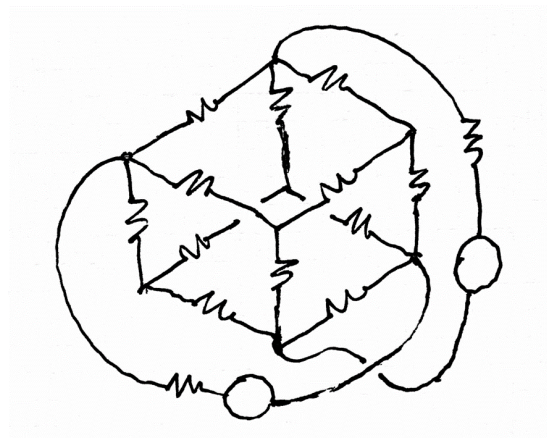


1. (7 points)

In the circuit of the figure, count the number of true nodes, b-nodes, and branches and report the values in the fields below.

Figure:



Number of true nodes: ____

Number of binary nodes: ____

Number of branches: ____

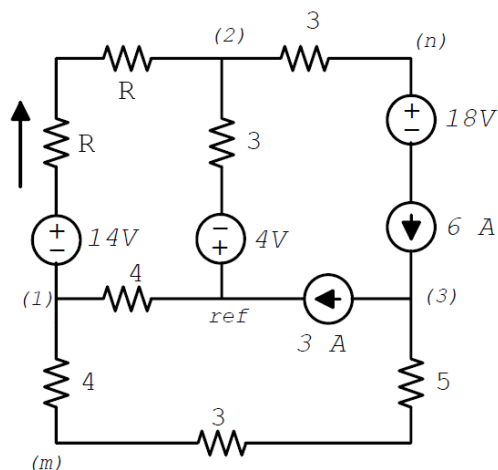
Correct Answers:

- 8
- 2
- 14

2. (7 points)

In the figure, the up going current on the top left branch is $\frac{48}{17}$ amps. Compute the value of each of the resistors R in ohms. Note: The numbers near the resistors are their resistances, given in ohms.

Figure:



$R = ______ \Omega$

Correct Answers:

- 5

3. (7 points)

Which one of these options represents the unit for voltages?

- ?
- joules per second
- joules per ampere
- joules per coulomb
- coulombs per second

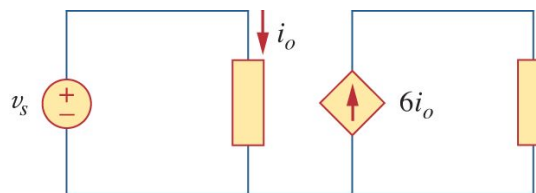
Correct Answers:

- joules per coulomb

4. (7 points)

The dependent source in the figure is a (choose the right one)

Figure:



- ?
- Voltage-controlled current source
- Voltage-controlled voltage source
- Current-controlled current source
- Current-controlled voltage source

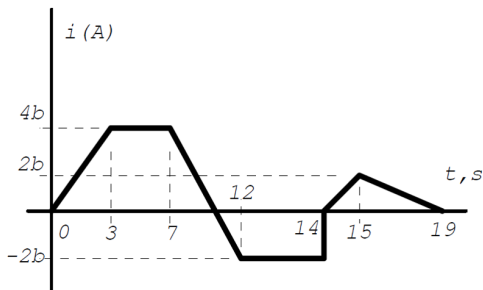
Correct Answers:

- Current-controlled current source

5. (7 points)

The current in the figure flows through a resistor of unknown value R ohms. The value $b = 2$. From $t = 0$ up to $t = 19$ the resistor absorbed a total energy of 5504 J . What is the value, in ohms, of the resistor R ?

Figure:



$R = \underline{\hspace{1cm}} \Omega$

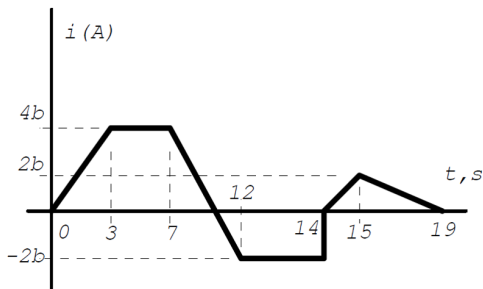
Correct Answers:

- 12

6. (7 points)

The current in the figure flows through a capacitor of unknown value C farads. The value $b = 15$. At $t = 19$ sec, the voltage across the capacitor is $\frac{420}{9}$ volts. What is the value, in farads, of the capacitor, C ? The capacitor was discharged at t equal zero.

