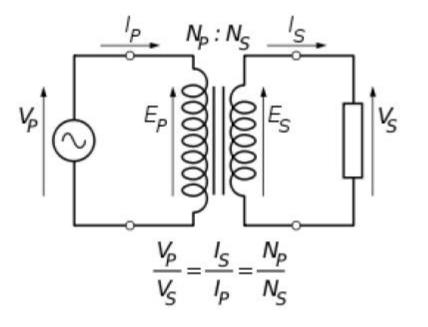Ideal transformer has following characteristics:

☐ Core has no hysteresis or eddy currents.

☐ Magnetizing curve is vertical with no saturation

☐ Leakage flux in the core is 0.

☐ Winding resistance is 0.

$$\frac{V_P}{V_S} = \frac{I_S}{I_P} = \frac{N_P}{N_S}$$

$$P_{in} = V_p I_p \cos \theta_p \qquad \theta_p = \theta_s = \theta \qquad P_{out} = V_s I_s \cos \theta$$

$$S_{in} = V_p I_p \qquad S_{out} = V_s I_s \qquad S_{in} = S_{out}$$

$$Z_p = a^2 \, Z_s$$