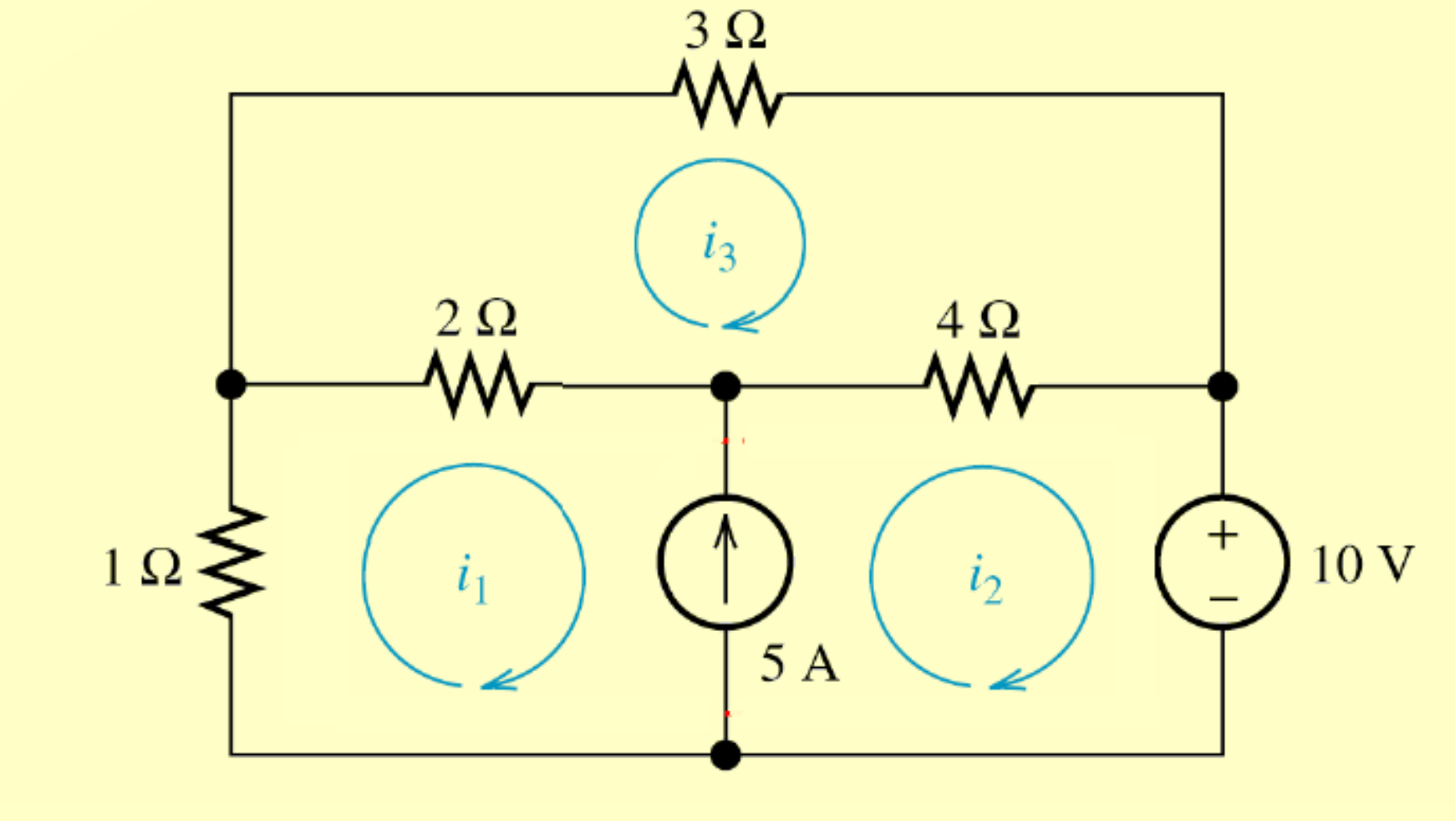
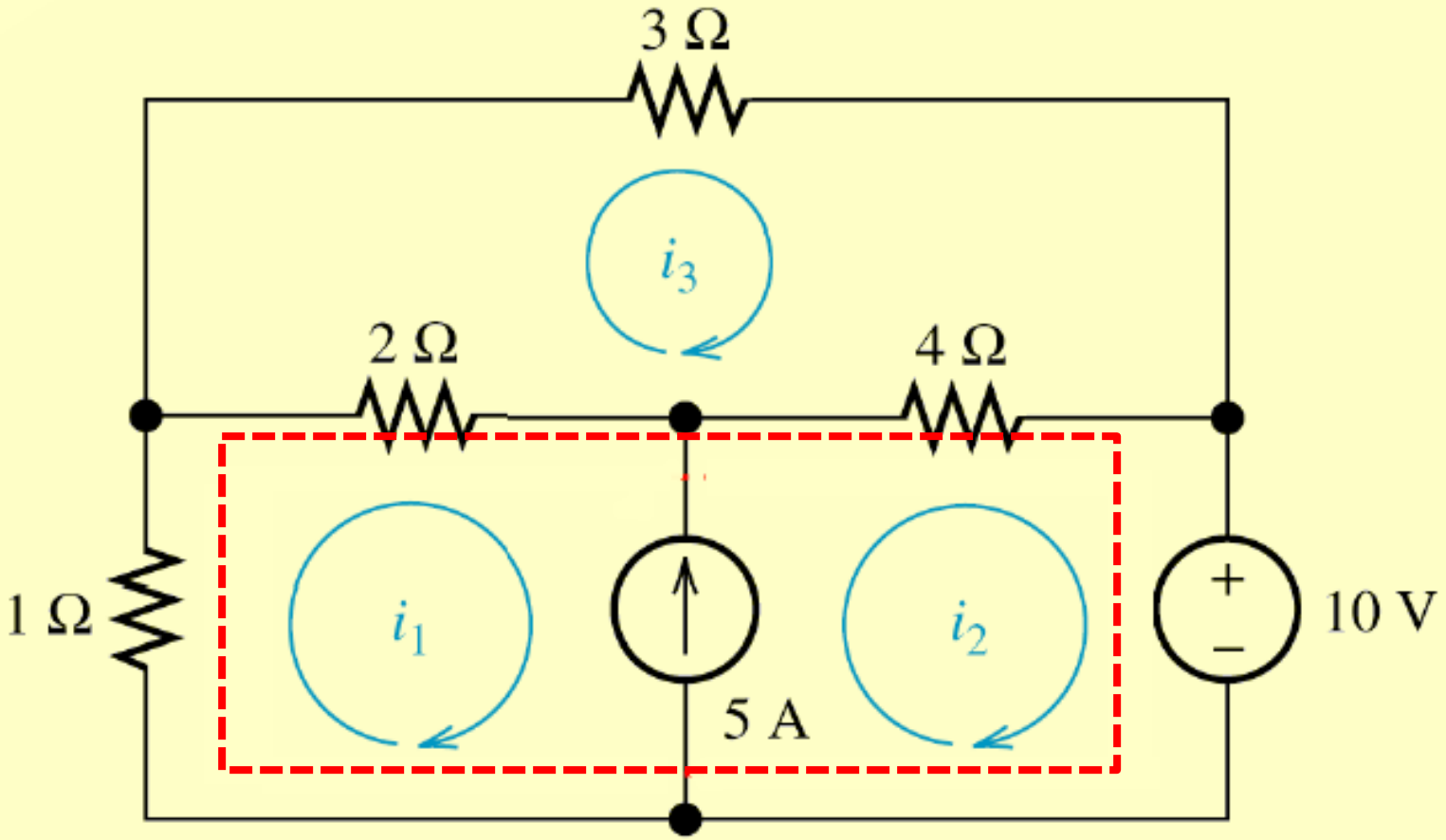
Current source common to 2 mesh



