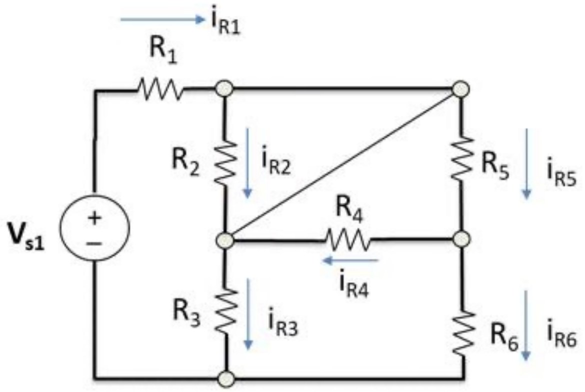
What's the current in R_3, i.e., i_{R3}, in the following circuit? (Hint: use supernode)

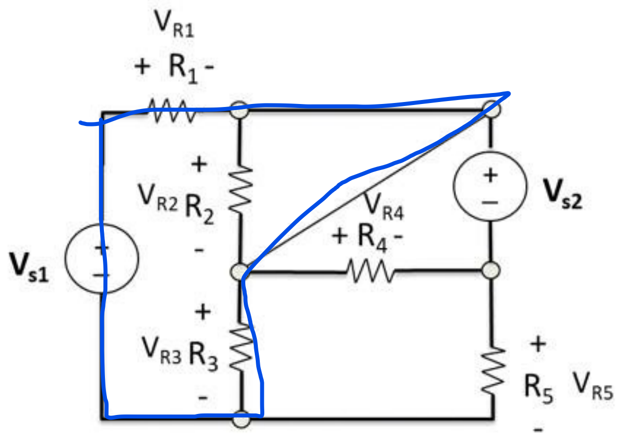


Given iR1 = 7.5A, i_{R5} =2.5A, i_{R6} = 5.5A
Which among the following values most closely matches the correct answer?

- a. 2.5A
- b. 3.0A
- c. 2.0A
- d. 1.5A

iR3 = iR1(question) - iR6(question)

What's the voltage across R_3, i.e., V_{R3}, in the following circuit? (Hint: label different node with different color)

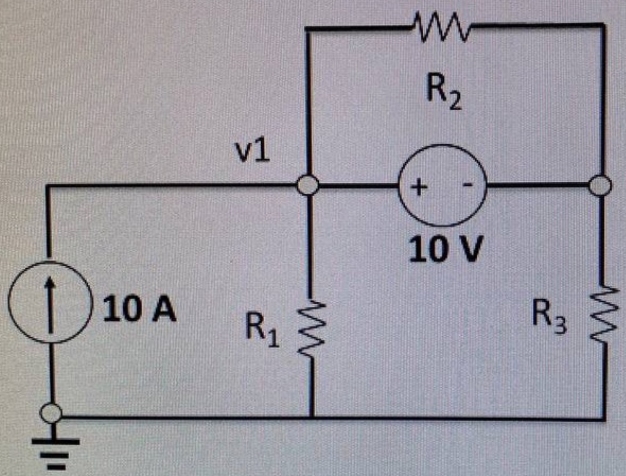


Given V_{R1} = 8V, V_{R5} = 1 V, V_{S1} = 10 V, and V_{S2} = 1 V
Which among the following values most closely matches the correct answer?

- a. 1V
- b. 3V
- c. 4V
- d. 2V

own notes: -Vs1(question) + Vr1(question) + Vr3 = 0

In the circuit below, what is the Thevenin (open-circuit) voltage when R_3 is the load?



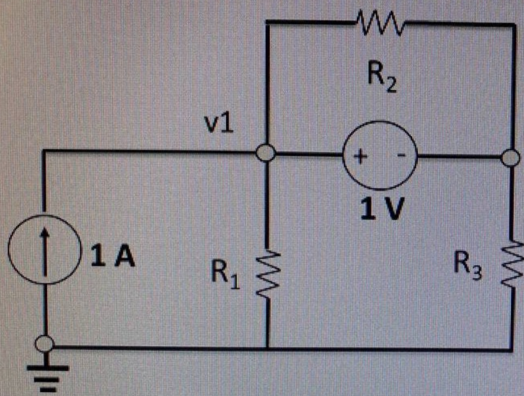
Given $R_1 = R_2 = R_3 = 8\ \Omega$

Which among the following values most closely matches the correct answer?

- a. 65V
- b. 75V
- c. 60V
- d. 70V

own notes: 10A(given) x R(question) - 10V(given) =

In the circuit below, what is the Norton (short-circuit) current when R_3 is the load?