Figure:



$\underline{\hspace{1cm}} \text{ F}$

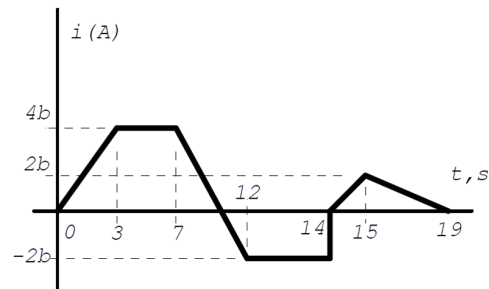
Correct Answers:

- 9

7. (7 points)

The current in the figure flows through an inductor of unknown value L henrys. The value $b = 13$. At $t = 10$ s, the voltage across the inductor is -15.6 volts. What is the energy stored in the inductor at that time W_L , in joules?

Figure:



$W_L = \underline{\hspace{1cm}} \text{ J}$

Correct Answers:

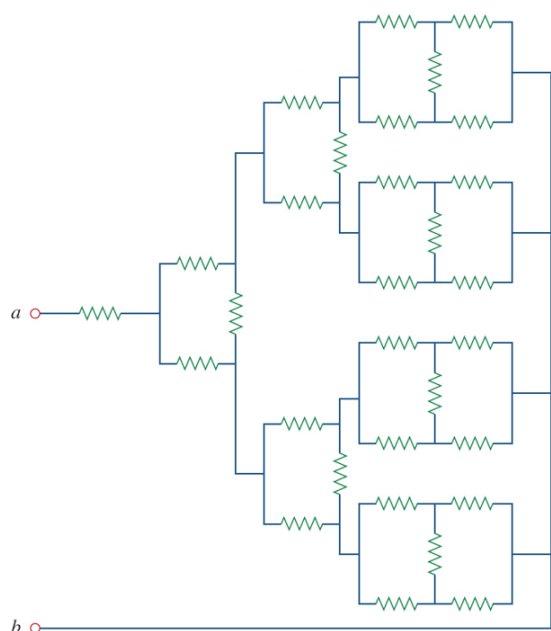
- 13.52

8. (7 points)

What is the total equivalent resistance R_{ab} , in ohms, between terminals 'a' and 'b' of the group in the figure. All the resistors in that figure have the same value 4 ohms.

Note: You don't need a calculator for this, do you?

Figure:



$$R = ___ \Omega$$

Correct Answers:

- 8

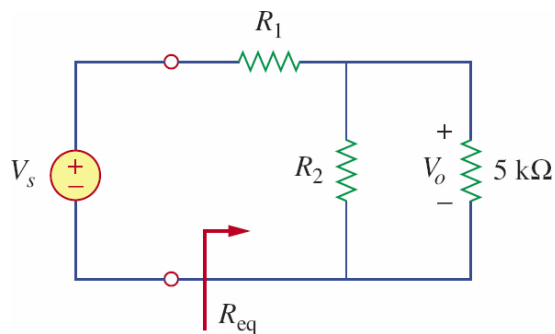
9. (7 points)

We need to design the circuit below to meet two criteria:

- The ratio $\frac{V_o}{V_s} = \frac{40}{170}$
- The total resistance, R_{eq} , seen by the source is $\frac{170}{13}$ kilo ohms

What are the values of R_1 and R_2 , in kilo ohms?

Figure:



$$R_1 = ___ k\Omega$$

$$R_2 = ___ k\Omega$$

Correct Answers:

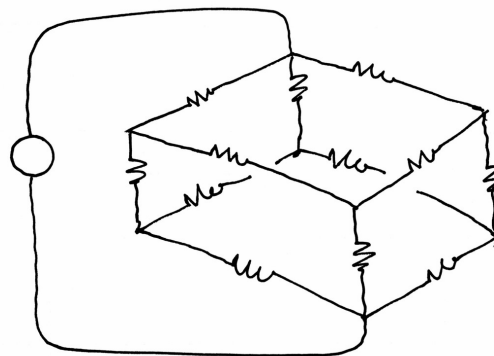
- 10
- 8

10. (7 points)

In the figure, all resistors have the same value, **3 ohms**. What is the equivalent resistance seen by the source, in ohms?

