EEE201
Circuit Analysis II

Ankara University

Faculty of Engineering

Electrical and Electronics Engineering Department

Sinusoidal Steady-State Analysis

EEE201 Circuit Analysis II

Lecture 3

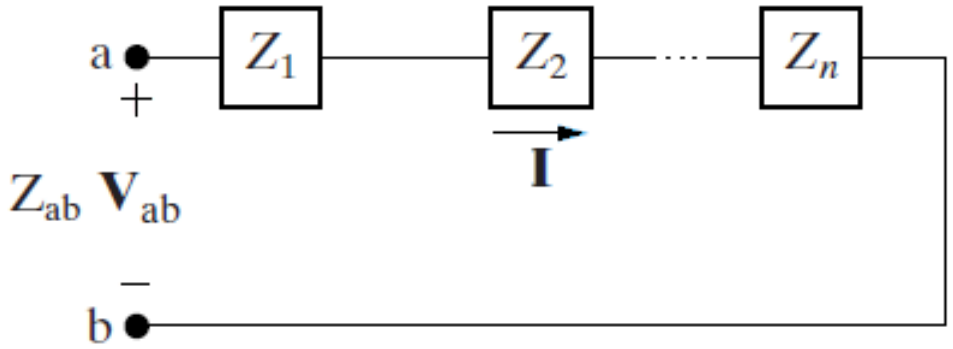
Agenda

- Series, Parallel, and Δ-to-Y Simplifications
- Source Transformations
- Thevenin-Norton Equivalent Circuits

Series, Parallel, and Δ-to-Y Simplifications

Combining impedances in series:

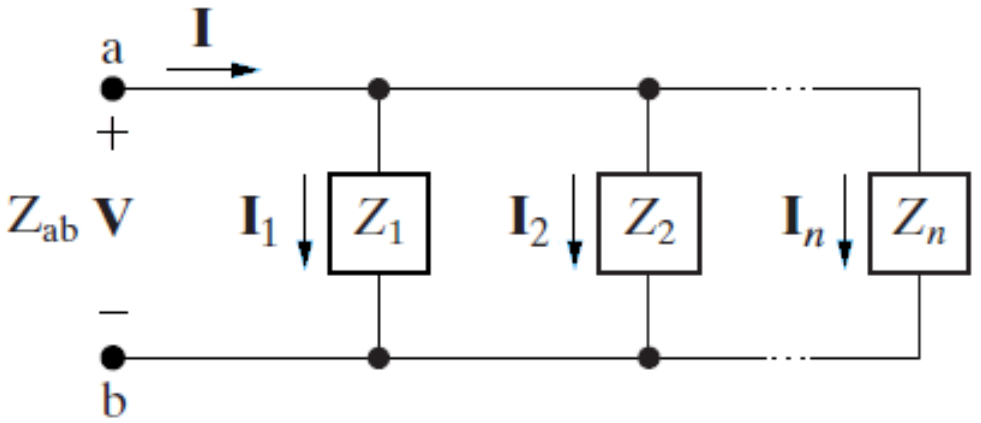
$$Z_{ab} = Z_1 + Z_2 + \ \ldots + Z_n$$



Series, Parallel, and Δ-to-Y Simplifications

Combining impedances in parallel:

$$\frac{1}{Z_{ab}} = \frac{1}{Z_1} + \frac{1}{Z_2} + \ \ldots + \frac{1}{Z_n}$$



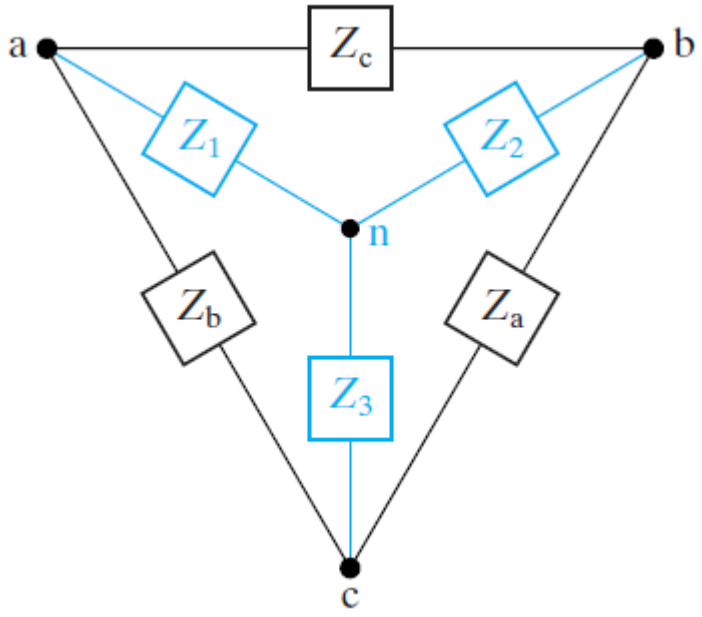
Series, Parallel, and Δ-to-Y Simplifications

