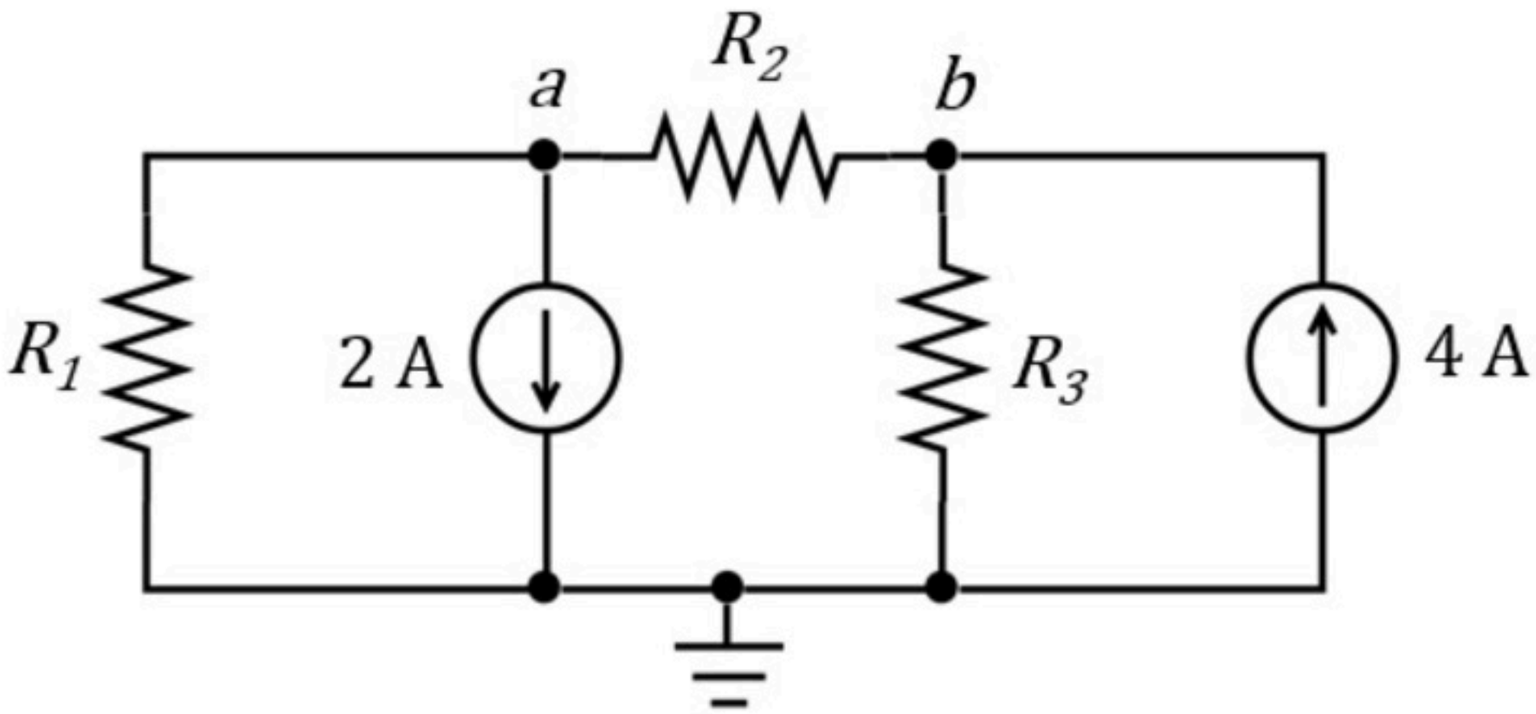
Nodal Mesh 001

Problem has been graded.

Find the node voltages v_a and v_b.
Use nodal analysis.



Given Variables:

R1 : 3 ohm

R2 : 6 ohm

R3 : 1 ohm

Calculate the following:

va (V) :

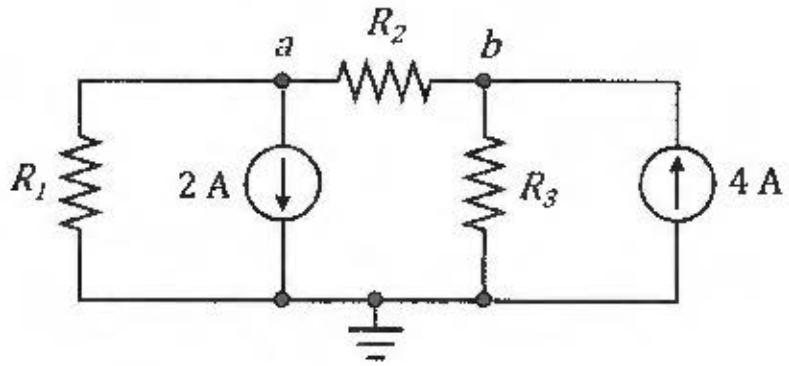
vb (V) :

Find the node voltages v_a and v_b.
Use nodal analysis.

R1 = 2 Ω

R2 = 1 Ω

R3 = 1 Ω



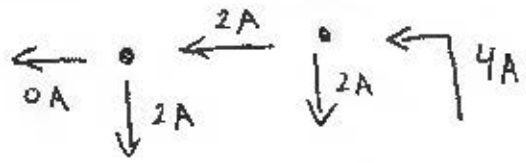
⊛ KCL @ a : $\frac{v_a}{2} + \frac{v_a - v_b}{1} + 2 = 0 \Rightarrow 3v_a - 2v_b = -4$ (1)

⊛ KCL @ b. $\frac{v_b - v_a}{1} + \frac{v_b}{1} - 4 = 0 \Rightarrow -v_a + 2v_b = 4$ (2)

⊛ (1) + (2) : $2v_a = 0 \Rightarrow$ $\boxed{v_a = 0\,V}$

$\boxed{v_b = 2\,V}$

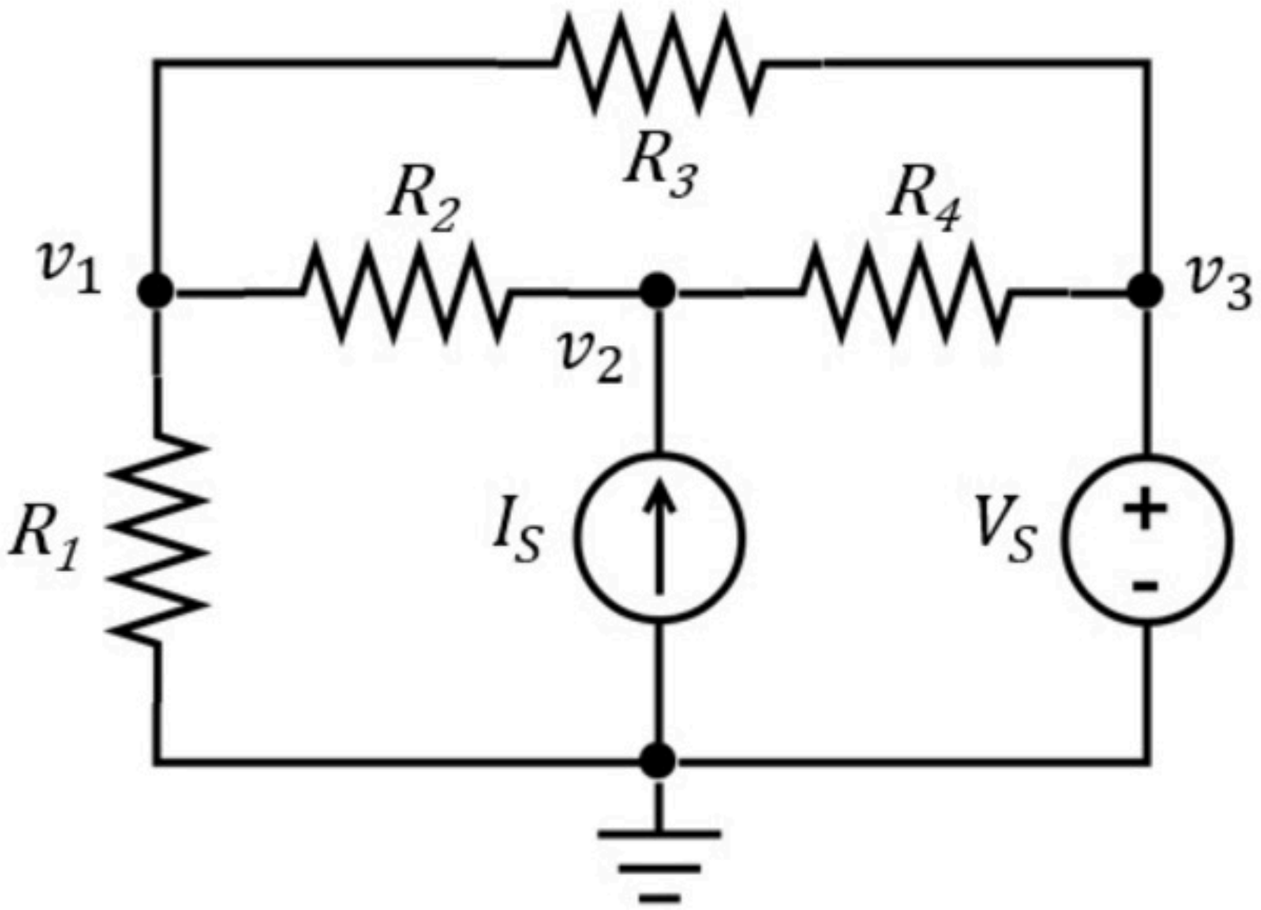
CHECK KCL



Nodal Mesh 002

Problem has been graded.