$$i_1 + 2(i_1 - i_3) + ? = 0$$

Super Mesh

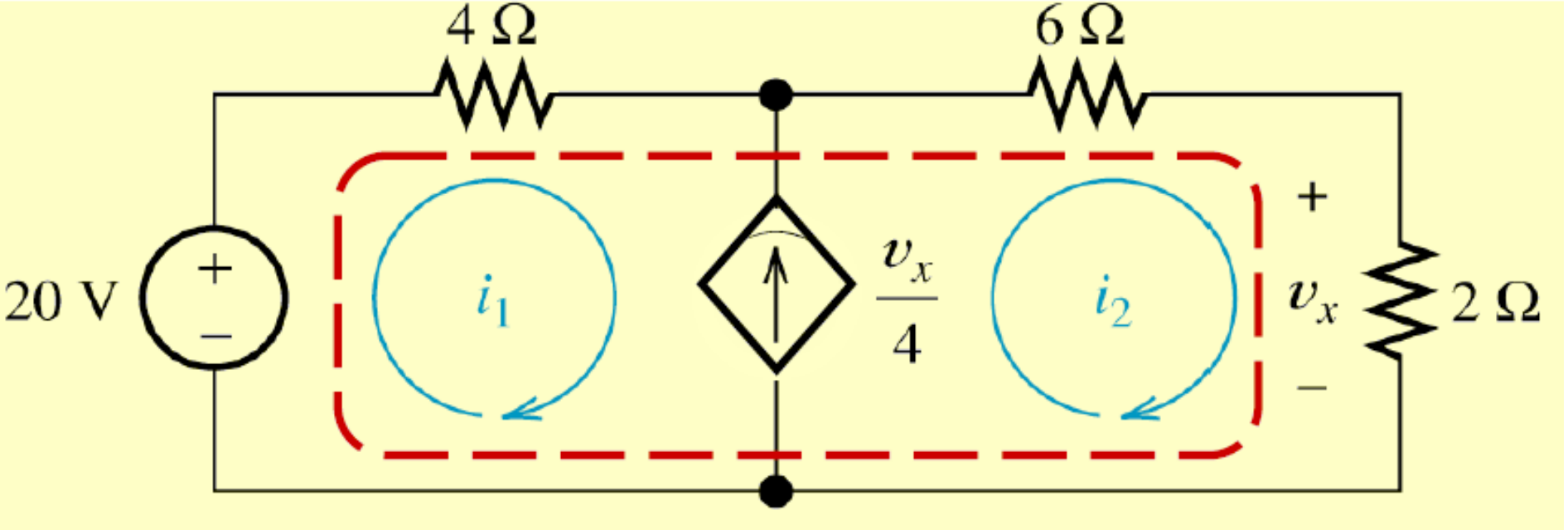


Super mesh $$i_1 + 2(i_1 - i_3) + 4(i_2 - i_3) + 10 = 0$$

Mesh-3 $$3i_3 + 4(i_3 - i_2) + 2(i_3 - i_1) = 0$$

