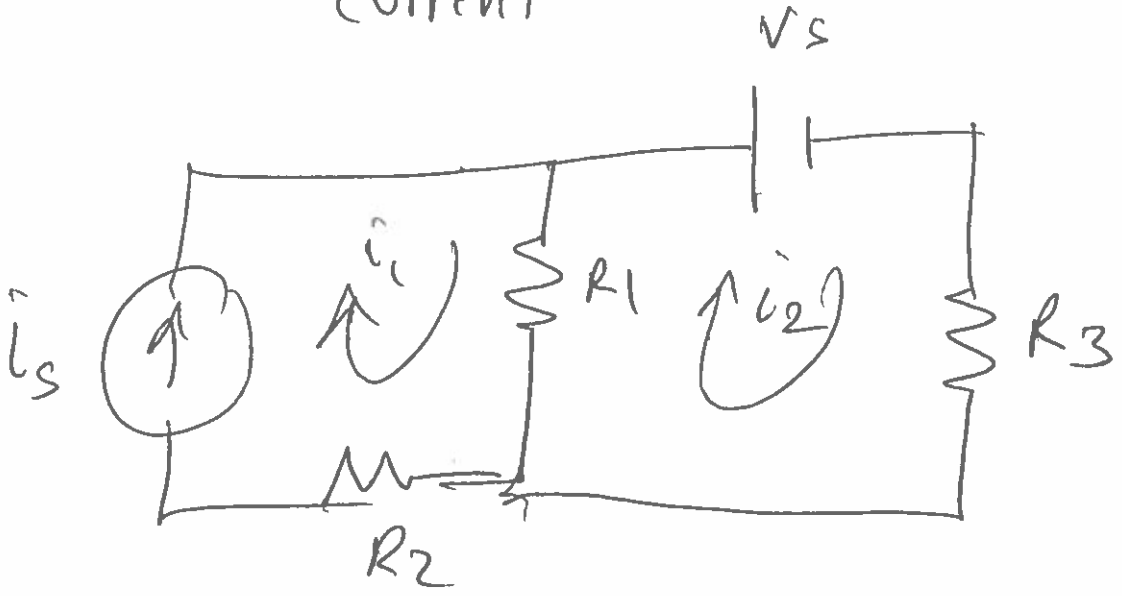
$$= 200\Omega\,(0.0131\,A) = +2.62$$

$\Rightarrow$ B is higher potential

How to handle current sources in mesh analysis ?

