EEE201
Circuit Analysis II

Ankara University

Faculty of Engineering

Electrical and Electronics Engineering Department

Sinusoidal Steady-State Analysis

EEE201 Circuit Analysis II

Lecture 4

Agenda

- Linear Transformer
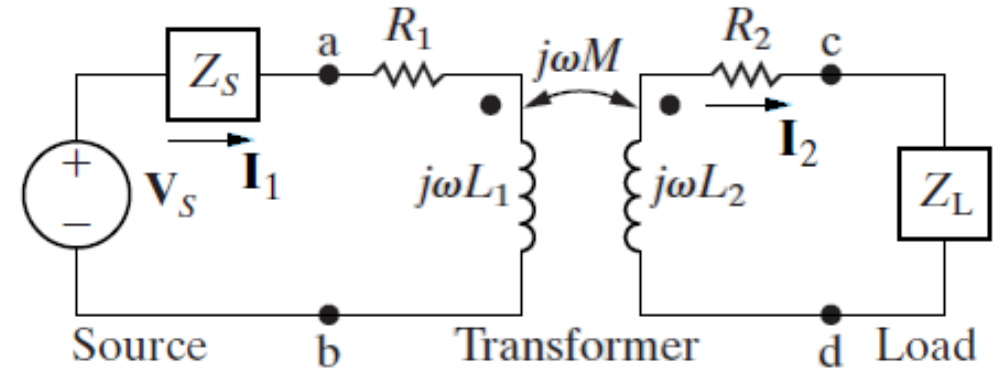- Ideal Transformer

Linear Transformer

R_1: the resistance of the primary winding

R_2: the resistance of the secondary winding

L_1: the self-inductance of the primary winding

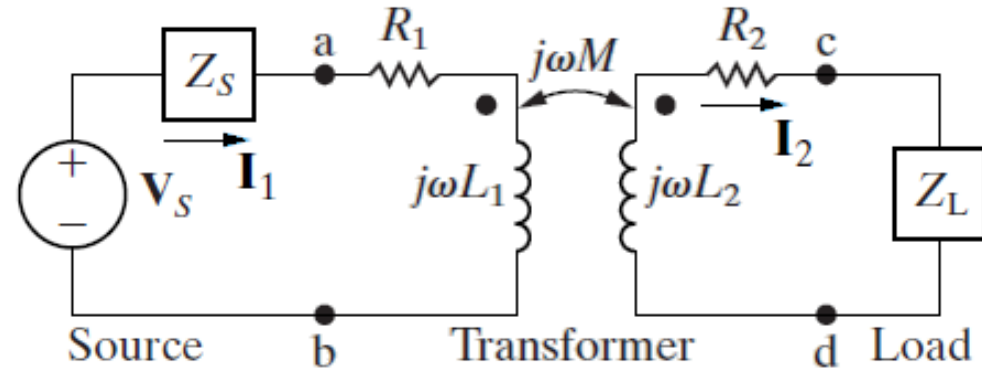L_2: the self-inductance of the secondary winding

M: the mutual inductance

Linear Transformer

$$Z_{11} = Z_s + R_1 + jwL_1$$

$$Z_{22} = R_2 + jwL_2 + Z_L$$

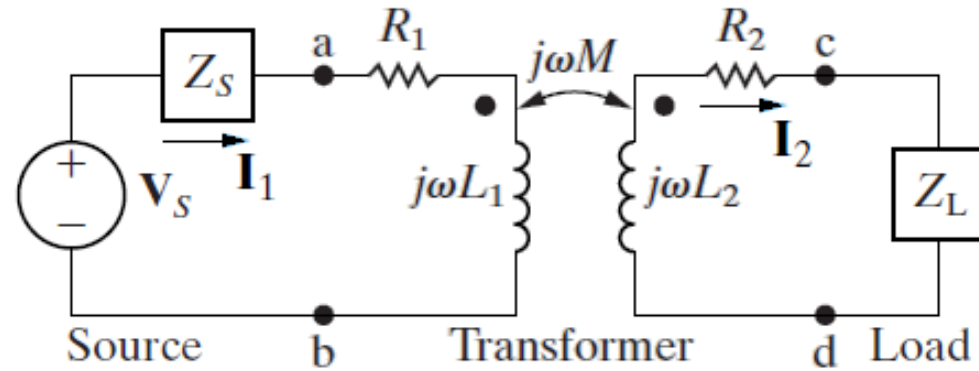$$I_1 = \frac{Z_{22}}{Z_{11}Z_{22} + w^2M^2}V_S$$