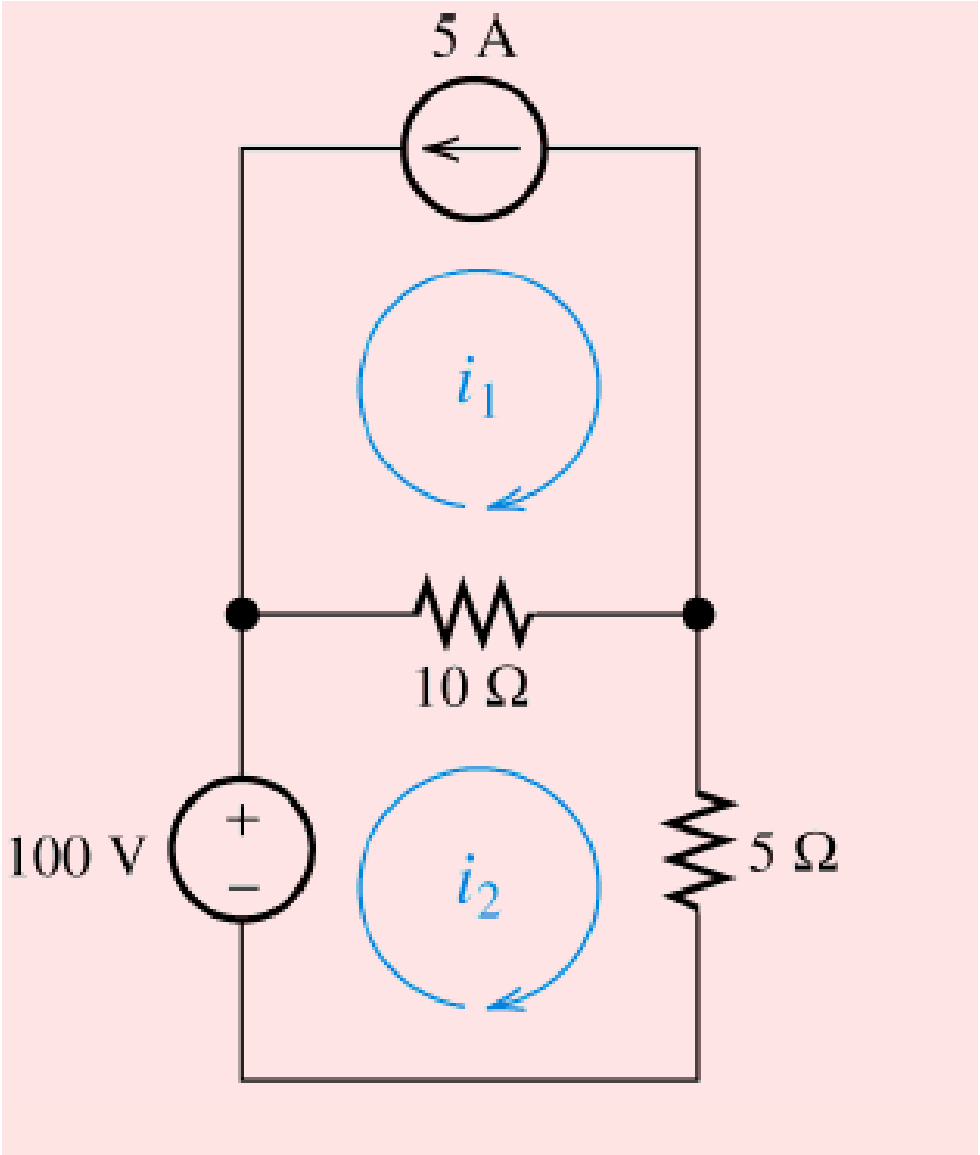
$$i_2 - i_1 = 5$$

Example

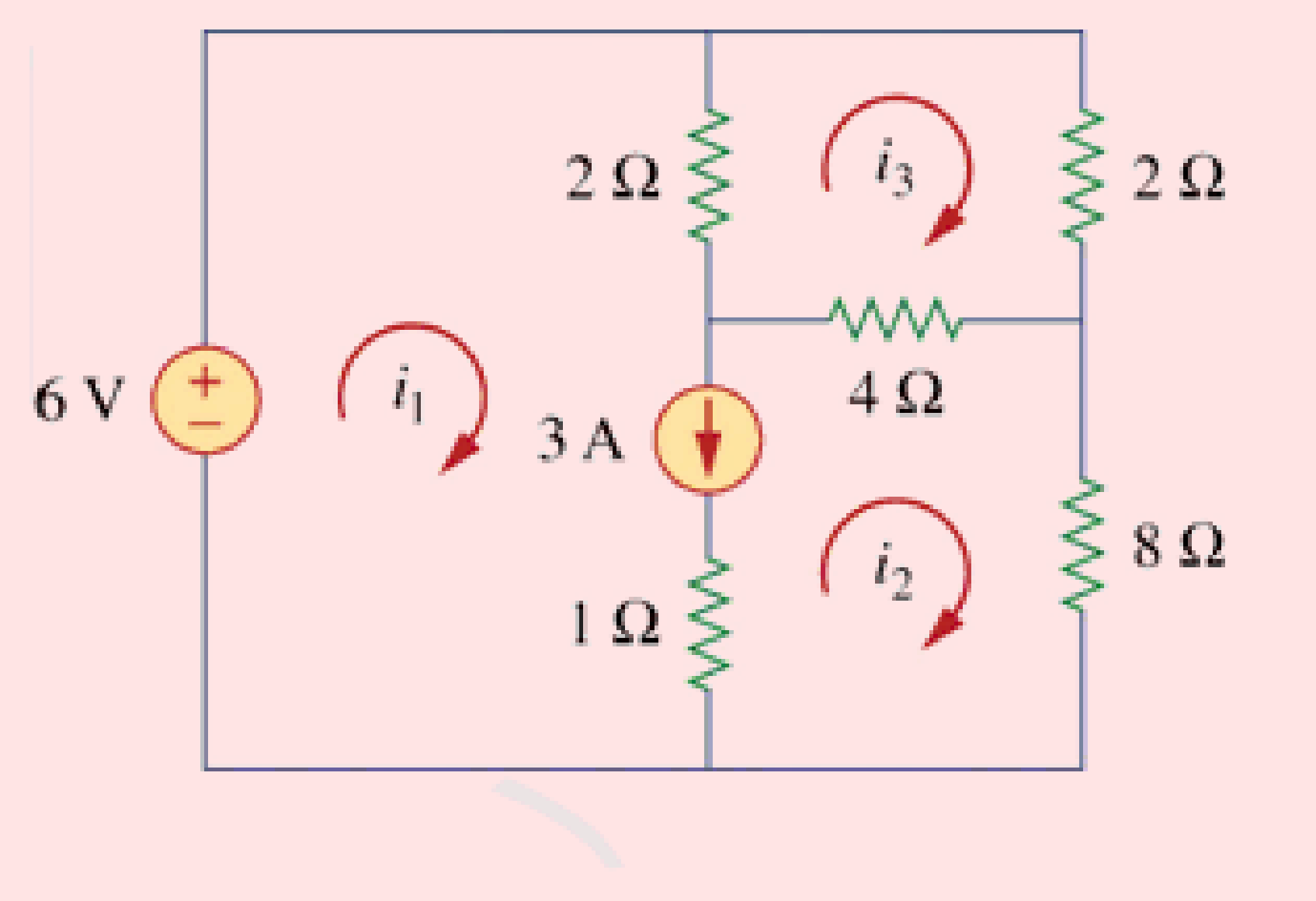


$$-20 + 4i_1 + 6i_2 + 2i_2 = 0$$

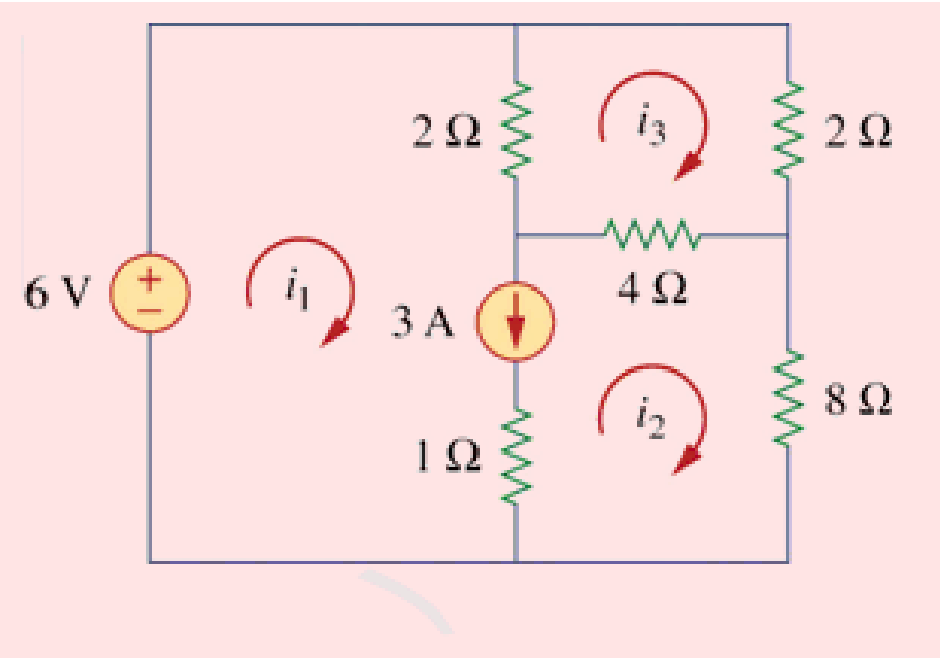
$$\frac{v_x}{4} = i_2 - i_1 \qquad v_x = 2i_2$$

