General Physics 2 | 3rd Quarter

WW3: Series & Parallel Connection

February 3 2022

A. Series Connection

Given:

- $V_T = 12V$
- $R_1 = 5\Omega$
- $R_2 = 10\Omega$
- $R_3 = 4\Omega$
- $R_4 = 2\Omega$

Find:

- R_T
- I_T
- $I_1, \cdots, I_4$
- $V_1, \cdots, V_4$

Solution:

- $R_T = 5\Omega + 10\Omega + 4\Omega + 2\Omega$
- $R_T = 21\Omega$

- $I_T = \frac{12V}{21\Omega}$
- $I_T = \frac{4}{7}A$

- $I_1, \cdots, I_4 = \frac{4}{7}A$

- $V_1 = \frac{4}{7}A \cdot 5\Omega = \frac{20}{7}V$
- $V_2 = \frac{4}{7}A \cdot 10\Omega = \frac{40}{7}V$
- $V_3 = \frac{4}{7}A \cdot 4\Omega = \frac{16}{7}V$
- $V_4 = \frac{4}{7}A \cdot 2\Omega = \frac{8}{7}V$

B. Parallel Connection

Given:

- $V_T = 24\,V$
- $R_1 = 3\,\Omega$
- $R_2 = 5\,\Omega$
- $R_3 = 8\,\Omega$
- $R_4 = 4\,\Omega$

Find:

- R_T
- I_T
- $I_1, \cdots, I_4$
- $V_1, \cdots, V_4$

Solution:

- $\frac{1}{R_T} = \frac{1}{3\,\Omega} + \frac{1}{5\,\Omega} + \frac{1}{8\,\Omega} + \frac{1}{4\,\Omega} = \frac{109}{120}\,\Omega$
- $R_T = \frac{120}{109}\,\Omega$
- $I_T = \frac{24\,V}{\frac{120}{109}\,\Omega} = 24\,V \cdot \frac{109}{120}\,\Omega$
- $I_T = \frac{109}{5}\,A$
- $I_1 = \frac{24\,V}{3\,\Omega} = 8\,A$
- $I_2 = \frac{24\,V}{5\,\Omega} = \frac{24}{5}\,A$
- $I_3 = \frac{24\,V}{8\,\Omega} = 3\,A$
- $I_4 = \frac{24\,V}{4\,\Omega} = 4\,A$
- $V_1, \cdots, V_4 = 24\,V$