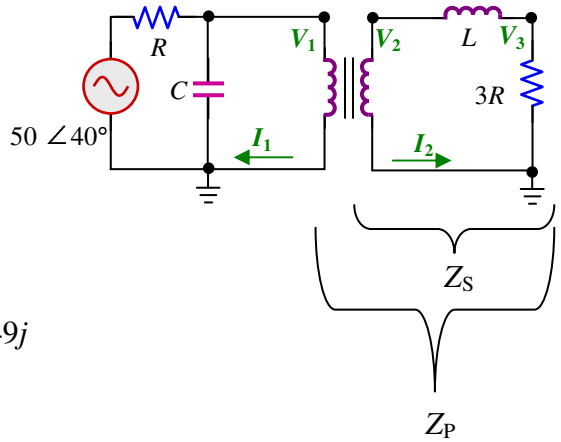
In-Class example problem:



Given: $f = 60$ Hz, $n_p = 48$, $n_s = 80$
$C = 12\ \mu$F, $L = 0.5$ H, $R = 100\ \Omega$

I. $\omega = 2\pi f = 376.991$ rad/s, $N = 1.6666$, $1/N^2 = 0.36$

II. $Z_L = \omega L j = 188.496\ j$ $Z_C = -j/(\omega C) = -221.049j$

III. $Z_S = 3R + Z_L = 300 + 188.496\ j$,

$Z_{TP} = (1/N^2)\ Z_S = 108 + 67.858\ j$

IV. $Z_{tot} = R + (Z_{TP})(Z_C)/(Z_{TP} + Z_C)$ $= 250.212 - 7.98316j$ $= 250.34\ \angle -0.3189$ rad

V. $I_{tot} = V_0/Z_{tot}$ $= 0.14883 + 0.1332j$ $= 0.19973\ \angle 0.7300$ rad

VI. $V_1 = V_0 - I_{tot}\ R$ $= 23.4193 + 18.8197j$ $= 30.0441\ \angle 0.676931$ rad

VII. $I_1 = V_1\ /Z_{TP}$ $= 0.23397 + 0.02725j$ $= 0.23555\ \angle 0.11595$ rad

VIII. $V_2 = NV_1$ $= 39.0322 + 31.3662j$ $= 50.0734\ \angle 0.67693$ rad

$0 - V_2 = Z_S\ I_2$ (uses path from ground, through $3R$, then through L…), so

$I_2 = -V_2/Z_S$ $= (-140.38 - 16.3502\ j\ )$mA $= 141.329\ \angle -3.02564$ rad

IX. $0 - V_3 = 3R\ I_2$, so $V_3 = -3R\ I_2$ $= 42.1141 + 4.90507j$ $= 42.3988\ \angle +0.115948$ rad