

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 447 volts.

1. What is the primary voltage?

$$V_1 = \frac{N_1}{N_2} V_2 = \frac{7200 \text{ V}}{480 \text{ V}} 447 \text{ V} = 6705 \text{ V}$$

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?

$$Z_2 = \frac{|V|^2}{S^*} = \frac{(447 \text{ V})^2}{(40 + j10 \text{ MVA})^*} = 4.70 + j1.18 \text{ m}\Omega$$

Refer to primary:

$$Z_1 = Z_2 \left(\frac{N_1}{N_2} \right)^2 = (4.70 + j1.18 \text{ m}\Omega) \left(\frac{7200}{480} \right)^2 = 1.058 + j0.264 \text{ }\Omega$$