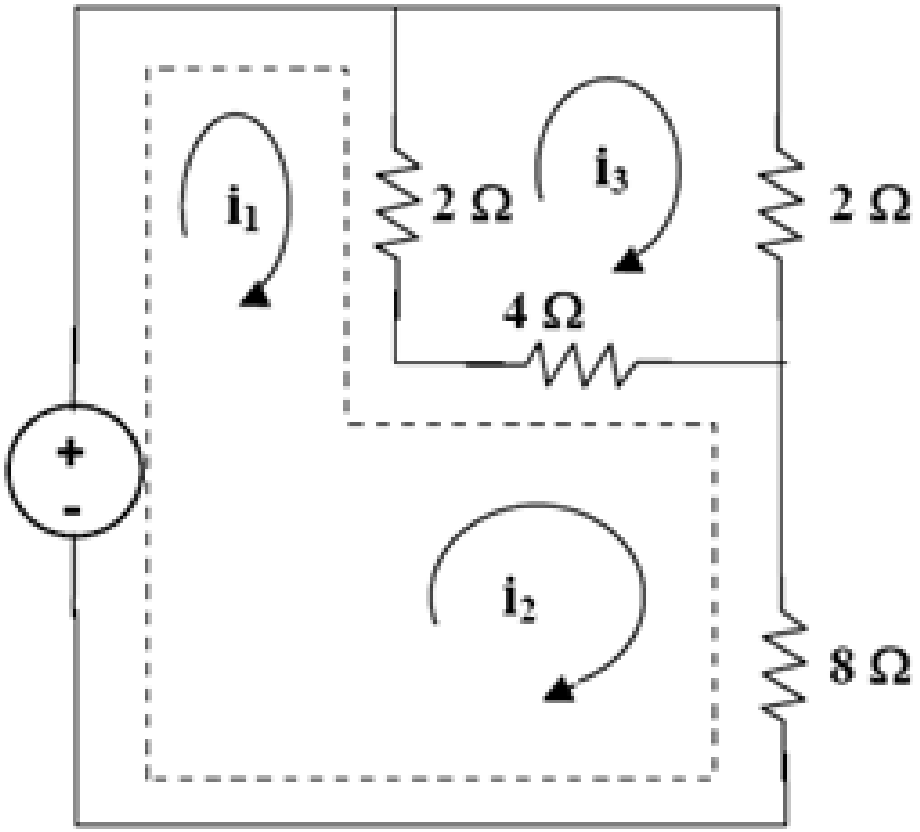

5 A
i_1
10 Ω
100 V
+
−
i_2
5 Ω

Identify the super mesh



Identify the super mesh





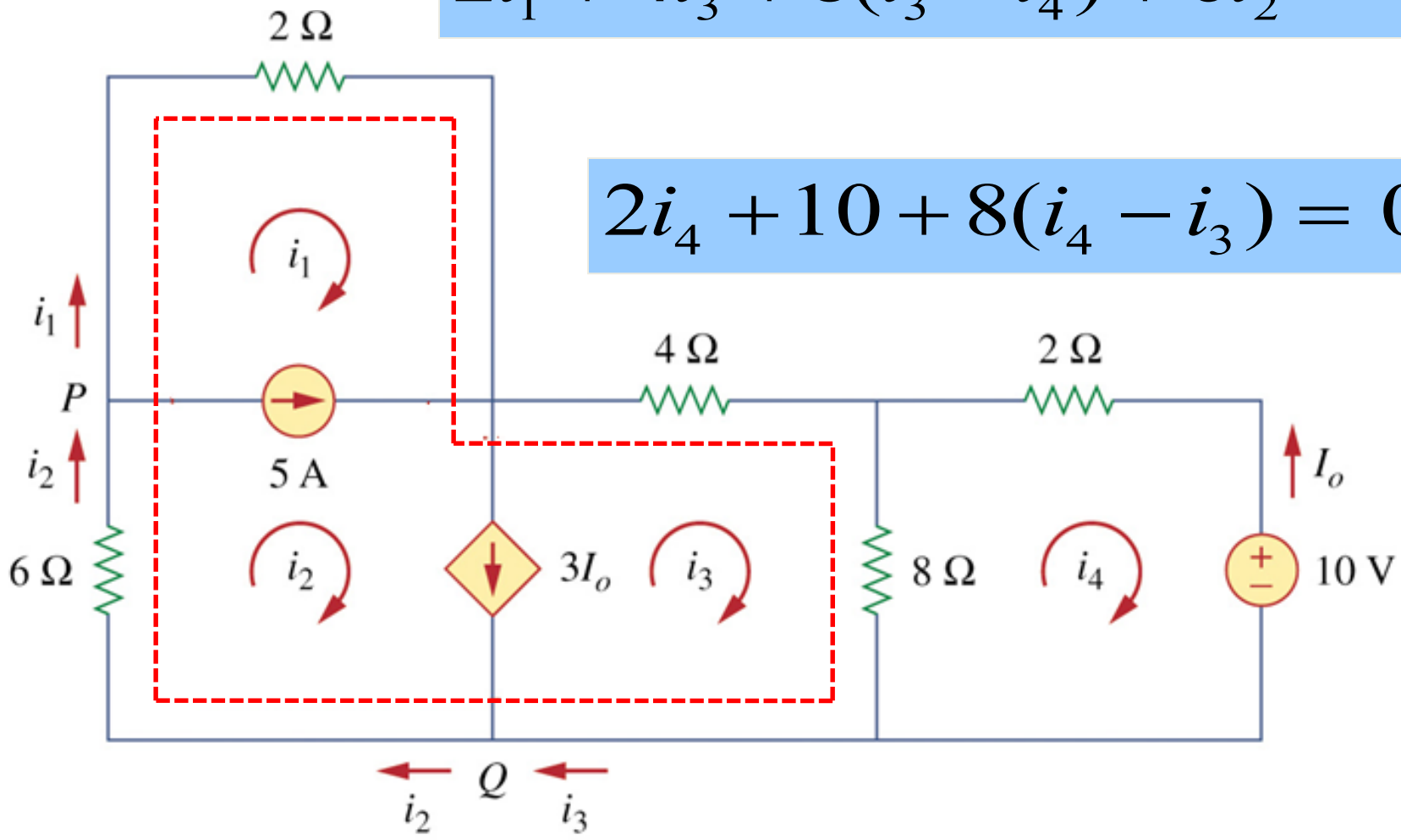
$$-6 + 2(i_1 - i_3) + 4(i_2 - i_3) + 8i_2 = 0$$

