Answer on Question#52399 - Physics - Electric Circuits

Two resistances $R_1 = 2\Omega$ and $R_2 = 3\Omega$ are in parallel. The combination is in series with $R_3 = 15\Omega$ resistance and a power supply of voltage V. There is a current of $I_1 = 3\text{A}$ through the 2Ω resistance. What are the values of the current I delivered by, and the voltage V across the power supply?

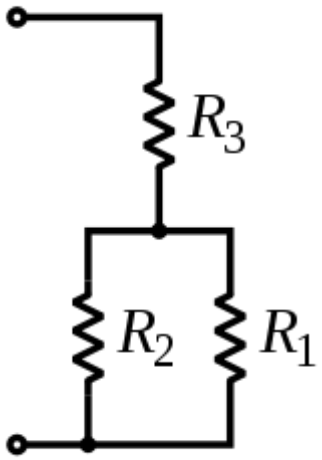
3A and 10.5V

4A and 9V

4A and 12V

12A and 18V

Solution:



The voltage at R_1 is given by

$$V_1 = I_1 R_1 = 3\text{ A} \cdot 2\Omega = 6\text{V}$$

The total resistance of parallel connection is given by

$$R_{\parallel} = \frac{R_1 R_2}{R_1 + R_2} = \frac{2\Omega \cdot 3\Omega}{2\Omega + 3\Omega} = \frac{6}{5}\Omega$$

Therefore, the current I delivered across the power supply is

$$I = \frac{V_1}{R_{\parallel}} = \frac{6\text{V}}{\frac{6}{5}\Omega} = 5\text{A}$$

The total resistance of the circuit is

$$R_{total} = R_3 + R_{\parallel} = 15\Omega + \frac{6}{5}\Omega = 16.2\Omega$$

Therefore, the voltage across the power supply is

$$V = I \cdot R_{total} = 5\ \text{A} \cdot 16.2\ \Omega = 81\ \text{V}$$

None of the variants above is correct.

Answer: 5 A and 81 V.