ECE 3600 homework 8A Non-Ideal transformers

c

1. The parameters of a step-down transformer are shown below.
   The transformer is loaded with $\mathbf{Z_L} := (2.5 + 0.8 \cdot j) \cdot \Omega$ and the secondary voltage is $V_2 := 36 \cdot V$

   $R_m := 2 \cdot k\Omega$ $R_s := 2 \cdot \Omega$ $X_m := 800 \cdot \Omega$ $X_s := 5 \cdot \Omega$ $N := 5$

   a) Draw the model with the load connected. Label parts, voltages and currents as needed for the rest of the problem.

   b) Find the primary, source voltage. Magnitude only. $|\mathbf{V_S}|$ = ?

   c) Find the total complex power supplied the primary, source voltage. $\mathbf{S_S} = P_S + j \cdot Q_S$ = ?

   d) Find the magnitude of the current flowing from the primary, source voltage. $|\mathbf{I_S}|$ = ?

f) The transformer would be fully loaded if $V_S := 208 \cdot V$ and $Z_L := 2 \cdot \Omega$ all real
Find the voltage regulation as defined in your notes. %VR = ?

2. The parameters of a step-down transformer are shown below. The primary voltage is $V_S := 120 \cdot V$
The transformer is loaded with $\mathbf{Z_L} = R_L + jX_L$ and the secondary current is $I_2 := 3.2 \cdot A$

$R_m := 1.5 \cdot k\Omega$ $R_s := 5 \cdot \Omega$ $X_m := 1 \cdot k\Omega$ $X_s := 7 \cdot \Omega$ $N := 4$

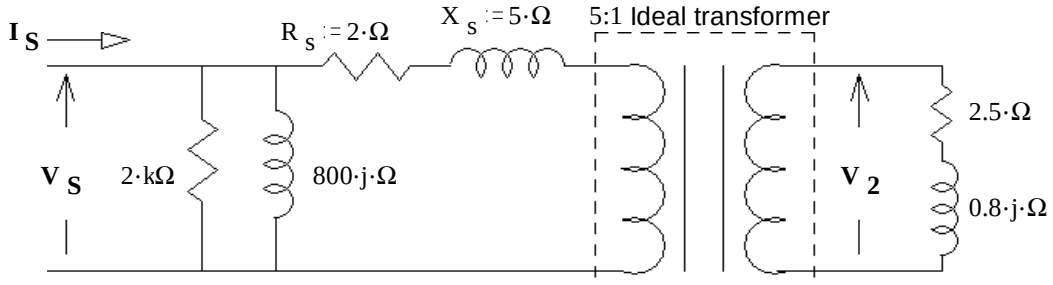
a) The primary, source voltage provides 40 VARs $Q_S := 40 \cdot VAR$ Find X_L
Hint: draw the model with the load.

b) Find R_L

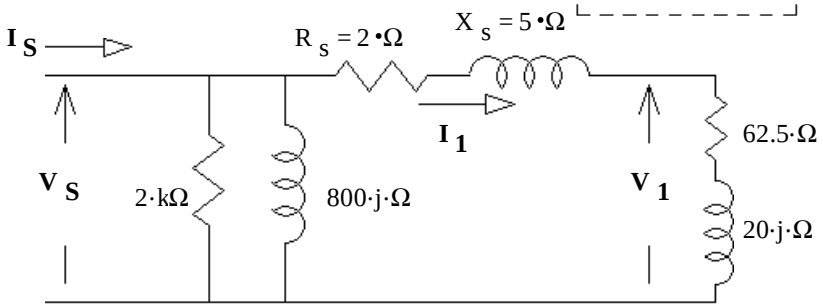
c) Find the efficiency of this transformer.

Answers

1. a)



and/or



b) 189.7·V c) 503.3 + 233.1·j VA d) 2.923·A e) 93.4·% f) 4.48·%

2. a) 2.062·Ω b) 8.723·Ω c) 87.5·%