$$2i_3 + 4(i_3 - i_2) + 2(i_3 - i_1) = 0$$

$$i_1 - i_2 = 3$$

$$2i_1 + 4i_3 + 8(i_3 - i_4) + 6i_2 = 0$$

$$2i_4 + 10 + 8(i_4 - i_3) = 0$$



$$i_2 - i_1 = 5$$

$$i_2 - i_3 = 3I_O$$

$$I_O = -i_4$$

Nodal vs. Mesh Analysis

To select the method that results in the smaller number of equations. For example:

1. Choose nodal analysis for circuit with fewer nodes than meshes.
   *Choose mesh analysis for circuit with fewer meshes than nodes.

   *Networks that contain many series connected elements, voltage sources, or supermeshes are more suitable for mesh analysis.

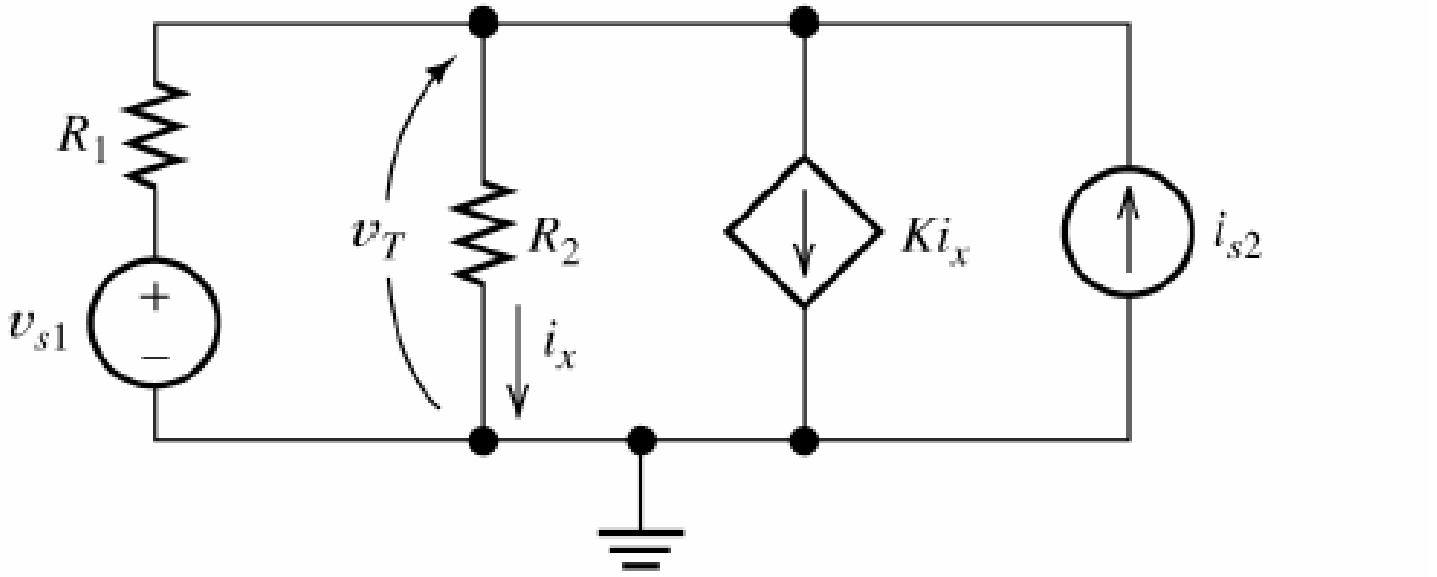
   *Networks with parallel-connected elements, current sources, or supernodes are more suitable for nodal analysis.

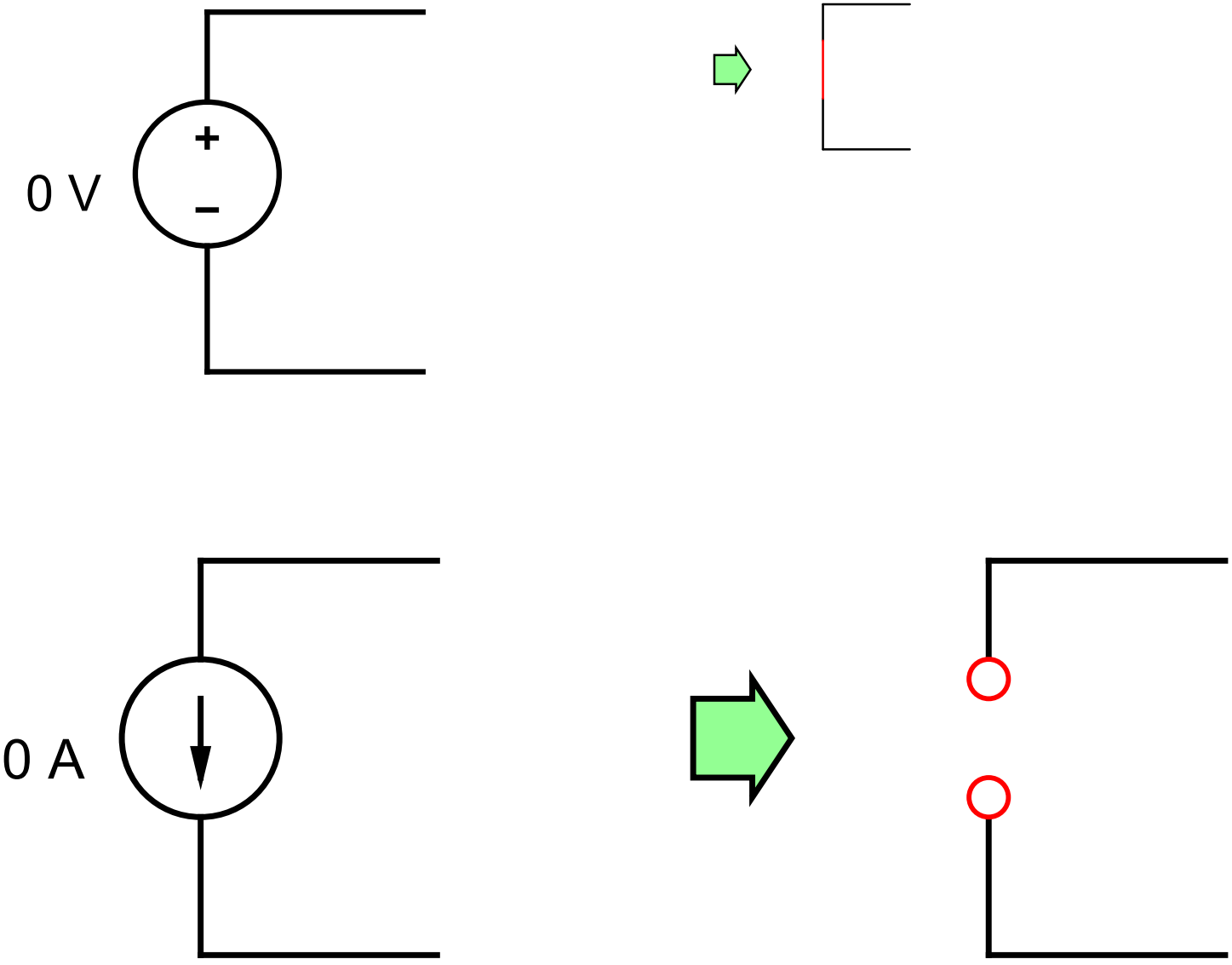
2. If node voltages are required, it may be expedient to apply nodal analysis. If branch or mesh currents are required, it may be better to use mesh analysis.

