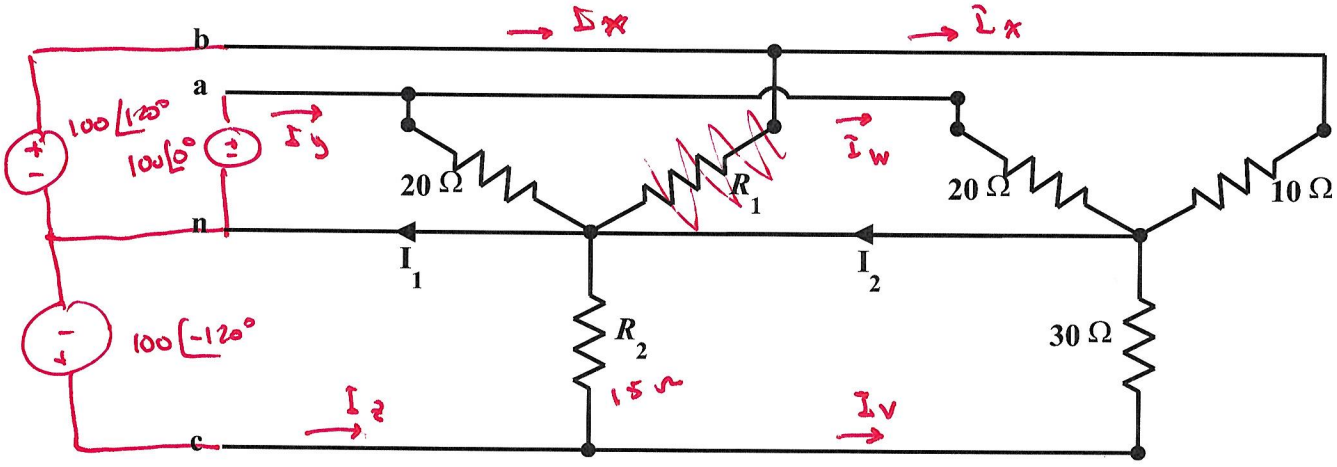
EE 3340

Homework Problem #048

Given $v_\phi = 100$ V (i.e., $\mathbf{V}_{an} = 100\angle 0°$ V, $\mathbf{V}_{bn} = 100\angle 120°$ V and $\mathbf{V}_{cn} = 100\angle -120°$ V) for the load shown below, determine R_1 and R_2 so that the sources see a balanced load. Then, find the values of $\mathbf{I}_1$ and $\mathbf{I}_2$.



$20\Omega \| 20\Omega = 10\Omega$

$\therefore$ Choose R_1 so that $R_1 \| 10\Omega = 10\Omega$

$\Rightarrow R_1 = \infty$ (open circuit)

and Choose R_2 so that $R_2 \| 30\Omega = 10\Omega$

$\Rightarrow \frac{30R_2}{30 + R_2} = 10$

$30R_2 = 300 + 10R_2$

$20R_2 = 300$

$R_2 = 15\Omega$

$\mathbf{I}_x = \frac{100\angle 120°}{10} = 10\angle 120°$ A

$\mathbf{I}_y = \frac{100\angle 0°}{10} = 10\angle 0°$ A

$\mathbf{I}_z = \frac{100\angle -120°}{10} = 10\angle -120°$ A

$\mathbf{I}_w = \frac{1}{2}\mathbf{I}_y = 5\angle 0°$ A

$\mathbf{I}_v = \frac{1}{3}\mathbf{I}_z = \frac{10}{3}\angle -120°$ A

$\mathbf{I}_2 = \mathbf{I}_x + \mathbf{I}_w + \mathbf{I}_v \approx 6.009\angle 106.1°$ A

$\mathbf{I}_1 = \frac{1}{2}\mathbf{I}_y + \mathbf{I}_2 + \frac{2}{3}\mathbf{I}_z = 0$ (as expected, since the load is balanced w.r.t. the source)