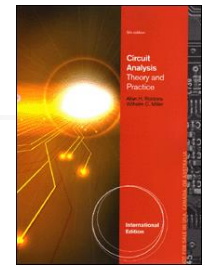


Chapter 05

Series Circuits

Series Circuits

- Current is similar to water flowing through a pipe
  - **Current leaving** the element must be **the same** as the **current entering** the element
- **Same current passes through every element of a series circuit**

Kirchhoff's Voltage Law (KVL)

- The **algebraic sum** of the voltage that rises and drops around a **closed loop** is equal to **zero**

  $\sum E = 0$ or $E_T - V_1 - V_2 - V_3 - \cdots - V_n = 0$

- Another way of stating KVL is:
  - Summation of **voltage rises** is **equal to** the summation of **voltage drops** around a **closed loop**

    $E_T = V_1 + V_2 + V_3 + \cdots + V_n$

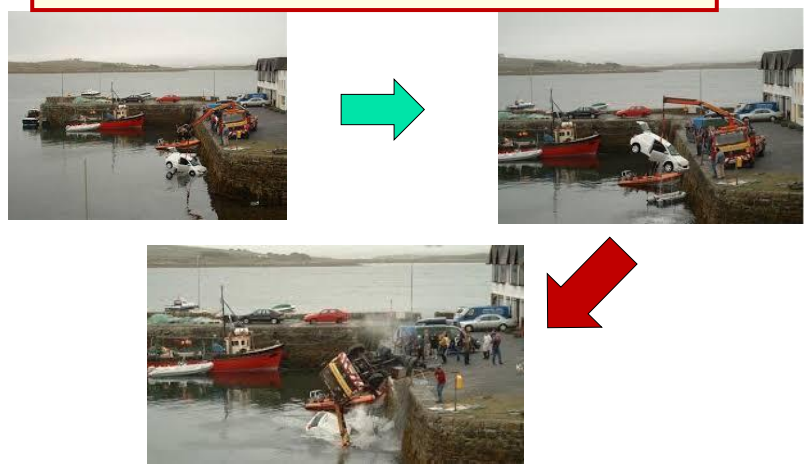
Resistors in Series

- For a circuit with 3 resistors: $E = V_1 + V_2 + V_3$

  $R_T = R_1 + R_2 + R_3$

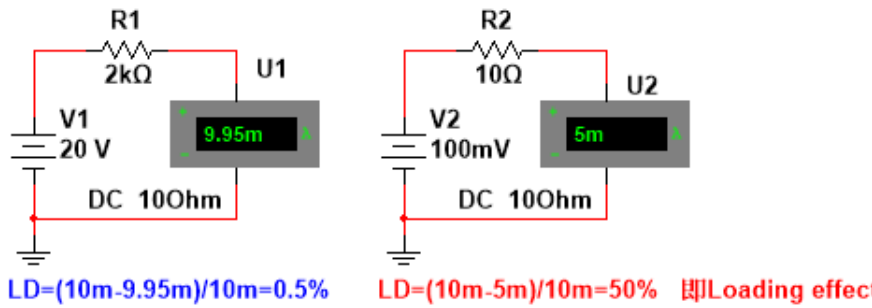
Loading Effects

$$\text{loading effect} = \frac{\text{theoretical value} - \text{measured value}}{\text{theoretical value}} \times 100\%$$



Source: from google search websites

Multisim



LD=(10m-9.95m)/10m=0.5%

LD=(10m-5m)/10m=50% 即Loading effect

Kernel abilities

1. What is total resistance R_t of resistors $R_1 \sim R_n$ in series? Please give an example.
2. What is KVL? Please give an example.
3. What is voltage divider for a series circuit ? Please give an example. (larger resistance larger voltage)
4. What is loading effect of measuring current? Please give an example. (depending on the internal resistance of a current meter)