Superposition Principle

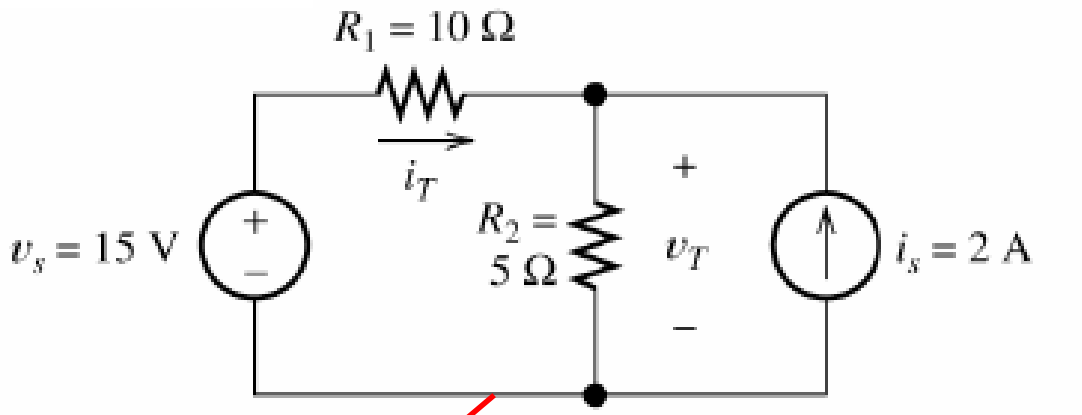
The superposition principle states that the total response is the sum of the responses to each of the independent sources acting individually.