Find the node voltages v_1, v_2 and v_3.
Use nodal analysis.



Given Variables:

R1 : 2 ohm

R2 : 1 ohm

R3 : 1 ohm

R4 : 2 ohm

Vs : 5 V

Is : 1 A

Calculate the following:

v1 (V) :

---

v2 (V) :

---

v3 (V) :

Find the node voltages v_1, v_2 and v_3.
Use nodal analysis.

R1 = 2 Ω

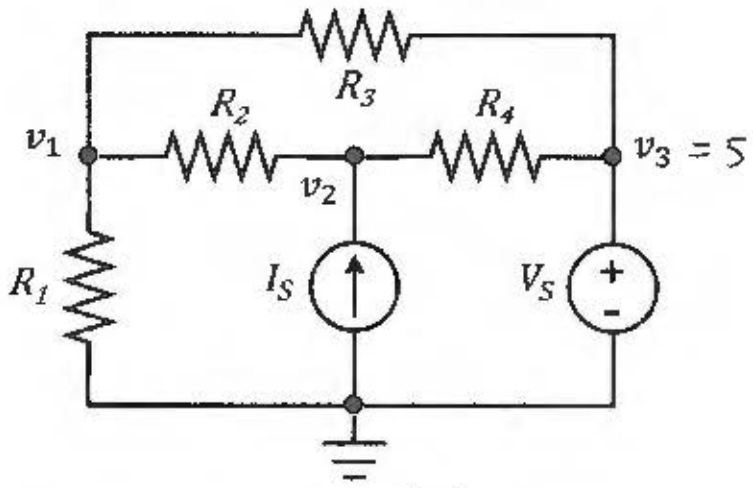
R2 = 1 Ω

R3 = 1 Ω

R4 = 2 Ω

Vs = 5 V

Is = 1 A



$v_3 = V_S \Rightarrow \boxed{v_3 = 5V}$

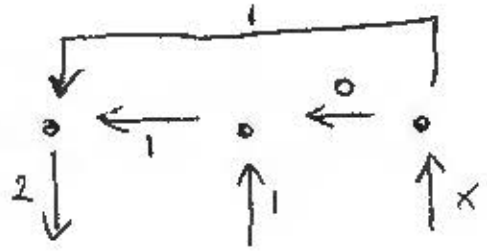
⊗ KCL @ 1 : $\frac{v_1}{2} + \frac{v_1 - 5}{1} + \frac{v_1 - v_2}{1} = 0 \Rightarrow 5v_1 - 2v_2 = 10$ (1)

⊗ KCL @ 2 : $\frac{v_2 - v_1}{1} + \frac{v_2 - 5}{2} - 1 = 0 \Rightarrow -2v_1 + 3v_2 = 7$ (2)

⊗ $3 \times (1) + 2 \times (2)$: $11 v_1 = 44 \Rightarrow \boxed{v_1 = 4V}$

$\boxed{v_2 = 5V}$

CHECK KCL

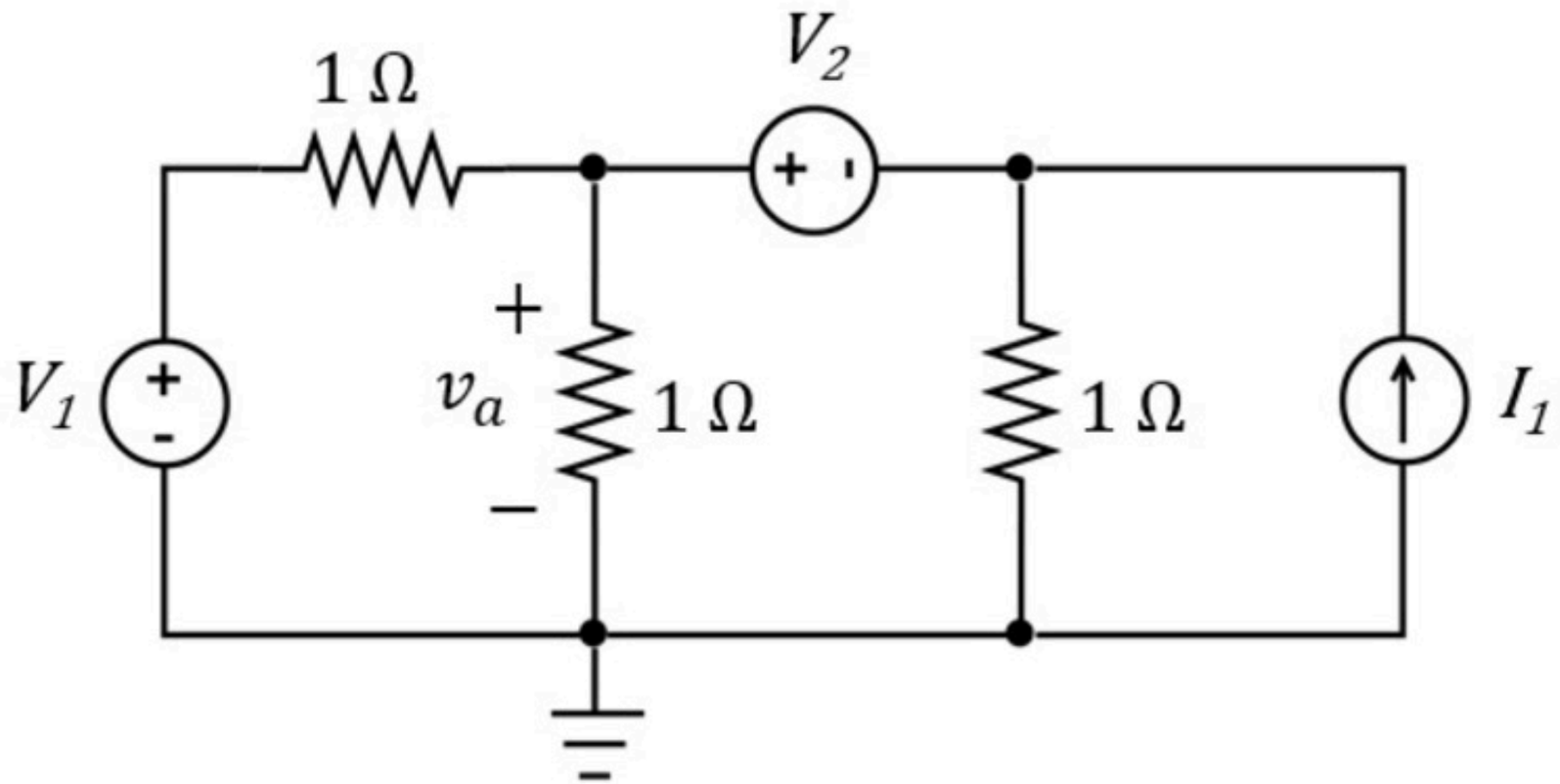


$x = 1$

Nodal Mesh 003

Problem has been graded.

Find the voltage v_a . Use nodal analysis.



Given Variables:

V1 : 6 V

V2 : 10 V

I1 : 5 A

Calculate the following:

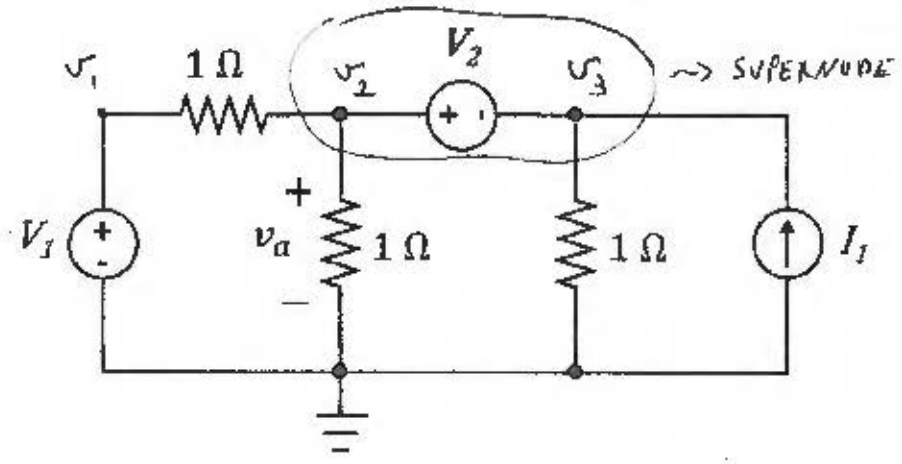
va (V) :

Find the voltage v_a . Use nodal analysis.

