EEE104
Circuit Analysis I

Ankara University

Faculty of Engineering

Electrical and Electronics Engineering Department

Resistive Circuits

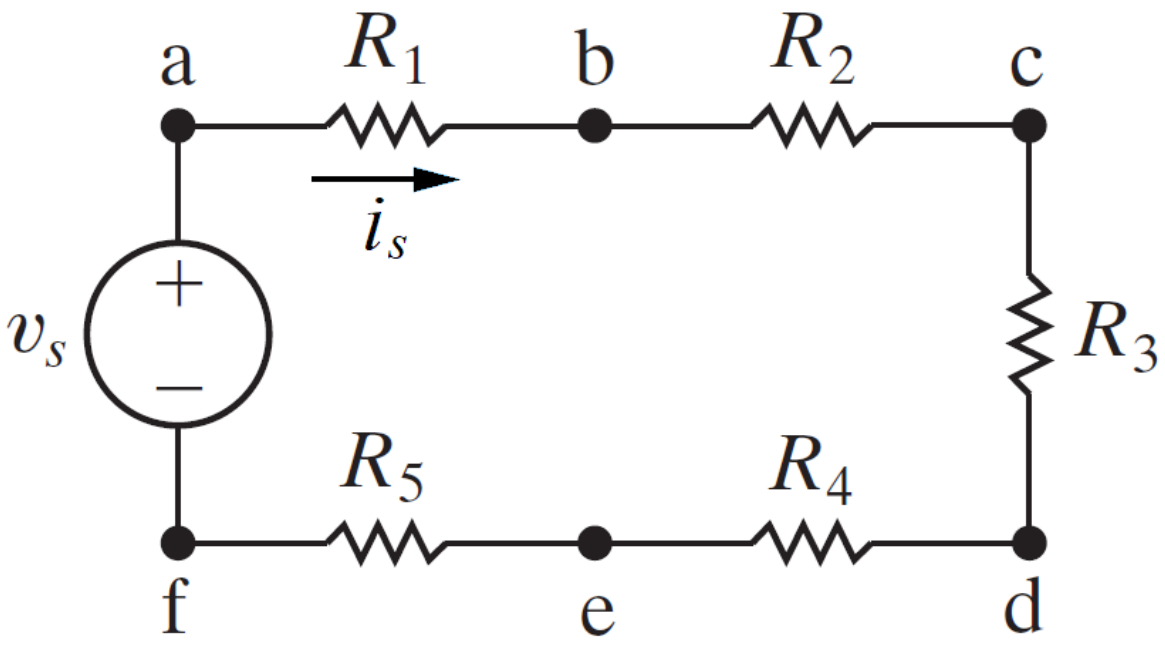
EEE104 Circuit Analysis I

Lecture 4

Agenda

- Resistors in Series
- Resistors in Parallel
- Voltage Divider
- Current Divider

- Resistors in Series



$v_s = i_s R_1 + i_s R_2 + i_s R_3 + i_s R_4 + i_s R_5$

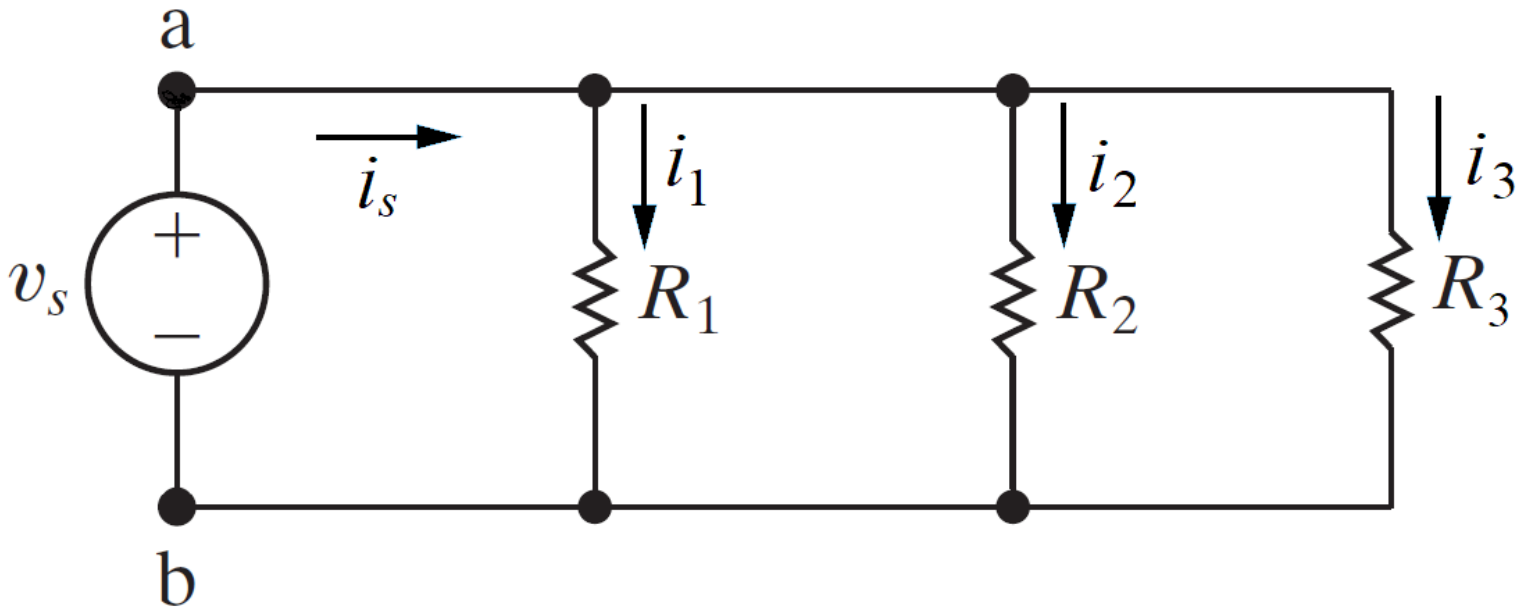
$v_s = i_s (R_1 + R_2 + R_3 + R_4 + R_5)$