again 2 cases

(1) current source only involves 1 Mesh current




$$i_1 = i_s$$

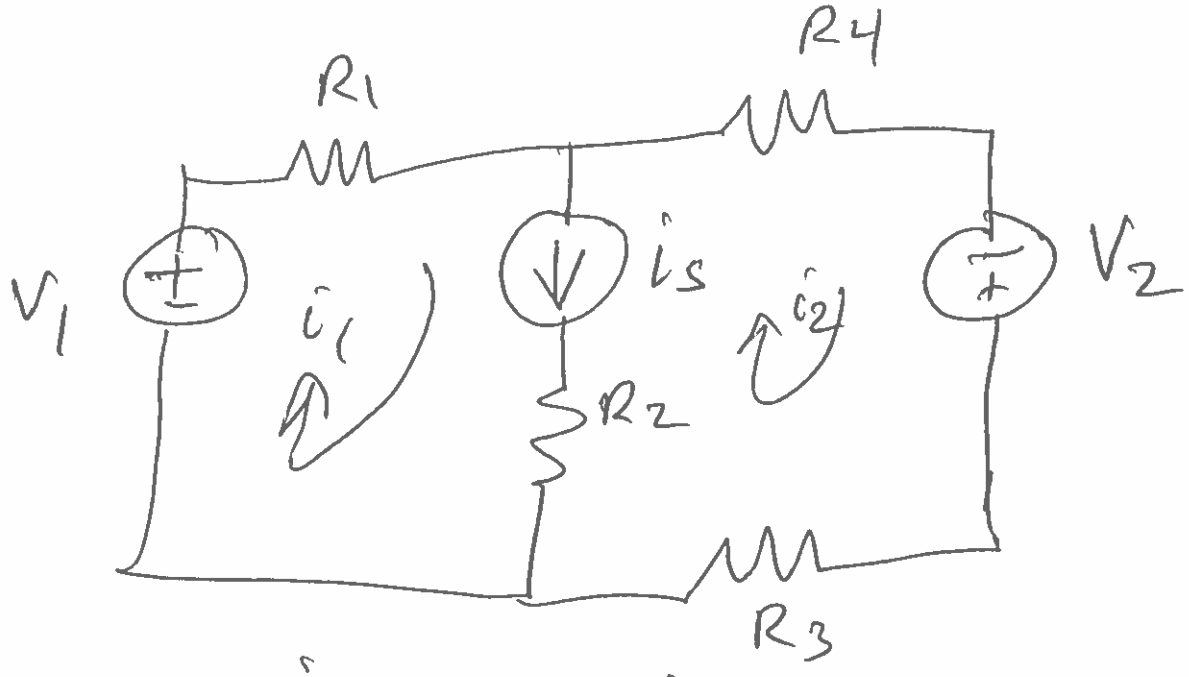
$$-V_s = i_2(R_1 + R_3) - i_1 R_1$$

$$i_2(R_1 + R_3) = i_s R_1 - V_s$$

$$i_2 = \frac{i_s R_1 - V_s}{R_1 + R_3}$$

2 Case  Current Source involves

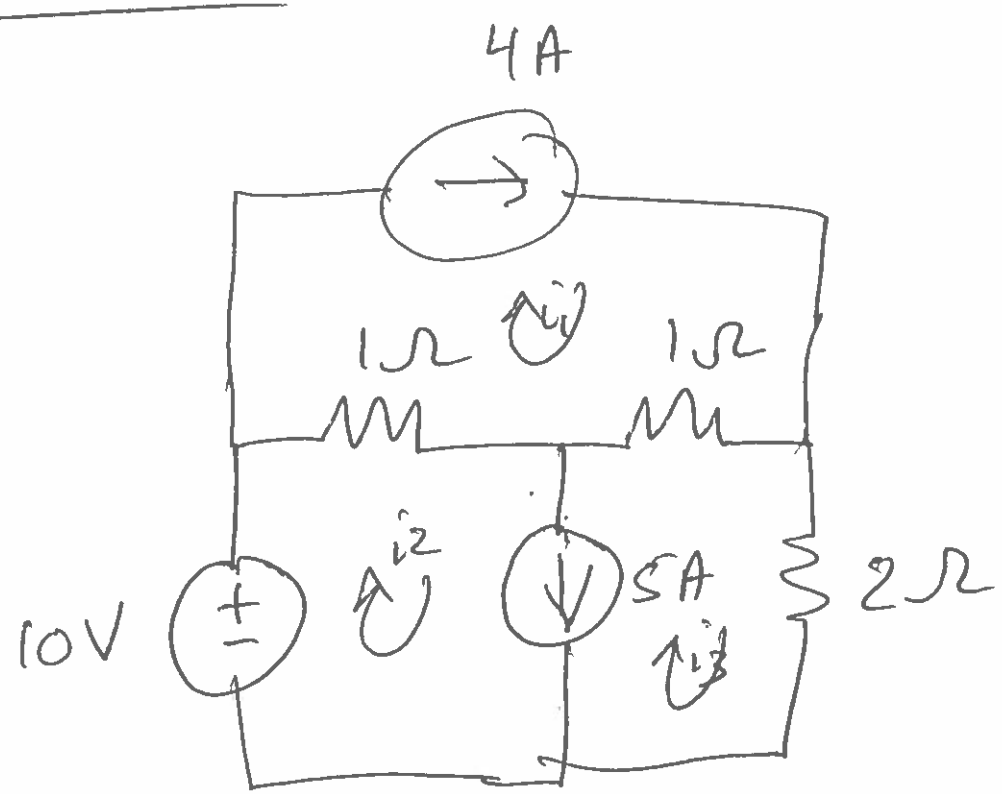
2 Meshes ⇒ Super Mesh




$$i_1 - i_2 = +i_s \qquad 1\ eQn$$

$$V_1 + V_2 = i_1(R_1) + i_2(R_4 + R_3)$$

example 1