V1 = 6 V

V2 = 10 V

I1 = 5 A



$v_1 = V_1 = 6V$

⊛ KCL @ SN : $\frac{v_1 - 6}{1} + \frac{v_2}{1} + \frac{v_3}{1} - 5 = 0$

$\Rightarrow \quad 2v_2 + v_3 = 11 \qquad (1)$

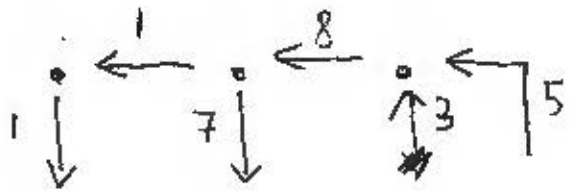
⊛ SN : $v_2 = v_3 + 10 \qquad (2)$

⊛ (2) in (1) : $2v_3 + 20 + v_3 = 11 \quad \Rightarrow \quad 3v_3 = -9 \quad \Rightarrow \quad v_3 = -3V$

$v_2 = 7V$

$v_a = v_2 \quad \Rightarrow \quad \boxed{v_a = 7V}$

CHECK KCL AND $v_2 - v_3 = 10V$



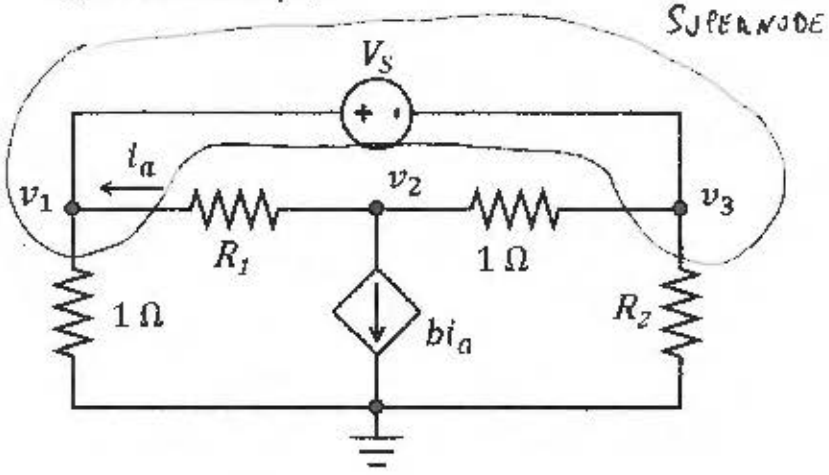
Find the node voltages v_1, v_2 and v_3.
Use nodal analysis.

Vs = 9 V

R1 = 5 Ω

R2 = 5 Ω

b = 3 A/A



OPTION 1

⊛ KCL @ SN: $\frac{v_1}{1} + \frac{v_1 - v_2}{5} + \frac{v_3 - v_2}{1} + \frac{v_3}{5} = 0 \Rightarrow 6v_1 - 6v_2 + 6v_3 = 0$

$\Rightarrow v_1 - v_2 + v_3 = 0$ (1)

⊛ KCL @ 2: $\frac{v_2 - v_1}{5} + \frac{v_2 - v_3}{1} + 3\left(\frac{v_2 - v_1}{5}\right) = 0 \Rightarrow -4v_1 + 9v_2 - 5v_3 = 0$ (2)

⊛ SN: $v_1 = v_3 + 9$ (3)

(3) in (1): $v_3 + 9 - v_2 + v_3 = 0 \Rightarrow -v_2 + 2v_3 = -9$ (4)

(3) in (2): $-4v_3 - 36 + 9v_2 - 5v_3 = 0 \Rightarrow 9v_2 - 9v_3 = 36$

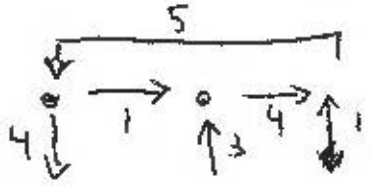
$\Rightarrow v_2 - v_3 = 4$ (5)

(4) + (5): $2v_3 - v_3 = -9 + 4 \Rightarrow \boxed{v_3 = -5V}$

$\boxed{v_1 = 4V}$ FROM (3)

$\boxed{v_2 = -1V}$ FROM (5)

CHECK KCL

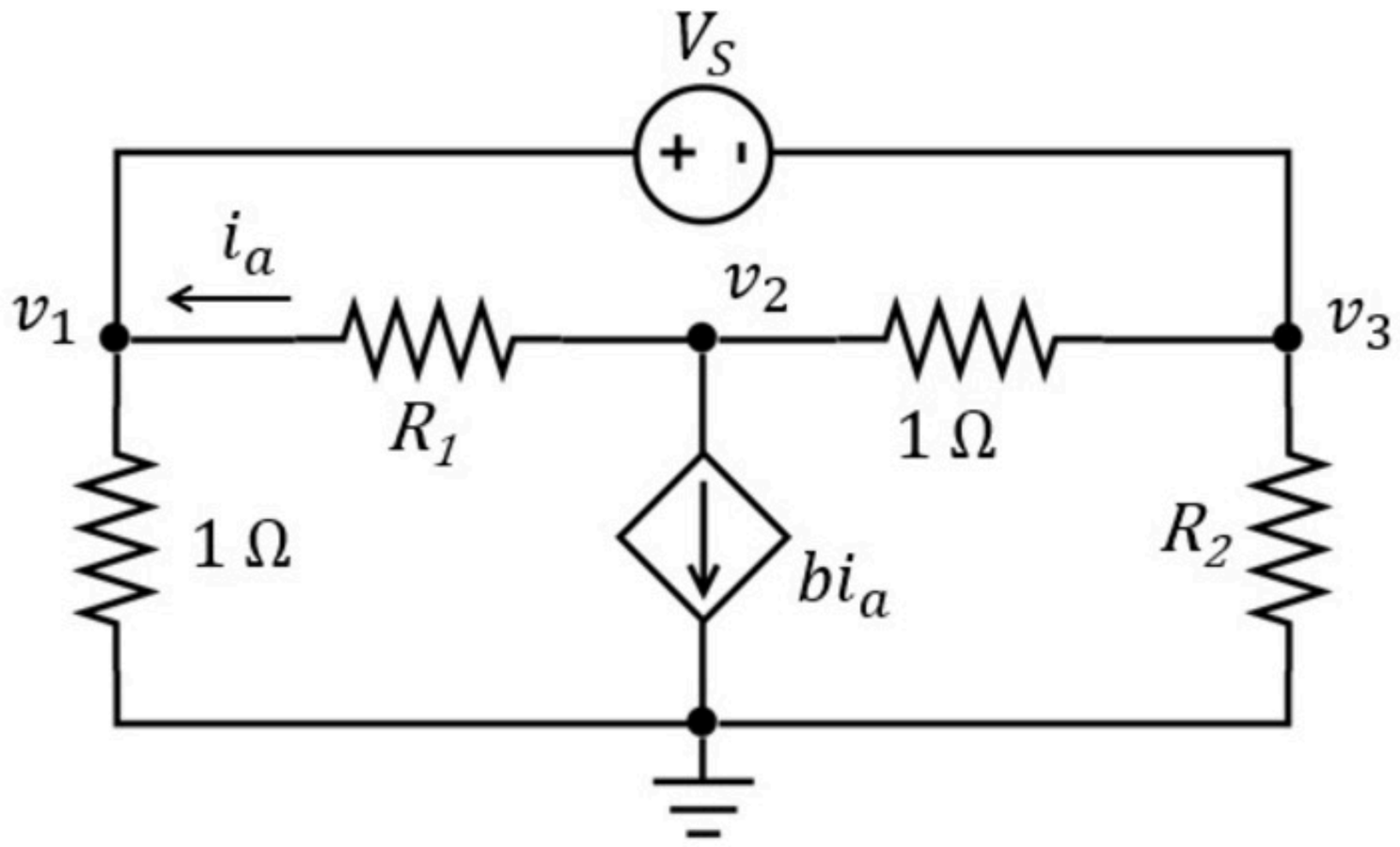


AND $v_1 = v_3 + 9$

Nodal Mesh 004

Problem has been graded.

Find the node voltages v_1, v_2 and v_3.
Use nodal analysis.