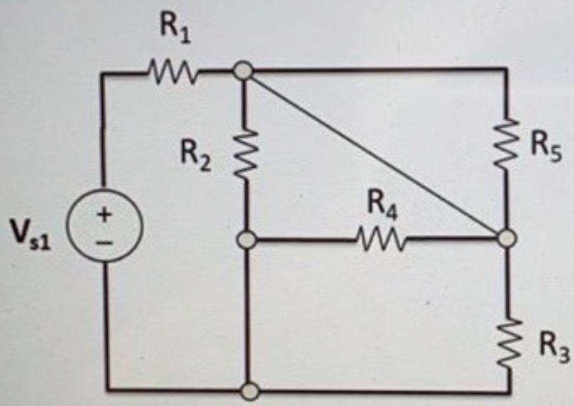
Given R_1 = 2.5 Ω, R_2 = 1 Ω Which among the following values most closely matches the correct answer?

- a. 0.8A
- b. 0.5A
- c. 0.6A
- d. 0.7A

ib(R2) - (ia-ib)(R1) = 0
[this if the formula I used, but I got it wrong
not sure is it my careless mistake or the formula wrong]

find ib, with ia given in the diagram, and R1 and R2 in the question

What's the equivalent resistance seen by V_{S1} in the following circuit? (Hint: label different node with different color)



Given $R_1 = 1\ \Omega$, $R_2 = 1\ \Omega$, $R_3 = 1\ \Omega$, $R_4 = 1\ \Omega$, $R_5 = 2\ \Omega$

Which among the following values most closely matches the correct answer?

- a. $1.3\ \Omega$
- b. $2.6\ \Omega$
- c. $3.6\ \Omega$
- d. $1.6\ \Omega$

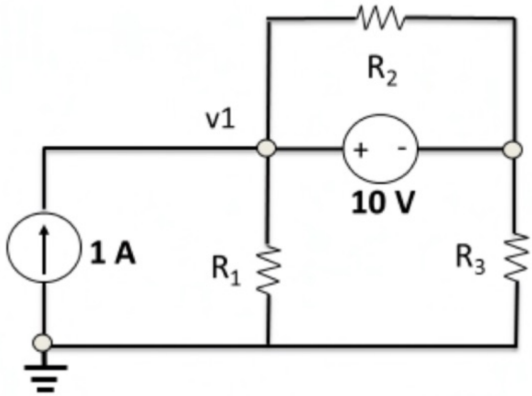
$$R_T = (R_3 \parallel R_4 + R_5) \parallel R_2 + R_1$$

$$= 1.714\ \Omega$$

Question 1

In the circuit below, what is the node voltage v1?

Given $R_1 = R_2 = R_3 = 110\ \Omega$



Selected Answer: 60.0 V

Answers:

- 65.0 V
- 30.0 V
- 35.0 V
- 60.0 V

$R_2 i_1 + 10 = 0 \rightarrow i_1 = \frac{1}{11}$

$-10 + R_3 i_2 + R_1(i_2 - 1) = 0$

$-10 + i_2(R_3 + R_1) - R_1 = 0 \rightarrow i_2 = \frac{6}{11}$

since node on R_3 = node on R_1,

$i_2 R_3 = V_1$

$V_1 = \frac{6}{11}(110)$

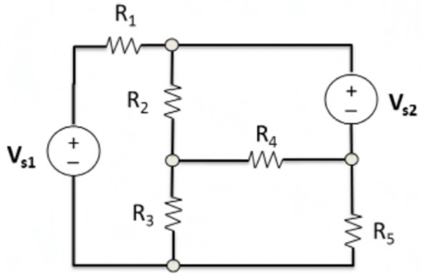
$= 60$

Question 2

20 ou

What's the equivalent resistance seen by R_4 in the following circuit? (Hint: short circuit V_{S1} and V_{S2})

Given $R_1 = R_2 = R_3 = R_4 = R_5 = 13\ \Omega$



Selected Answer: 7.8 Ω

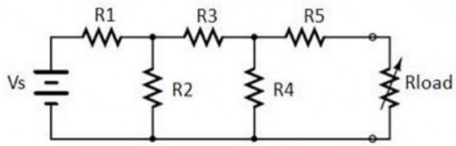
Answers:
- 6.8 Ω
- 7.8 Ω
- 9.8 Ω
- 8.8 Ω

$R_4 = [(R_1 \parallel R_5) + R_2] \parallel R_3$

$= 7.8\,\Omega$

Question 3

Referring to the following circuit



and knowing that

Vs = 10 [V]
R1 = 10.1 [Ohms]
R2 = 9.5 [Ohms]
R3 = 2.3 [Ohms]
R4 = 3.3 [Ohms]
R5 = 5.5 [Ohms]

determine the value of Rload which ensures maximum power transfer.