$$I_2 = \frac{jwM}{Z_{22}}I_1$$
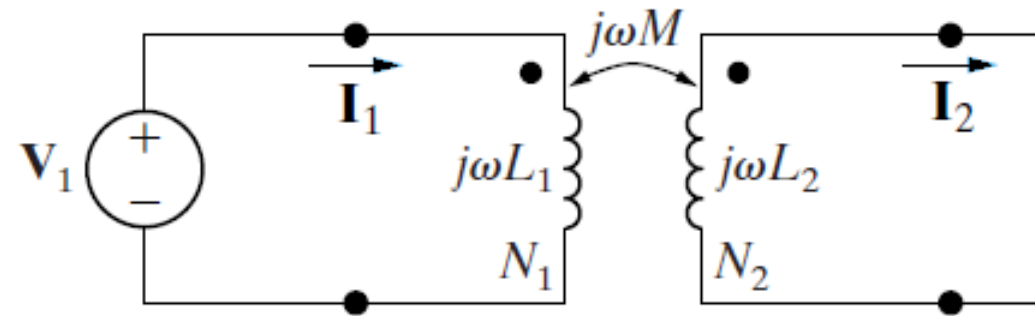
Linear Transformer

$$Z_{ab} = R_1 + jwL_1 + Z_r$$

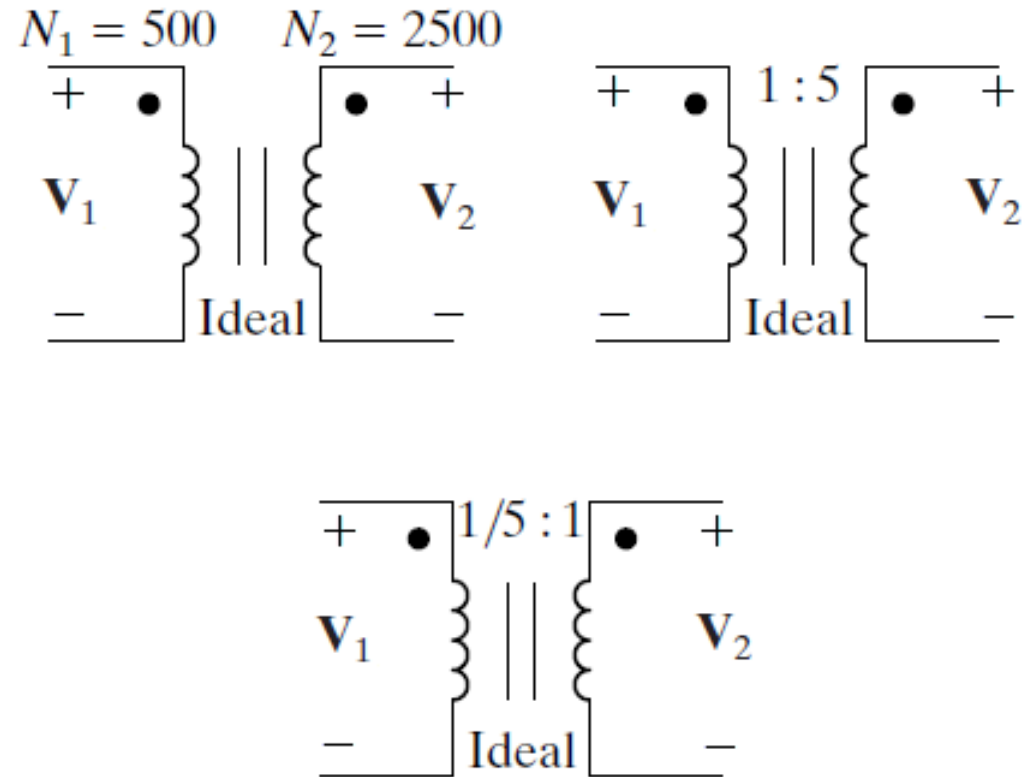$$Z_r = \frac{w^2 M^2}{R_2 + jwL_2 + Z_L}$$ **(Reflected impedance)**

Ideal Transformer

$$\frac{V_1}{N_1} = \frac{V_2}{N_2}$$

$$I_1 N_1 = I_2 N_2$$

Ideal Transformer

Reference

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