find $i_1, i_2, i_3$ $\Rightarrow$ $\boxed{i_1 = 4A}$

$$i_2 - i_3 = 5A$$

$$10V = i_2(1\Omega) + i_3(1\Omega + 2\Omega) - i_1(1\Omega + 1\Omega)$$

$$10V + (4A)(2\Omega) = i_2(1\Omega) + i_3(3\Omega)$$

$$\underbrace{18V} = (5A + i_3)(1\Omega) + i_3(3\Omega)$$

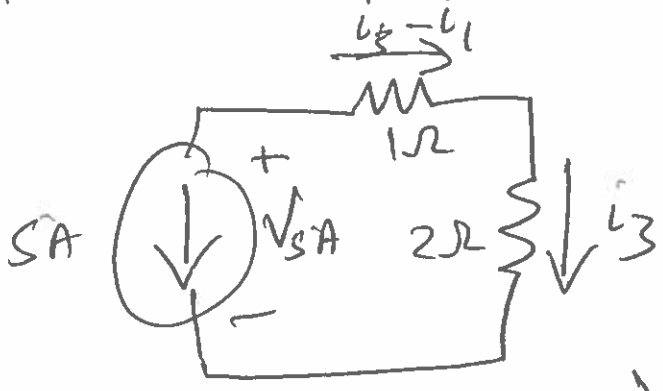
$$13V = i_3 (4\Omega)$$

$$i_3 = \frac{13}{4} A$$

$$i_2 = 5A + i_3 = \frac{33}{4} A$$

$$i_1 = 4\,A \quad i_3 = 3.25\,A \quad i_2 = 8.25A$$

What is voltage across 5A source?