Δ-to-Y transformation:

$$Z_1 = \frac{Z_b Z_c}{Z_a + Z_b + Z_c}$$

$$Z_2 = \frac{Z_c Z_a}{Z_a + Z_b + Z_c}$$

$$Z_3 = \frac{Z_a Z_b}{Z_a + Z_b + Z_c}$$



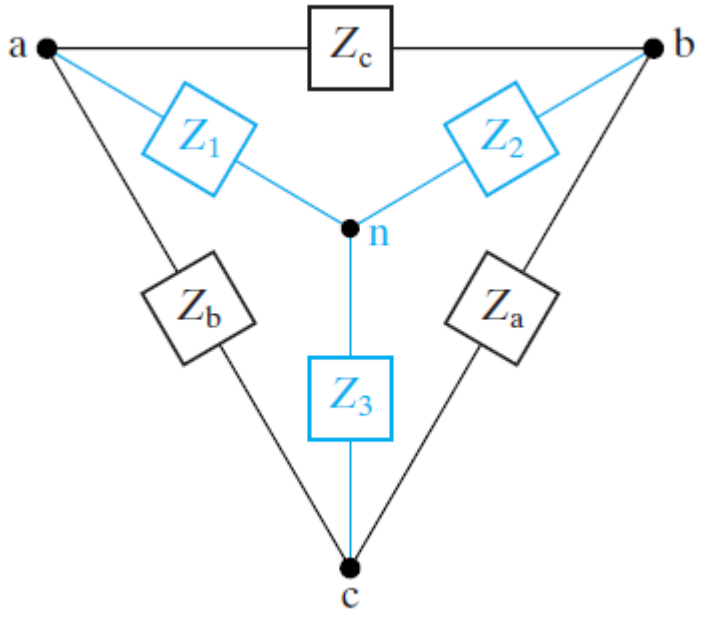
Series, Parallel, and Δ-to-Y Simplifications

Y-to-Δ transformation:

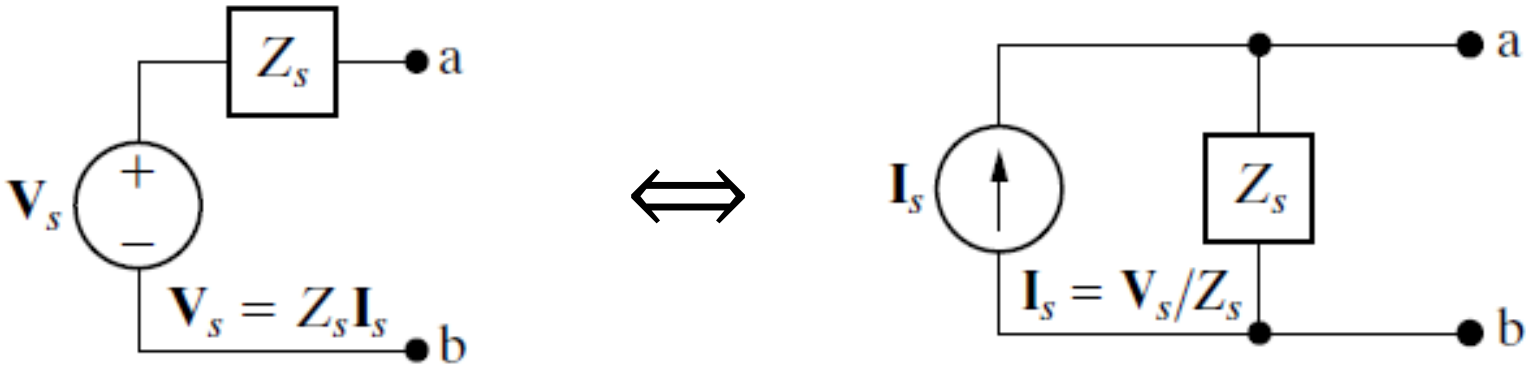
$$Z_a = \frac{Z_1Z_2 + Z_2Z_3 + Z_3Z_1}{Z_1}$$

$$Z_b = \frac{Z_1Z_2 + Z_2Z_3 + Z_3Z_1}{Z_2}$$

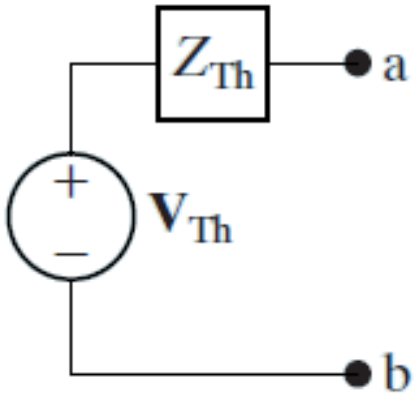
$$Z_c = \frac{Z_1Z_2 + Z_2Z_3 + Z_3Z_1}{Z_3}$$



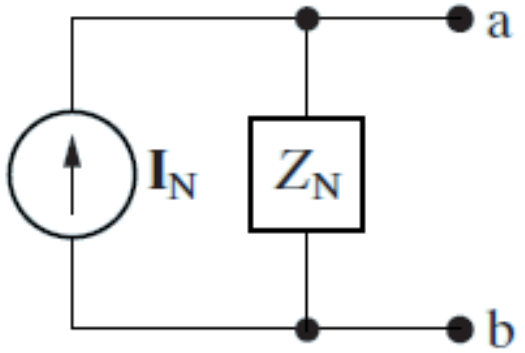
Source Transformations



Thevenin-Norton Equivalent Circuits



Thevenin equivalent circuit



Norton equivalent circuit

Reference

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