Given Variables:

Vs : 9 V

R1 : 5 ohm

R2 : 5 ohm

b : 3 A/A

Calculate the following:

v1 (V) :

---

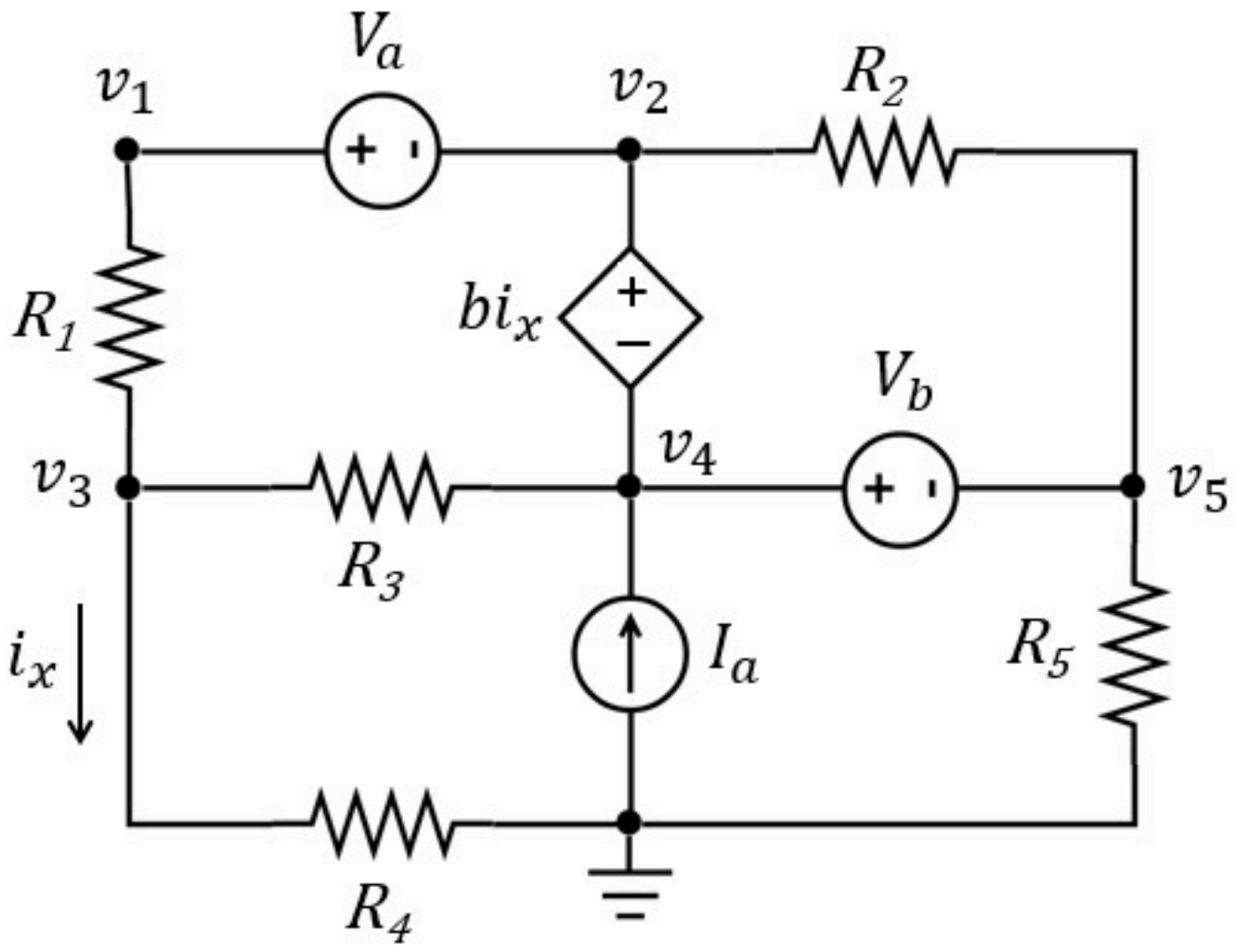
v2 (V) :

---

v3 (V) :

Nodal Mesh 005

Problem has been graded.



Given Variables:

R1 : 1 ohm

R2 : 2 ohm

R3 : 1 ohm

R4 : 2 ohm

R5 : 1 ohm

Va : 1 V

Vb : 1 V

Ia : 4 A

b : 1.5 V/A

Calculate the following:

v1 (V) :

---

v2 (V) :

---

v3 (V) :

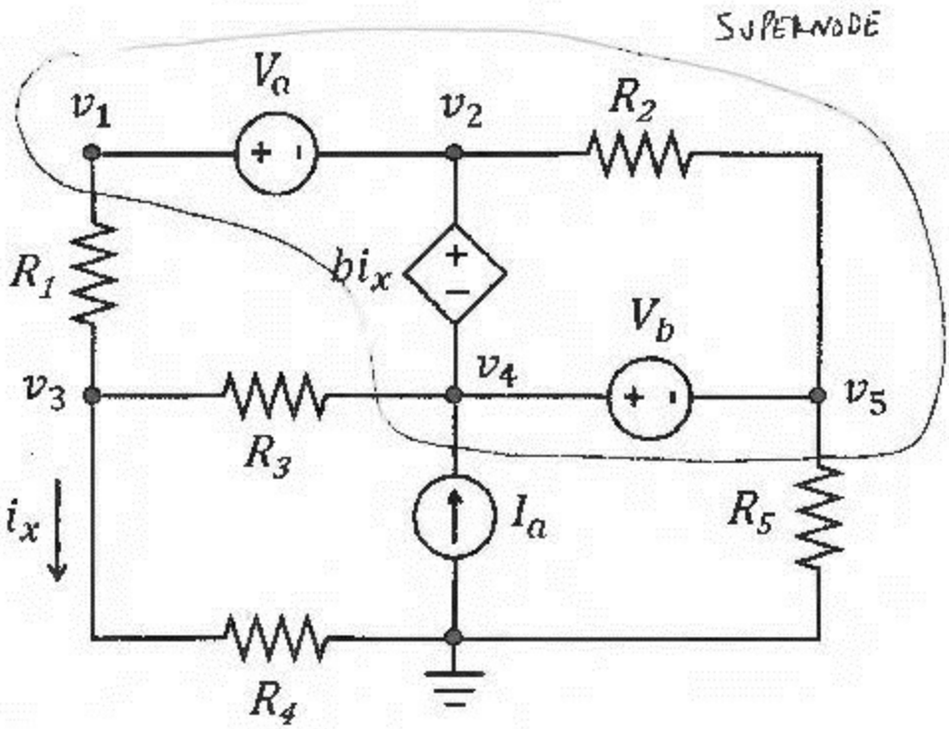
---

v4 (V) :

---

v5 (V) :

Hint: Use a supernode and move GND (and move it back).



R1 = 1 Ω

R2 = 3 Ω

R3 = 1 Ω

R4 = 4 Ω

R5 = 1 Ω

Va = -2 V

Vb = 2 V

Ia = 3 A

b = 1 V/A

⊛ KCL @ 3 : $\frac{v_3 - v_1}{1} + \frac{v_3 - v_4}{1} + \frac{v_3}{3} = 0 \Rightarrow -3v_1 + 7v_3 - 3v_4 = 0$ (1)

⊛ KCL @ SN : $\frac{v_1 - v_3}{1} + \frac{v_4 - v_3}{1} + \frac{v_5}{1} - 3 = 0 \Rightarrow v_1 - 2v_3 + v_4 + v_5 = 3$ (2)

⊛ SN V_a : $v_1 = v_2 - 2 \Rightarrow v_1 = v_2 - 2$ (3)

⊛ SN V_b : $v_4 = v_5 + 2 \Rightarrow v_5 = v_4 - 2$ (4)

⊛ SN bi_x : $v_2 = v_4 + 1 \cdot \frac{v_3}{3} \Rightarrow v_3 = 3v_2 - 3v_4$ (5)

(4),(3) IN (1) : $-3v_2 + 6 + 21v_2 - 21v_4 - 3v_4 = 0 \Rightarrow 18v_2 - 24v_4 = -6$

$\Rightarrow 3v_2 - 4v_4 = -1$ (6)

(3),(4),(5) IN (2) : $v_2 - 2 - 6v_2 + 6v_4 + v_4 + v_4 - 2 = 3 \Rightarrow -5v_2 + 8v_4 = 7$ (7)

(6)×2 + (7) : $6v_2 - 5v_2 = -2 + 7 \Rightarrow \boxed{v_2 = 5V}$

$\boxed{v_1 = 3V}$ FROM (3)

$\boxed{v_4 = 4V}$ FROM (6)

$\boxed{v_5 = 2V}$ FROM (4)

