ECE 3364 HW 07, Fall 2016 Due 10/25

Problem 1.

A balanced 3-phase system has a Y-connected source (voltage and impedance $\tilde{V}_{a'n} = 1365\angle 0° \quad V_{rms}$, $Z_s = j2$, positive phase sequence) connected to a transmission line (impedance $Z_{line} = 1.5 \ \Omega$) which is connected to an **ideal** step-down three-phase $Y-\Delta$ connected transformer ($N_1 = 4000$, $N_2 = 2000$) whose secondary is connected to a Y-connected load ($Z_{L-Y} = 85.5 + j114 \ \Omega$). Find the phase current in the secondary coil and total power delivered to the 3-phase load.

Problem 2.

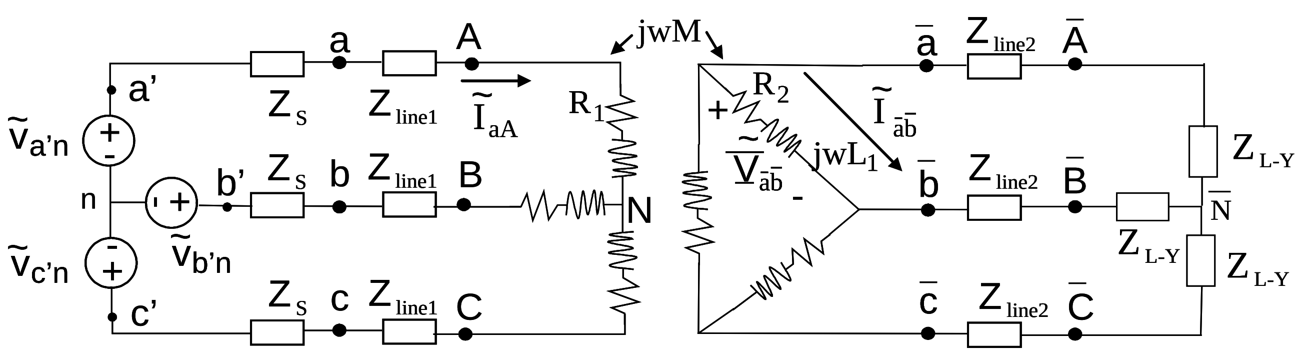
A balanced 3-phase system has a three-phase Y-connected source (voltage and impedance $\tilde{V}_{a'n} = 1365\angle 0° \quad V_{rms}$, $Z_s = j2$, positive phase sequence) connected to a three-phase transmission line (impedance $Z_{line} = 1.5 \ \Omega$) which is then connected to an **ideal** three-phase Y-Y step-down transformer ($N_1 = 4000$). The voltage across the Y-connected load on the secondary side of the transformer ($Z_{L-Y} = 85.5 + j114 \ \Omega$) is $220 \quad V_{rms}$. Find the number of turns N_2 in the secondary windings.

Problem 3.

Consider a balanced 3-phase system with a Y-connected source having internal impedance $Z_s = 4\,\Omega$ connected to a 3-phase transmission line having impedance $Z_{line} = 6 + j8\,\Omega$. The three-phase transmission line is connected to an **ideal** 3-phase transformer whose primary and secondary number of turns are $N_1 = 4000$ and $N_2 = 2000$. The secondary side of the 3-phase transformer is connected to a Y-connected load $Z_{Y-load} = 10 + j4\,\Omega$. Determine which arrangement of the transformer leads would result in the most power delivered to the load ?

(a) $Y-\Delta$ (b) $\Delta-Y$ (c) $\Delta-\Delta$ or $Y-Y$

Problem 4.



Given the balanced 3 phase circuit with a three phase $Y-\Delta$ transformer above:

$\tilde{V}_{a'n} = 1200\angle 0° \quad V_{rms}$ $\quad Z_S = 2 + j2$ $\quad R_1 + j\omega L_1 = 4 + j8$ $\quad R_2 + j\omega L_2 = 6 + j14$

$Z_{line1} = 10 + j5$ $\quad Z_{line2} = 4 + j1$ $\quad Z_{L-Y} = 112 - j16$

$\omega M = 9$

Find $I_{\bar{a}\bar{b}}$, the current in the secondary windings.