Allowing for some numerical approximation, which among the following values most closely matches the correct answer?

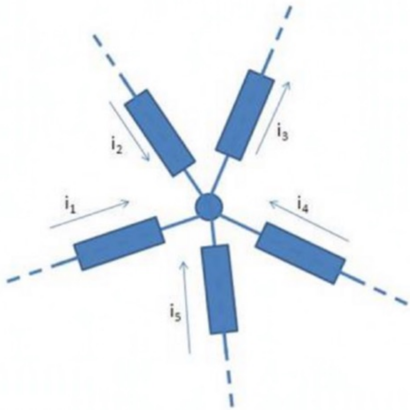
Selected Answer:	✔ Rload = 7.7624 [Ohms]
Answers:	Rload = 15.5248 [Ohms]
	Rload = -2.2376 [Ohms]
	✔ Rload = 7.7624 [Ohms]
	Rload = 30.7 [Ohms]

$R_T = [(R_1 \| R_2) + R_3] \| R_4 + R_5$

$= 7.7624\,\Omega$

Question 4

Referring to the following circuit



and knowing that

I1 = 9.1 [A]
I2 = -2.4 [A]
I3 = -1.9 [A]
I4 = -11.9 [A]

determine the value of I5.

Allowing for some numerical approximation, which among the following values most closely matches the correct answer?

Selected Answer: I5 = 3.3 A

Answers:
- I5 = -3.3 A
- I5 = -1.3 A
- I5 = 0.3 A
- I5 = 3.3 A

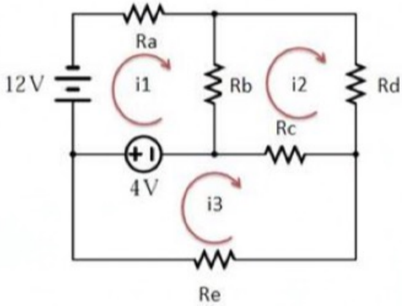
$i_1 + i_2 + i_4 + i_5 = i_3$

$i_5 = i_3 - i_1 - i_2 - i_4$

$= 3.3A$

Question 5

The mesh-current method, applied to the following circuit



will lead to a 3x3 system of equations such as

$$\begin{bmatrix} R_{11} & R_{12} & R_{13} \\ R_{21} & R_{22} & R_{23} \\ R_{31} & R_{32} & R_{33} \end{bmatrix} \cdot \begin{bmatrix} i_1 \\ i_2 \\ i_3 \end{bmatrix} = \begin{bmatrix} -8V \\ 0V \\ -4V \end{bmatrix}$$

Allowing for some numerical approximation and knowing

Ra = 3.1 [Ohms]
Rb = 4.5 [Ohms]
Rc = 20.2 [Ohms]
Rd = 20.3 [Ohms]
Re = 15.5 [Ohms]

which among the following matrices best represents the resistance matrix [Rij] in the equation above?

Selected Answer:

$$\begin{bmatrix} 7.6 & -4.5 & 0 \\ -4.5 & 45 & -20.2 \\ 0 & -20.2 & 35.7 \end{bmatrix}$$

Answers:

$$\begin{bmatrix} 7.6 & 0 & 0 \\ 0 & 45 & 0 \\ 0 & 0 & 35.7 \end{bmatrix}$$

$$\begin{bmatrix} 7.6 & -4.5 & -20.2 \\ 0 & 45 & 40.6 \\ 0 & 0 & 35.7 \end{bmatrix}$$

$$\begin{bmatrix} 3.1 & 4.5 & 20.2 \\ 4.5 & 20.3 & 15.5 \\ 20.2 & 15.5 & 18.6 \end{bmatrix}$$

$$\begin{bmatrix} 7.6 & -4.5 & 0 \\ -4.5 & 45 & -20.2 \\ 0 & -20.2 & 35.7 \end{bmatrix}$$

$12V + i_1 Ra + (i_1 - i_2) Rb - 4V = 0$

$i_1 (Ra + Rb) - Rb i_2 = -8V$

$(i_2 - i_1) Rb + i_2 Rd + (i_2 - i_3) Rc = 0$

$-Rb i_1 + i_2 (Rb + Rd + Rc) - Rc i_3 = 0$

$4V + (i_3 - i_2) Rc + i_3 Re = 0$

$-Rc i_2 + i_3 (Rc + Re) = -4V$