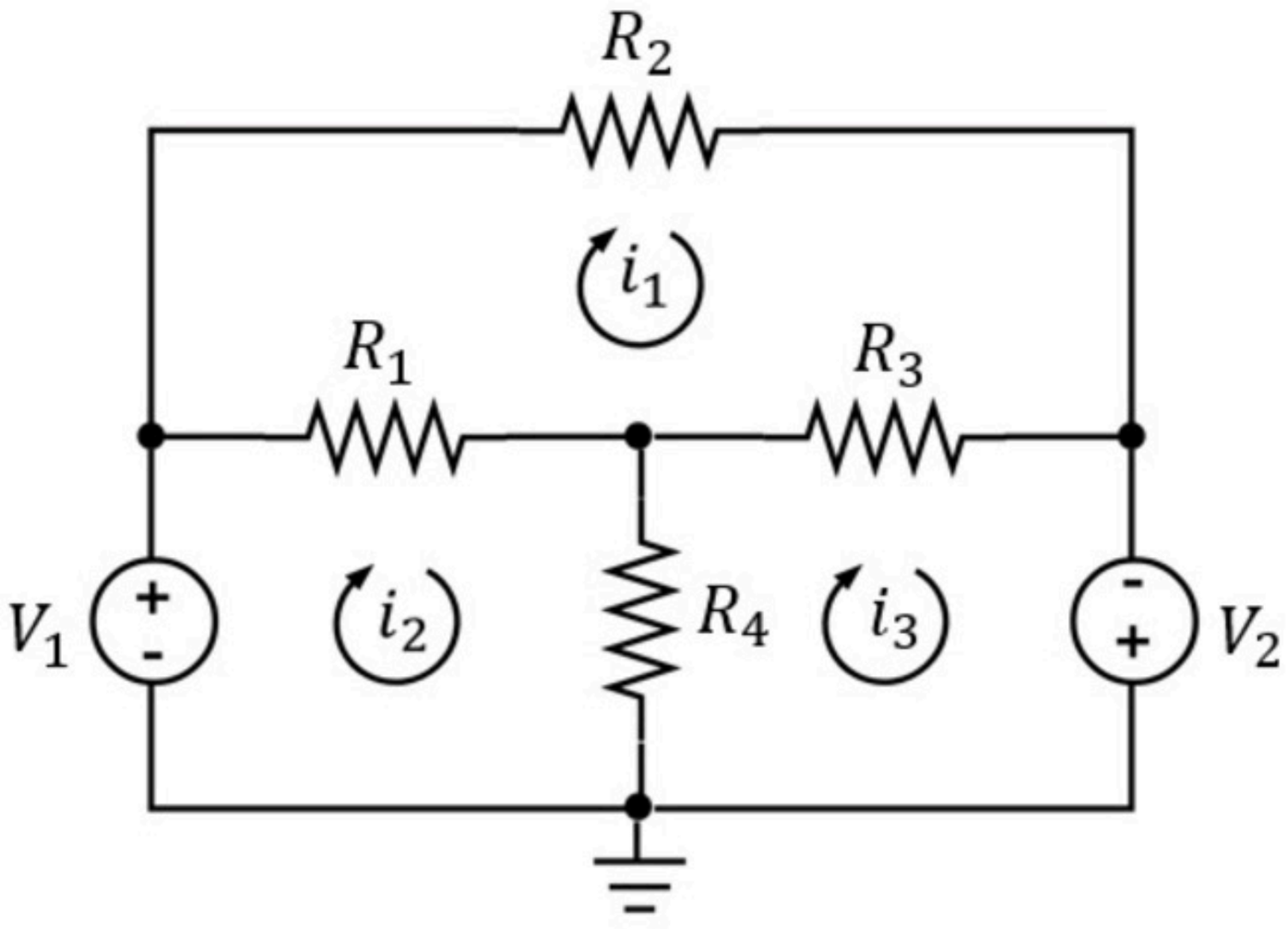
$\boxed{v_3 = 3V}$ FROM (5)

CHECK KCL

Nodal Mesh 006

Problem has been graded.

Find the mesh currents i_1, i_2, and i_3.



Given Variables:

R1 : 1 ohm

R2 : 1 ohm

R3 : 2 ohm

R4 : 1 ohm

V1 : 4 V

V2 : 3 V

Calculate the following:

i1 (A) :

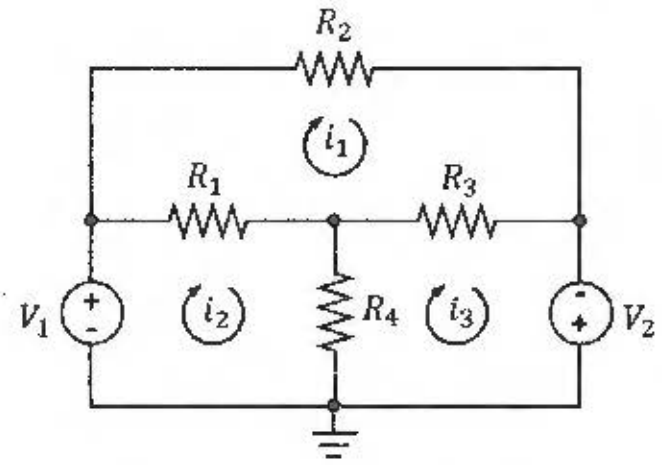
---

i2 (A) :

---

i3 (A) :

Find the mesh currents i_1, i_2, and i_3.



R1 = 1 Ω

R2 = 1 Ω

R3 = 2 Ω

R4 = 1 Ω

V1 = 4 V

V2 = 3V

⊗ MESH 1 : $1 \cdot i_1 + 2(i_1 - i_3) + 1(i_1 - i_2) = 0 \Rightarrow 4i_1 - i_2 - 2i_3 = 0$ (1)

⊗ MESH 2 : $-4 + 1(i_2 - i_1) + 1 \cdot (i_2 - i_3) = 0 \Rightarrow -i_1 + 2i_2 - i_3 = 4$ (2)

⊗ MESH 3 : $1 \cdot (i_3 - i_2) + 2 \cdot (i_3 - i_1) - 3 = 0 \Rightarrow -2i_1 - i_2 + 3i_3 = 3$ (3)

(1). $i_2 = 4i_1 - 2i_3$

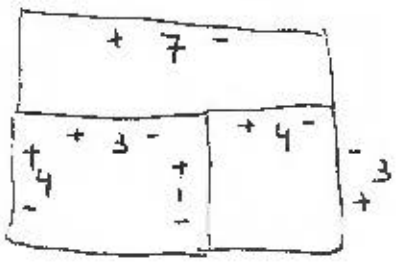
(1) IN (2): $-i_1 + 8i_1 - 4i_3 - i_3 = 4 \Rightarrow 7i_1 - 5i_3 = 4$ (4)

(1) IN (3). $-2i_2 - 4i_1 + 2i_3 + 3i_3 = 3 \Rightarrow -6i_1 + 5i_3 = 3$ (5)