Note: Yes, it is a cube of resistors.

Figure:



$$R_{eq} = ___ \Omega$$

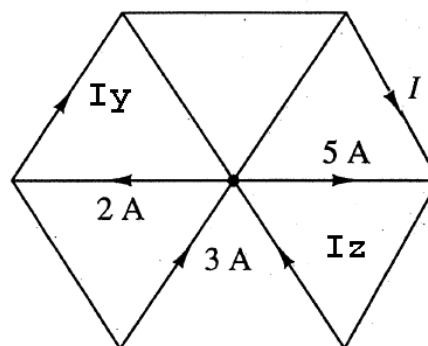
Correct Answers:

- 2.5

11. (7 points)

In the figure, in a single operation and using a single Gaussian surface, find the value of the current I , in amps. The value of the current I_y is **2 amps**, and I_z is **9 amps**.

Figure:



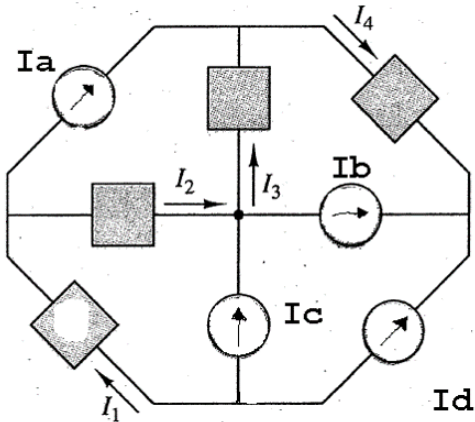
$$I = ___ A$$

Correct Answers:

12. (7 points)

In the figure, the square boxes represent a generic circuit element. Apply KCL to find I_1 , I_2 , I_3 and I_4 , in amps. The values of the current source currents are $I_a = 12$ amps, $I_b = 17$ amps, $I_c = 2$ amps and $I_d = 8$ amps.

Figure:



$I_1 = \underline{\hspace{1cm}} A$

$I_2 = \underline{\hspace{1cm}} A$

$I_3 = \underline{\hspace{1cm}} A$

$I_4 = \underline{\hspace{1cm}} A$

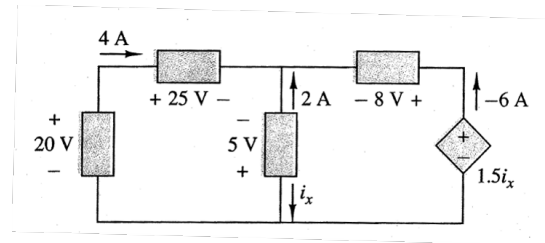
Correct Answers:

- -10
- -22
- -37
- -25

13. (7 points)

Four elements (blocks) and a dependent source form the circuit in the figure. Voltage across and current through each element is indicated. However, one (and only one) voltage (or current) is written incorrectly. Identify what value is wrong, and enter the correct value.

Figure:



The incorrect value is $\underline{\hspace{1cm}}$ V or A

The correct voltage should be $\underline{\hspace{1cm}}$ V or A

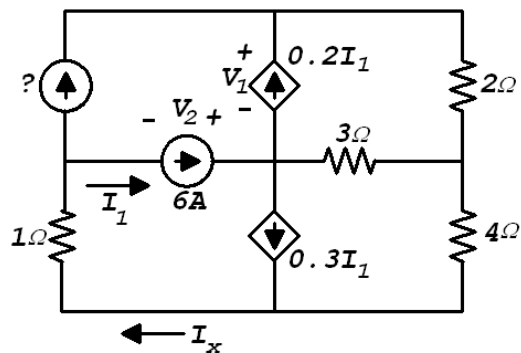
Correct Answers:

- 8
- 2

14. (7 points)

In the figure, $I_x = 23$ amps, find voltages V_1 and V_2

Figure:



$V_1 = \underline{\hspace{1cm}} V$

$V_2 = \underline{\hspace{1cm}} V$

Correct Answers:

- 27.4
- 116.8