Name: _____   UIN: _____   Section: _____   Score: _____

A single-phase 100-kVA, 7200/480-volt, 60-Hz distribution transformer is used as a step-down transformer. The load, which is connected to the 480-volt secondary winding, absorbs 40 MW of active (real) power and absorbs 10 Mvar of reactive power. The load is operated at 465 volts. Use the ideal transformer equations for this problem.

1. What is the primary voltage?

$$V_1 = \frac{N_1}{N_2} V_2 = \frac{7200 \text{ V}}{480 \text{ V}} 465 \text{ V} = 6975 \text{ V}$$

2. What is the real and reactive power supplied to the primary winding?

Conservation of power implies
$P_1 = P_2 = 40 \text{ MW}$
$Q_1 = Q_2 = 10 \text{ Mvar}$

3. What is the load impedance referred to the primary winding?

$$Z_2 = \frac{|V|^2}{S^*} = \frac{(465 \text{ V})^2}{(40 + j10 \text{ MVA})^*} = 5.08 + j1.27 \text{ m}\Omega$$

Refer to primary:

$$Z_1 = Z_2 \left(\frac{N_1}{N_2}\right)^2 = (5.08 + j1.27 \text{ m}\Omega)\left(\frac{7200}{480}\right)^2 = 1.14 + j0.285 \ \Omega$$