(4) + (5). $\boxed{i_1 = 7A}$

$\boxed{i_3 = 9A}$ $\boxed{i_2 = 10A}$

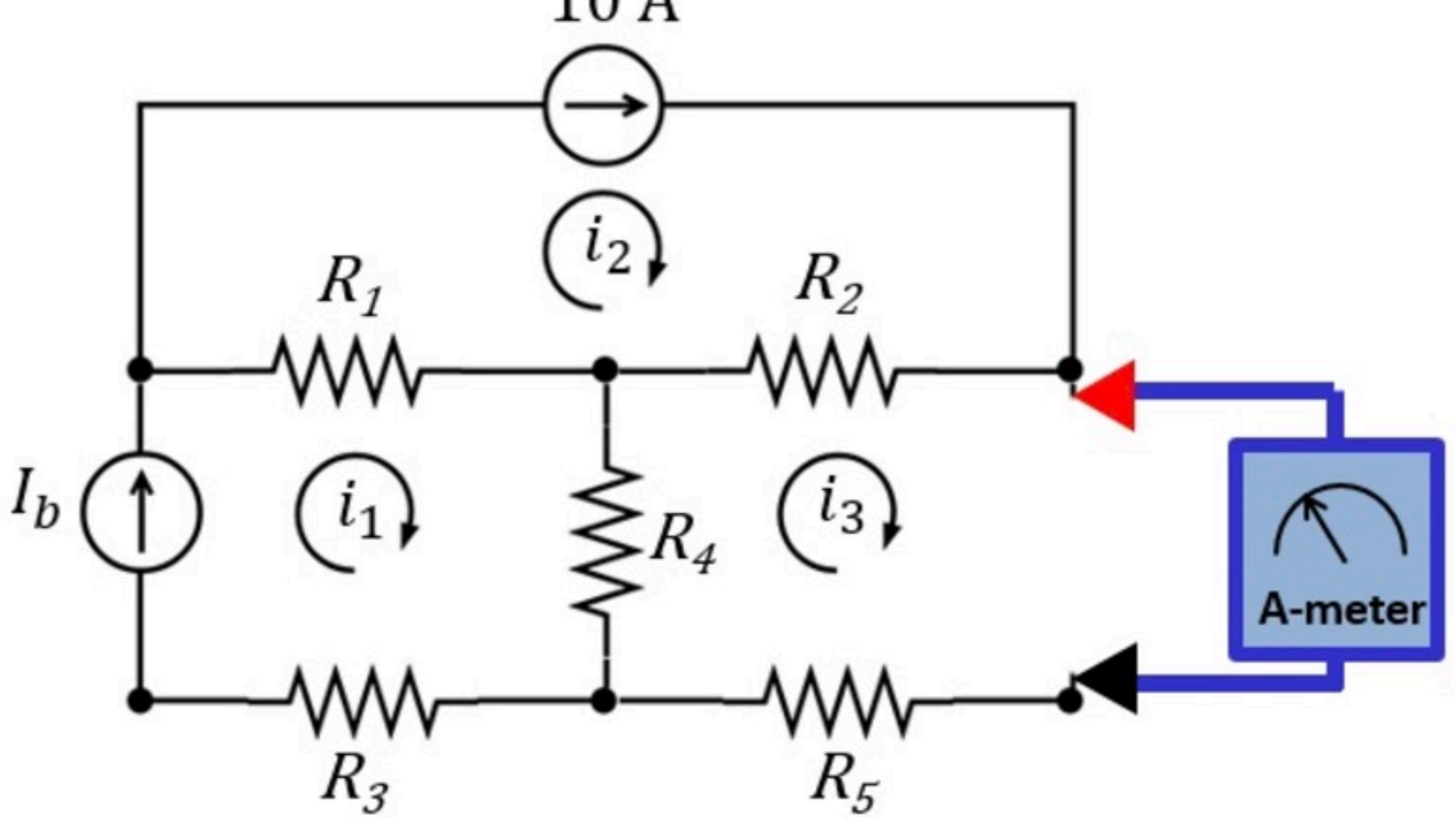
CHECK KVL



Nodal Mesh 007

Problem has been graded.

Given the ammeter reading X,
find the value of resistance R_4.



Given Variables:
R1 : 2 ohm
R2 : 3 ohm
R3 : 2 ohm
R5 : 5 ohm
X : 3 A
Ib : 1 A

Calculate the following:

R4 (ohm) :

> Hint: Find the voltage over R4 using KVL in any loop

Given the ammeter reading X,
find the value of resistance R_4.

R1 = 19 Ω

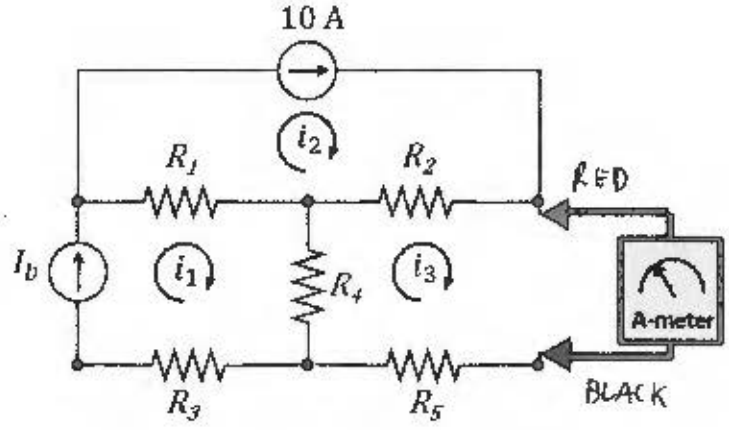
R2 = 2 Ω

R3 = 3 Ω

R5 = 2 Ω

X = 3 A

Ib = 1 A



$i_3 = X = 3$

$i_1 = I_b = 1$

$i_2 = 10$

A-METER

KVL MESH 3. $R_4(i_3 - i_1) + R_2(i_3 - i_2) + 0 + R_5 i_3 = 0$

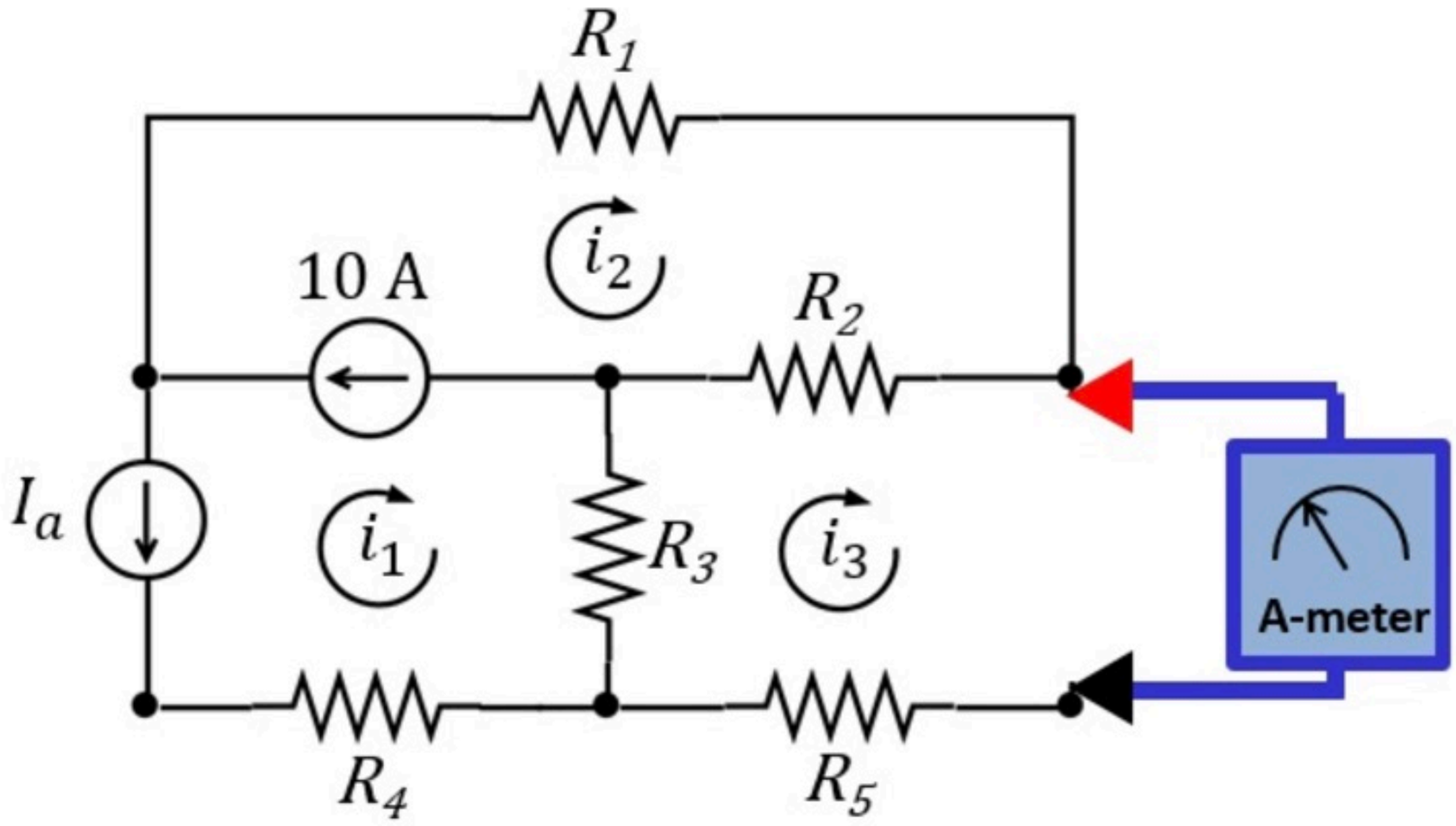
$R_4 \cdot 2 + 2 \cdot (-7) + 2 \cdot 3 = 0$

$\boxed{R_4 = 4\,\Omega}$

Nodal Mesh 008

Problem has been graded.

Given the ammeter reading X,
find the value of resistance R_3.