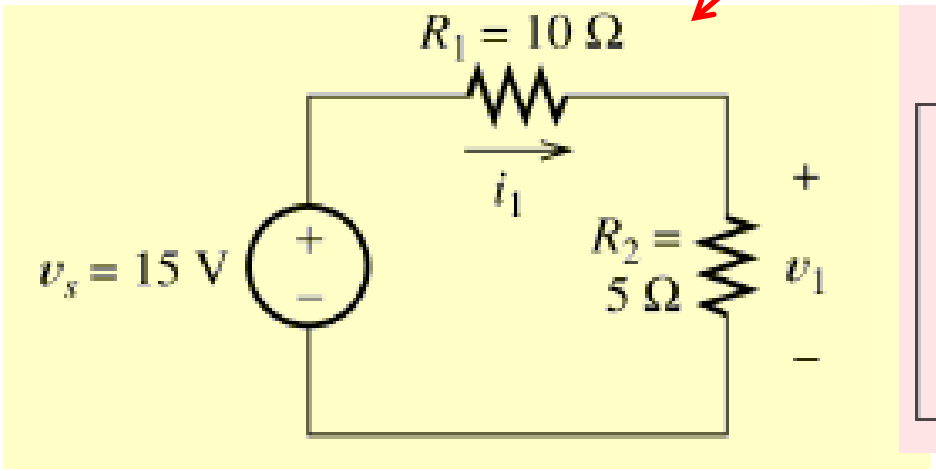
$$r_T = r_1 + r_2 + \cdots + r_n$$



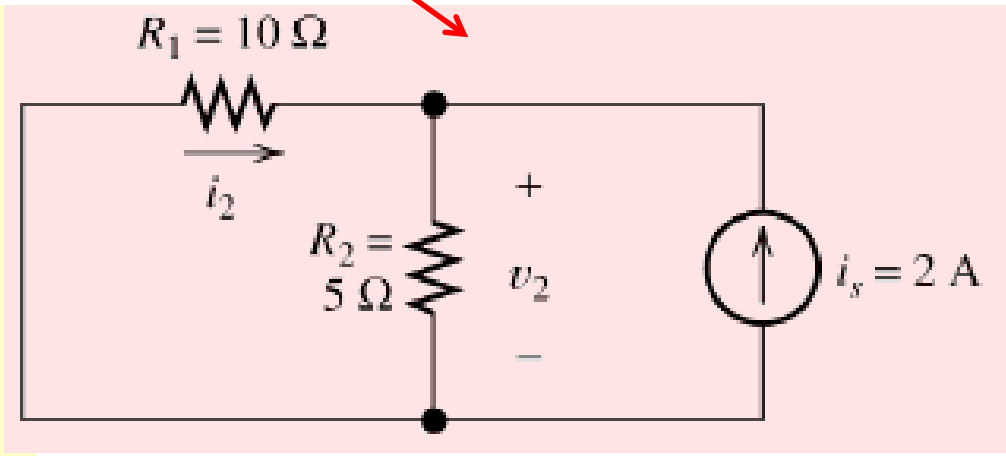

0 V
+
–
0 A

Example-1





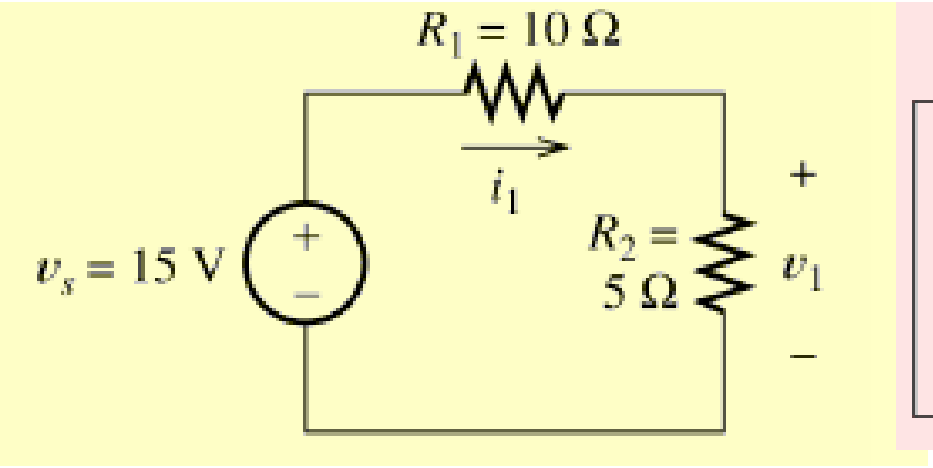
Circuit with only voltage source active. Current source is open circuited.

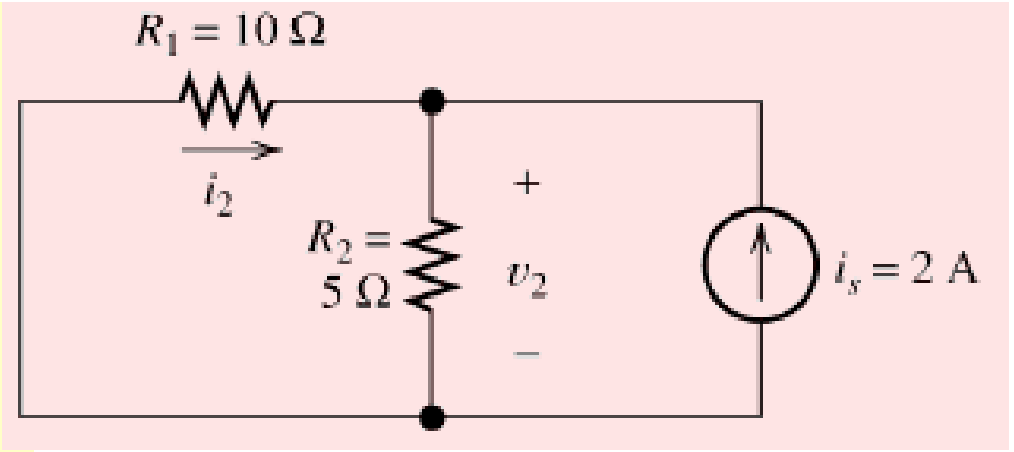


Circuit with only current source active. Voltage source is open circuited.