$v_s = i_s R_{\text{eq}}$

$R_{\text{eq}} = R_1 + R_2 + R_3 + R_4 + R_5$: Equivalent Resistance of Series Resistances

IN GENERAL: $R_{eq} = \sum_i R_i$

- Resistors in Parallel



$$i_s = \frac{v_s}{R_1} + \frac{v_s}{R_2} + \frac{v_s}{R_3}$$

$$i_s = v_s\left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}\right)$$

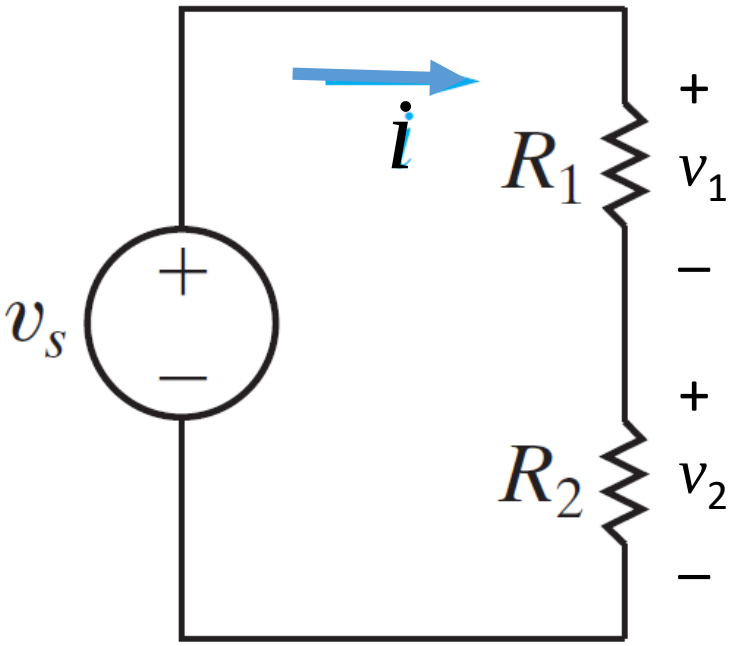
$$i_s = \frac{v_s}{R_{eq}}$$

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

IN GENERAL:

$$\frac{1}{R_{eq}} = \sum_i \frac{1}{R_i}$$

- Voltage Divider



$$v_s = iR_1 + iR_2$$
$$v_s = i(R_1 + R_2)$$

$$i = \frac{v_s}{R_1 + R_2}$$

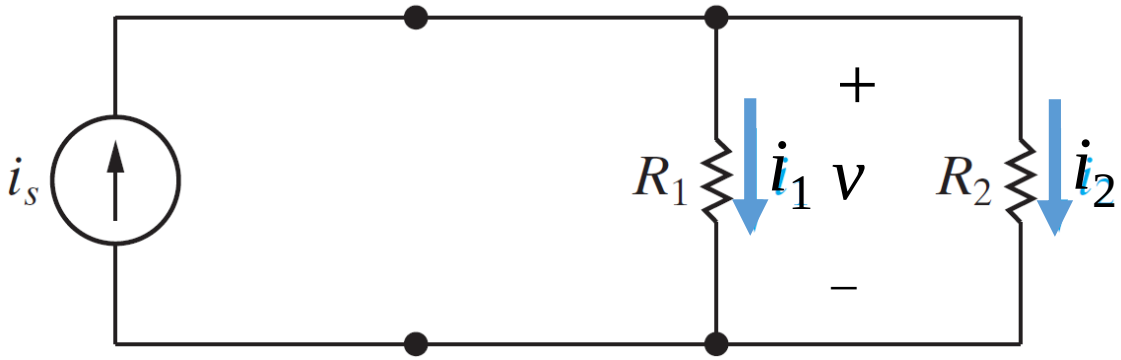
$$v_1 = iR_1 = v_s \frac{R_1}{R_1 + R_2}$$

$$v_2 = iR_2 = v_s \frac{R_2}{R_1 + R_2}$$

IN GENERAL:

$$v_i = v_s \frac{R_i}{\sum_k R_k}$$

- Current Divider



$$i_s = i_1 + i_2 = \frac{v}{R_1} + \frac{v}{R_2}$$

$$i_s = v(\frac{1}{R_1} + \frac{1}{R_2})$$

$$v = i_1 R_1 = i_2 R_2 = \frac{R_1 R_2}{R_1 + R_2} i_s$$

$$i_1 = \frac{R_2}{R_1 + R_2} i_s$$

$$i_2 = \frac{R_1}{R_1 + R_2} i_s$$

Reference

- Electric Circuits, Tenth Edition, James W. Nilsson, Susan A. Riedel Pearson, 2015