Given Variables:

R1 : 2 ohm

R2 : 2 ohm

R4 : 2 ohm

R5 : 2 ohm

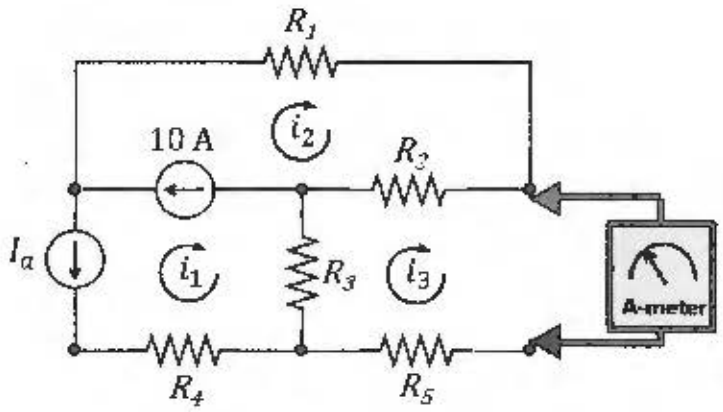
X : 2 A

Ia : 2 A

Calculate the following:

R3 (ohm) :

Given the ammeter reading X,
find the value of resistance R_3.



R1 = 23 Ω

R2 = 2 Ω

R4 = 34 Ω

R5 = 2 Ω

X = 2 A

Ia = 2 A

$i_3 = X = 2$

$i_1 = -I_a = -2$

$i_1 - i_2 = -10 \Rightarrow i_2 = i_1 + 10 = 8$

⊗ KVL IN MESH 3. $R_3 (i_3 - i_1) + R_2 (i_3 - i_2) + 0 + R_5 i_3 = 0$

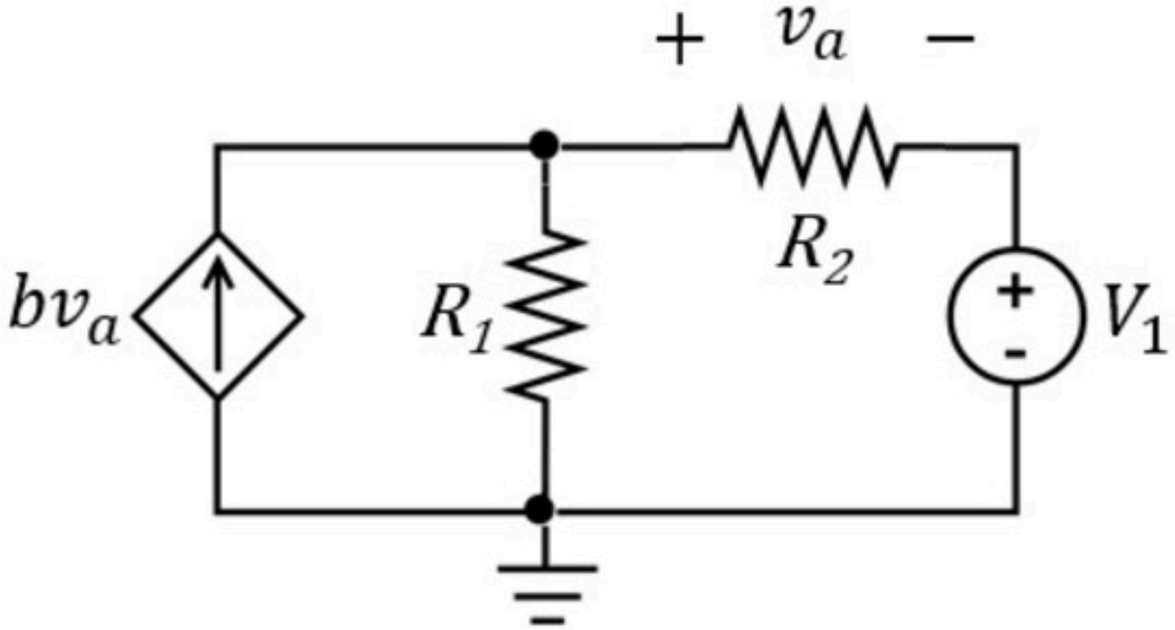
$R_3 \cdot 4 + 2 \cdot (-6) + 2\ 2 = 0$

$R_3 = 2\ \Omega$

Nodal Mesh 009

Problem has been graded.

Find the voltage v_a.
Use mesh analysis.



Given Variables:

R1 : 3 ohm

R2 : 4 ohm

b : 1 A/V

V1 : 10 V

Calculate the following:

va (V) :

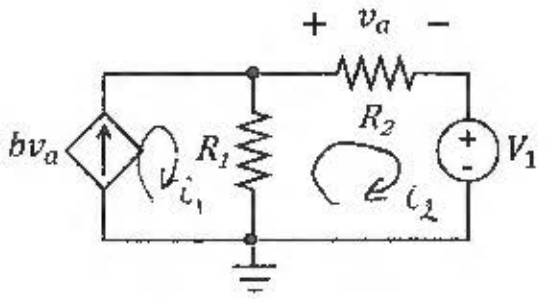
R1 = 3 Ω

R2 = 2 Ω

b = 1.5 A/V

V1 = 10 V

Find the voltage v_a.
Use mesh analysis.



⊛ $i_1 = b \cdot v_a = b\, R_2\, i_2 = 3\, i_2$

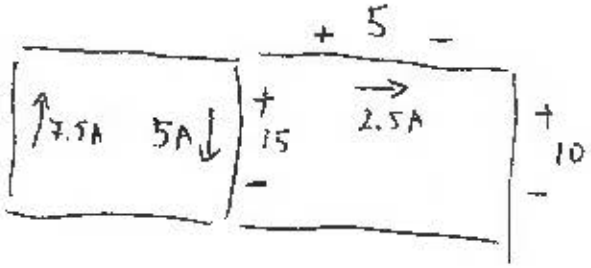
⊛ KVL IN ②: $3(\underbrace{i_2 - i_1}_{-2i_2}) + 2 \cdot i_2 + 10 = 0$

$-4 i_2 = -10$

$i_2 = 2.5\ A \qquad i_1 = 7.5\ A$

$v_a = i_2 \cdot R_2 = 5V \Rightarrow \boxed{v_a = 5V}$

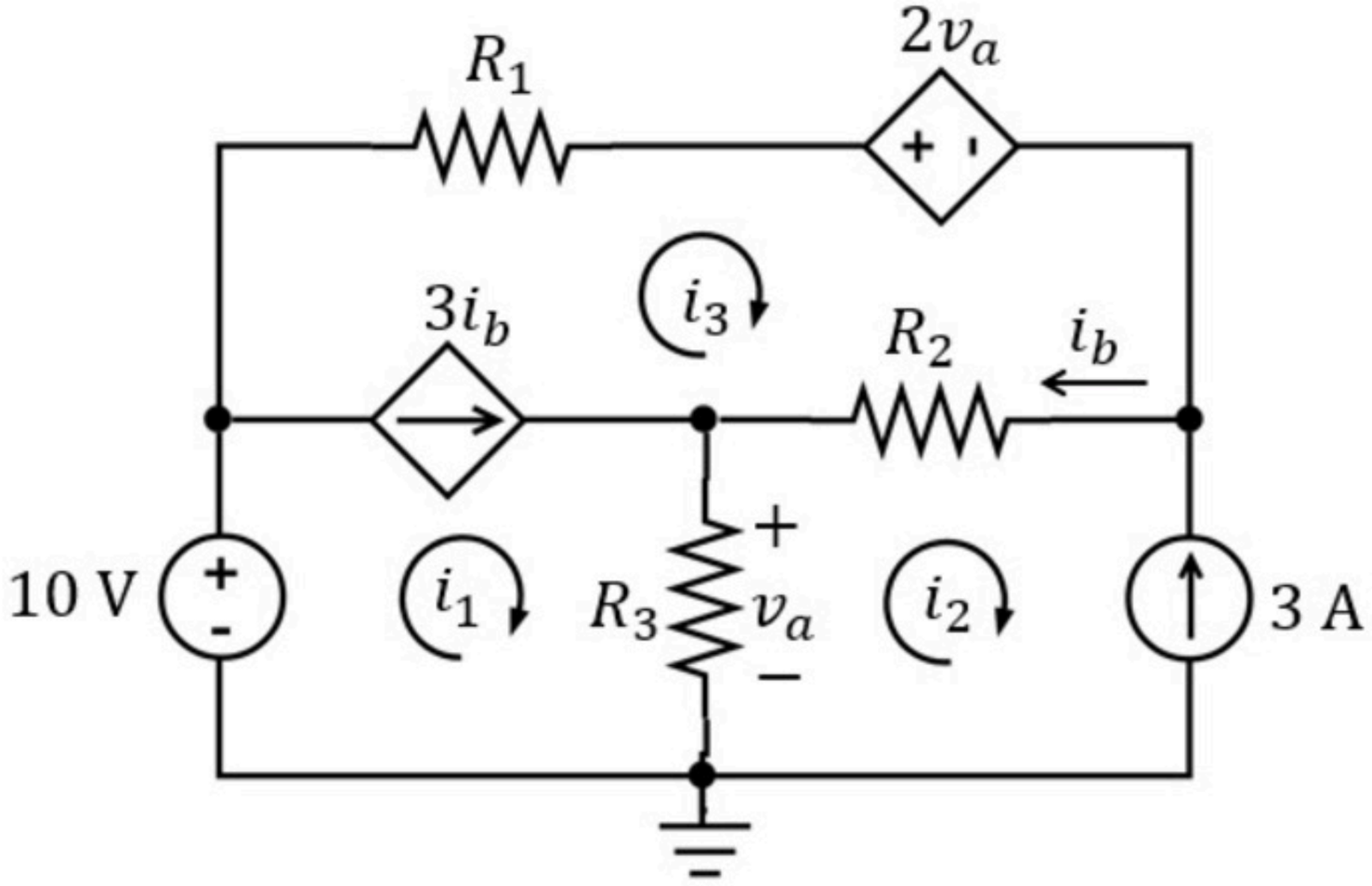
CHECK: KVL



Nodal Mesh 010

Problem has been graded.