$$i_T = i_1 + i_2$$

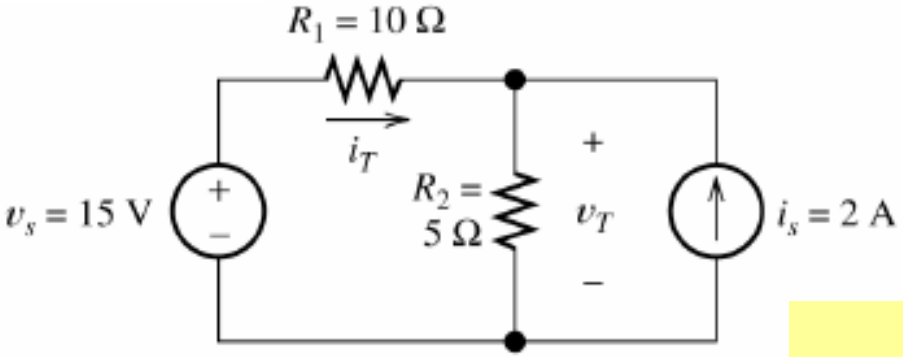
$$v_T = v_1 + v_2$$





$$v_1 = 15\frac{5}{15} = 5V$$

$$v_2 = 5 \times \left(2 \times \frac{10}{15} \right) = \frac{20}{3} V$$

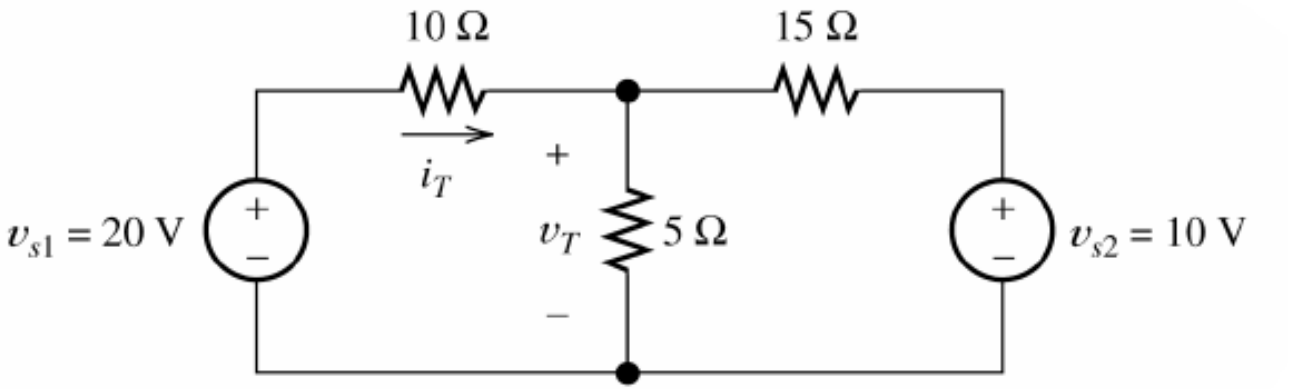


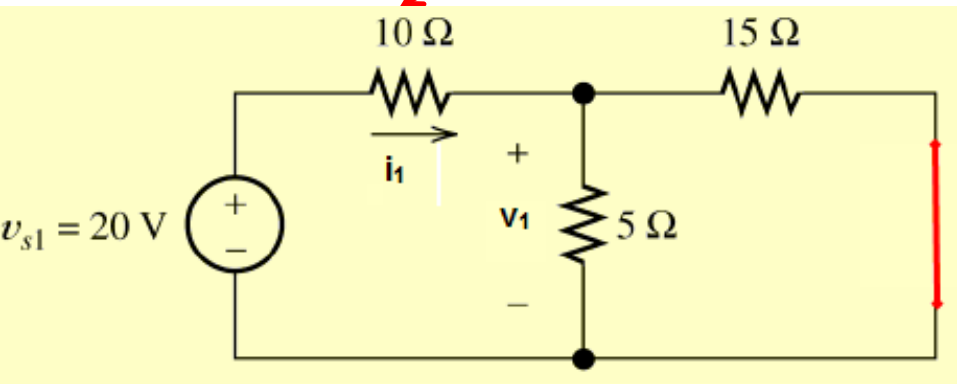
$$v_T = v_1 + v_2$$

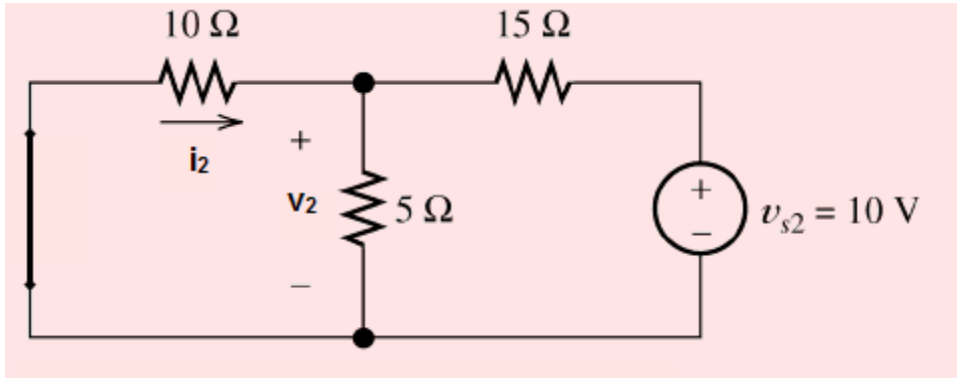
$$i_T = i_1 + i_2$$

$$v_T = v_1 + v_2 = 5 + \frac{20}{3} = \frac{35}{3} V$$

Example-2



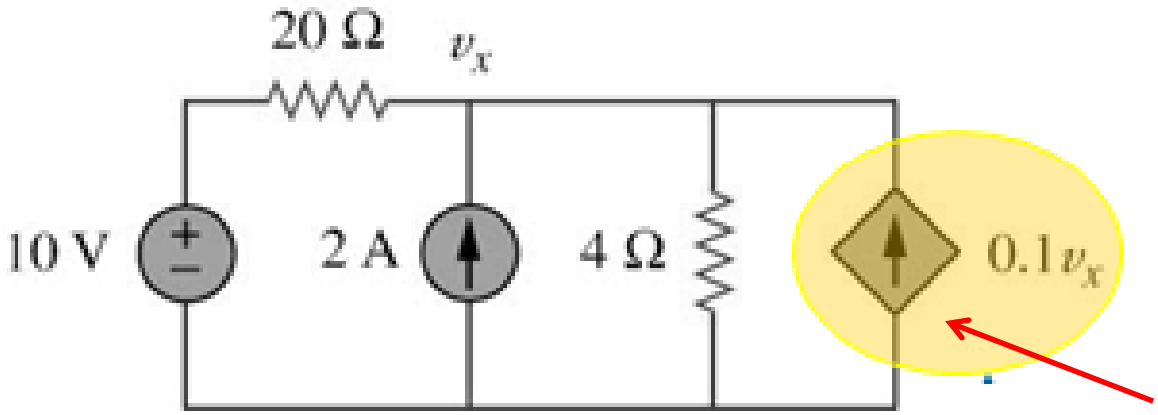




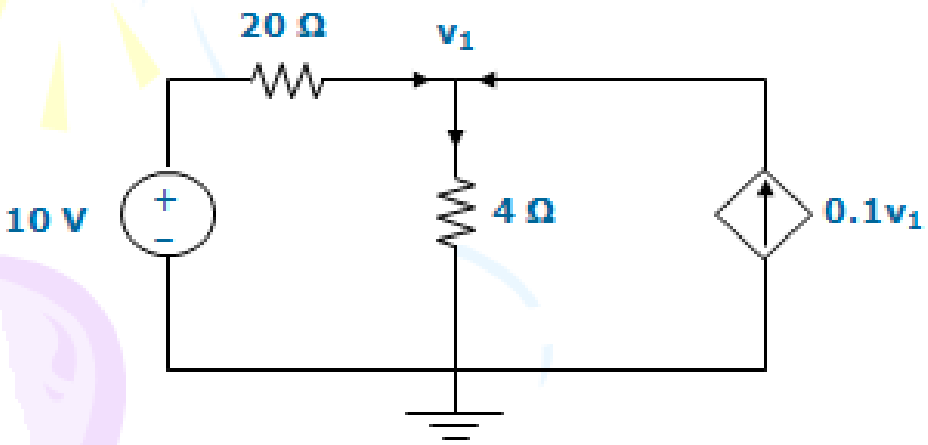
$$i_T = i_1 + i_2$$

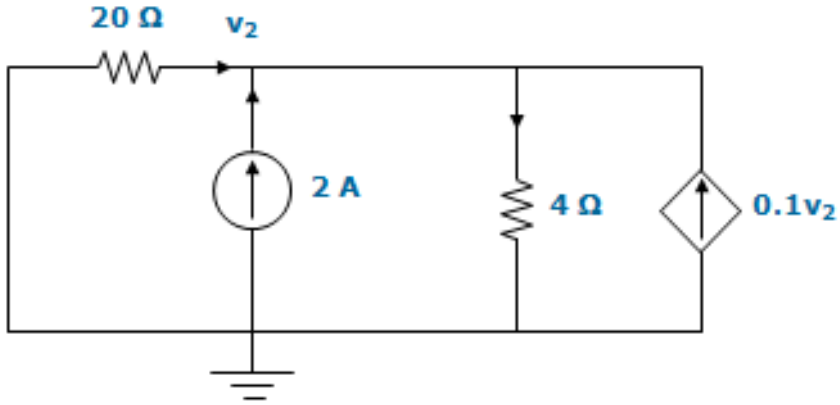
$$v_T = v_1 + v_2$$

Example-3



Dependant source keep unchanged





10V is discarded by short circuit

2A is discarded by open circuit