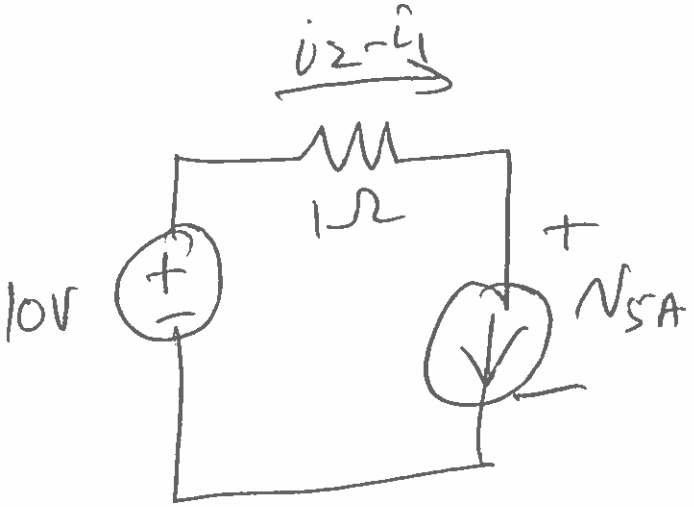

$$V_{5A} - (i_3 - i_1)(1\Omega) - i_3 (2\Omega) = 0$$

$$V_{5A} = i_3 3\Omega - i_1 (1\Omega)$$

$$V_{5A} = \left(\frac{13}{4} 3\right) V - (4\,A)(1\Omega)$$

$$9.75\,V \quad -4\,V$$

$$= +5.75V$$

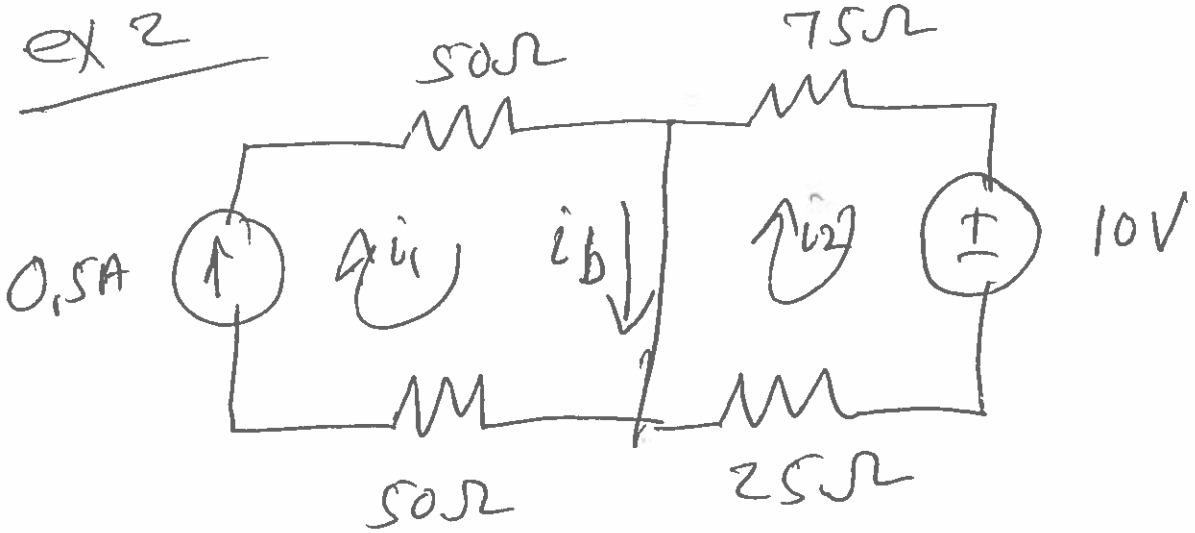



$$10V - (i_2 - i_1)(1\Omega) - V_{SA} = 0$$

$$V_{SA} = 10V - (8.25A - 4A)(1\Omega)$$

$$= 10V - 4.25A = +5.75V$$

ex 2



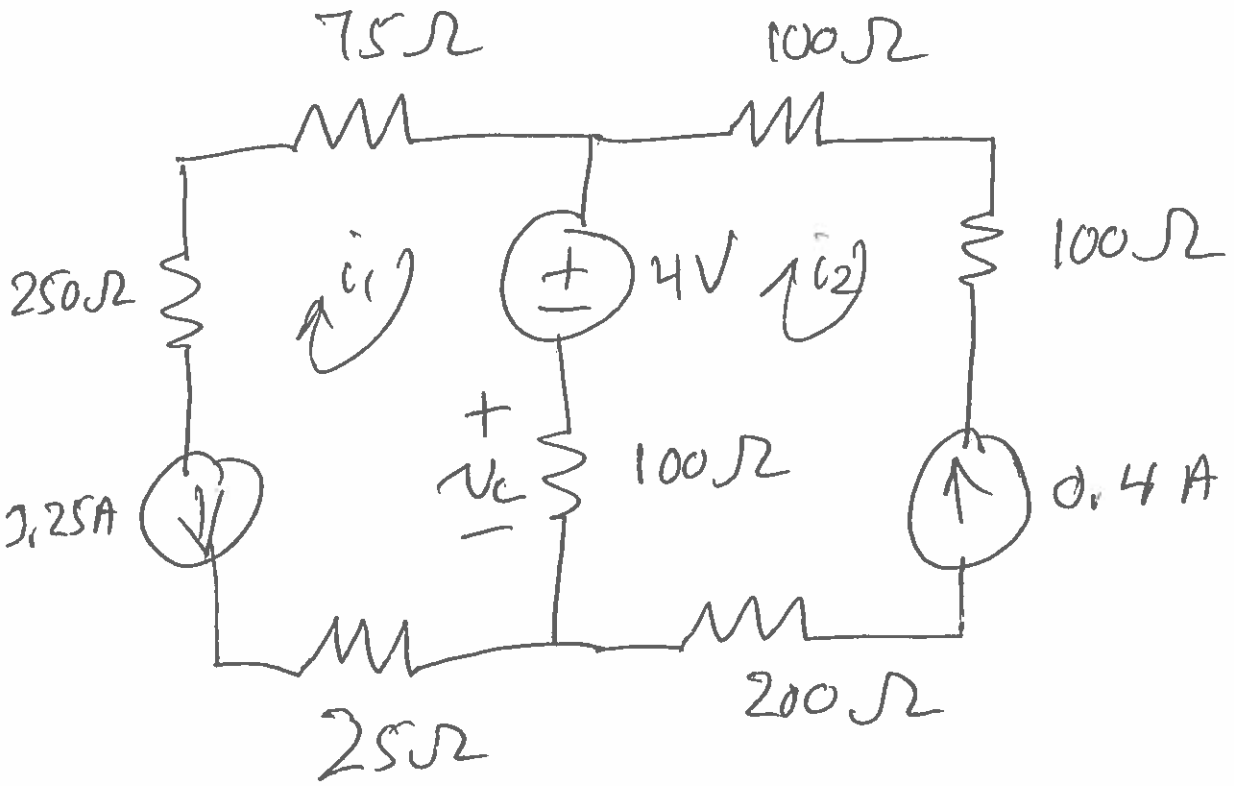

$$i_b = i_1 - i_2$$

$$i_1 = 0.5\,A$$

for $i_2$ $\Rightarrow$ $\quad -10V = i_2(75\Omega + 25\Omega)$