Find the mesh currents i_1, i_2, and i_3.



Given Variables:

R1 : 8 ohm

R2 : 2 ohm

R3 : 2 ohm

Calculate the following:

i1 (A) :

---

i2 (A) :

---

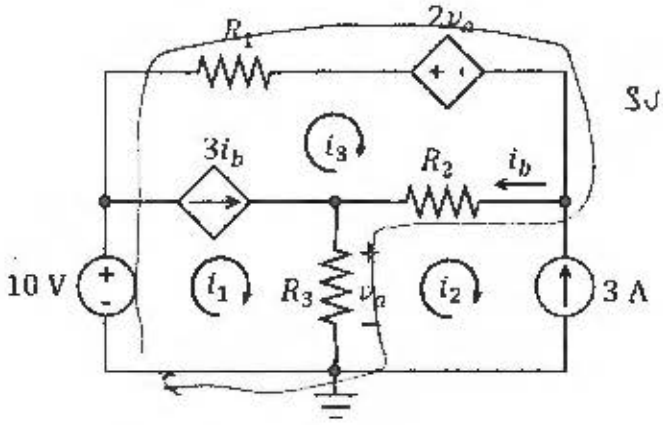
i3 (A) :

Find the mesh currents i_1, i_2, and i_3.

R1 = 16 Ω

R2 = 1 Ω

R3 = 1 Ω



⊗ $\boxed{i_2 = -3\,A}$

⊗ $i_1 - i_3 = 3 \cdot i_b = 3\,(i_3 - i_2) = 3i_3 + 9 \Rightarrow i_1 = 4i_3 + 9$ (1)

⊗ KVL SUPERMESH: $-10 + 16 \cdot i_3 + 2 \cdot (R_3)(i_1 + 3)$

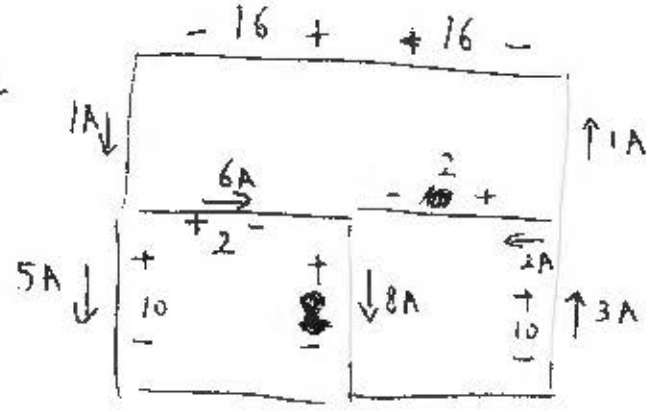
$+ 1\,(i_3 + 3) + 1 \cdot (i_1 + 3) = 0$

$\Rightarrow -10 + 16\,i_3 + 8i_3 + 24 + i_3 + 3 + 4i_3 + 12 = 0$

$\Rightarrow 29\,i_3 = -29$

$\Rightarrow \boxed{i_3 = -1\,A}$ $\boxed{i_1 = 5\,A}$

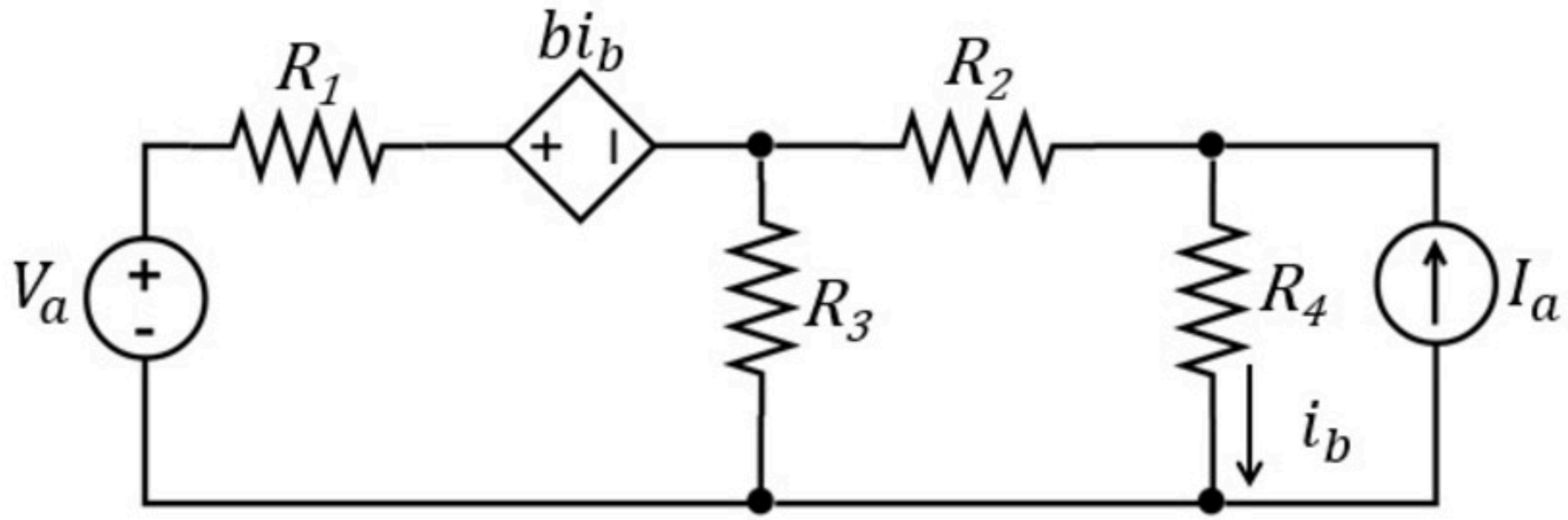
CHECK KVL



Nodal Mesh 011

Problem has been graded.

Find the value of the current i_b.
Use mesh analysis.



Given Variables:

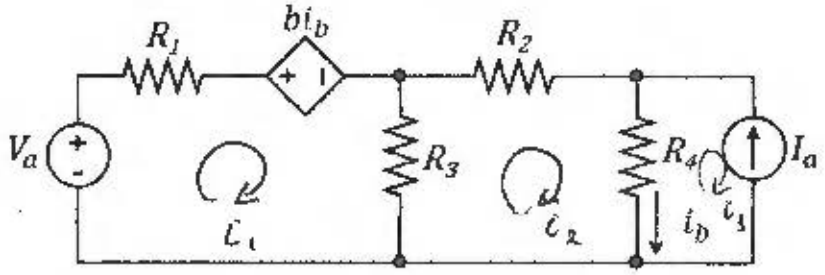
Va : 16 V
R1 : 2 ohm
R2 : 6 ohm
R3 : 8 ohm
R4 : 1 ohm
b : 2 V/A
Ia : 1 A

Calculate the following:

ib (A) :

> Hint: Do we need to use a supermesh?

Find the value of the current i_b.
Use mesh analysis.



Va = 16 V

R1 = 2 Ω

R2 = 6 Ω

R3 = 8 Ω

R4 = 1 Ω

b = 2 V/A

Ia = 1 A

$i_3 = -I_a = -1\,A$

$i_b = i_2 - i_3 = i_2 + 1$

MESH 1: $-16 + 2\cdot i_1 + 2\cdot i_b + 8(i_1 - i_2) = 0$

$-16 + 2i_1 + 2i_2 + 2 + 8i_1 - 8i_2 = 0$

$10\,i_1 - 6\,i_2 = 14$

$5i_1 - 3i_2 = 7 \quad (1)$

MESH 2: $8(i_2 - i_1) + 6i_2 + 1\cdot(i_2 + 1) = 0$

$-8i_1 + 15\,i_2 = -1 \quad (2)$

$5\times(1) + (2)$: $17\,i_1 = 34 \Rightarrow i_1 = 2A \Rightarrow i_2 = 1A$

$i_b = i_2 + 1 \Rightarrow \boxed{i_b = 2A}$

CHECK KVL