

Answer on Question #46028 – Physics – Electromagnetism

Question.

A 2Ω and a 3Ω resistors in parallel are connected in series to a 4Ω resistor. The combination is then connected across a $12V$ battery having internal resistance of 1Ω as shown in the figure. What is the equivalent resistance of the circuit?

Given:

$$R_1 = 2 \Omega$$

$$R_2 = 3 \Omega$$

$$R_3 = 4 \Omega$$

$$\varepsilon = 12 V$$

$$r = 1 \Omega$$

Find:

$$R = ?$$

Solution.

Define the resistance R_1 and R_2 :

$$\frac{1}{R_{1,2}} = \frac{1}{R_1} + \frac{1}{R_2} \rightarrow R_{1,2} = \frac{R_1 R_2}{R_1 + R_2}$$

And now let define equivalent resistance of the circuit:

$$R = R_{1,2} + R_3 + r = \frac{R_1 R_2}{R_1 + R_2} + R_3 + r$$

Calculate:

$$R = 1.2 + 4 + 1 = 6.2 \Omega$$

Answer.

$$R = \frac{R_1 R_2}{R_1 + R_2} + R_3 + r = 6.2 \Omega$$