$$i_2 = \frac{-10V}{100\Omega} = -0.1\,A$$

$$i_b = 0.5\,A - (-0.1\,A) = \underline{0.6\,A}$$




$v_c = ?$

$i_1 = -0.25\,A$

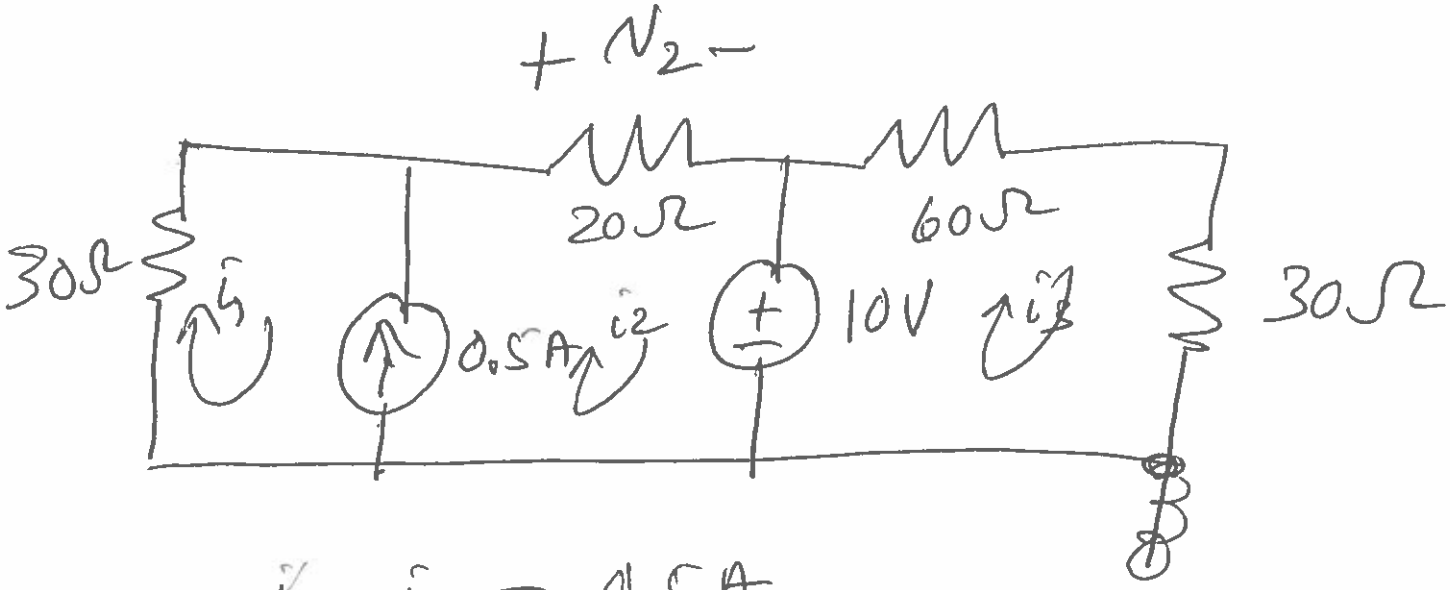
$i_2 = -0.40\,A$

$$v_c = (i_1 - i_2)\,100\Omega$$

$$v_c = (-1.25\,A - (-0.40\,A))\,100\Omega$$

$$= +.15\,A\,(100\Omega)$$

$$= +15\,V$$




$$i_2 - i_1 = 0.5\,A$$

$$-10V = i_1(30\Omega) + i_2(20\Omega)$$

$$-10V = i_1(30\Omega) + (0.5A + i_1)(20\Omega)$$

$$-10V = i_1(50\Omega) + 10V$$

$$i_1 = \frac{-20V}{50\Omega} = -0.4\,A$$

~~$V_2 = (-0.4A)(20\Omega) = -8V$~~