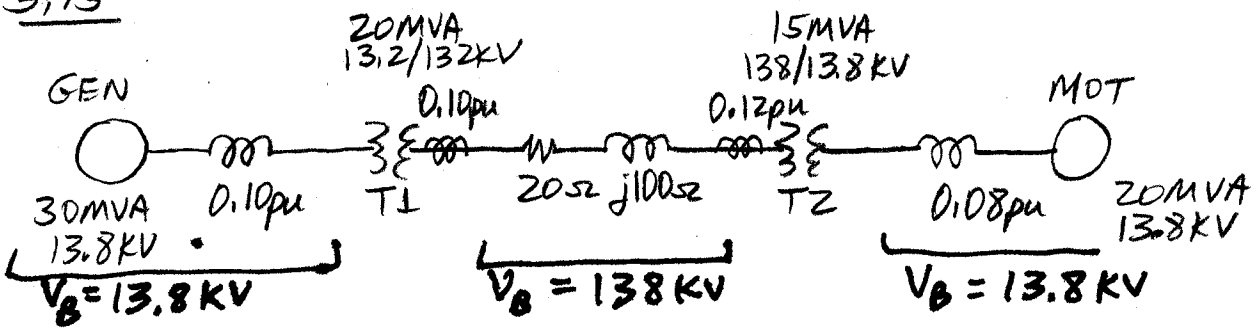
5.15



Step 1 – If $S_B = 30MVA$ in the generator section, then $S_B = 30MVA$ everywhere

Step 2 – If $V_{BLL} = 13.8kV$ in the generator section, we then use Actual line-to-line turns RATIOS to establish base elsewhere.

Going thru T1, V_{BLL} in transmission section becomes $13.8kV\left(\frac{132}{13.2}\right) = 138kV$

Going thru T2, V_{BLL} in the motor section becomes $138kV\left(\frac{13.8}{138}\right) = 13.8kV$

Step 3 – Adjust pu values for base change, and convert ANY ohmic values to pu

Going left to right

$\tilde{V}_{gen} = 1.0\angle 0$

$Z_{gen} = j0.10$

$Z_{T1} = j0.10\left(\frac{30MVA}{20MVA}\right)\left(\frac{132kV}{138kV}\right)^2 = j0.1372$

$Z_{BASE\ LINE} = \frac{V_{BLL\,kV}^2}{S_{B\,MVA}} = \frac{(138)^2}{30} = 634.8\,\Omega$

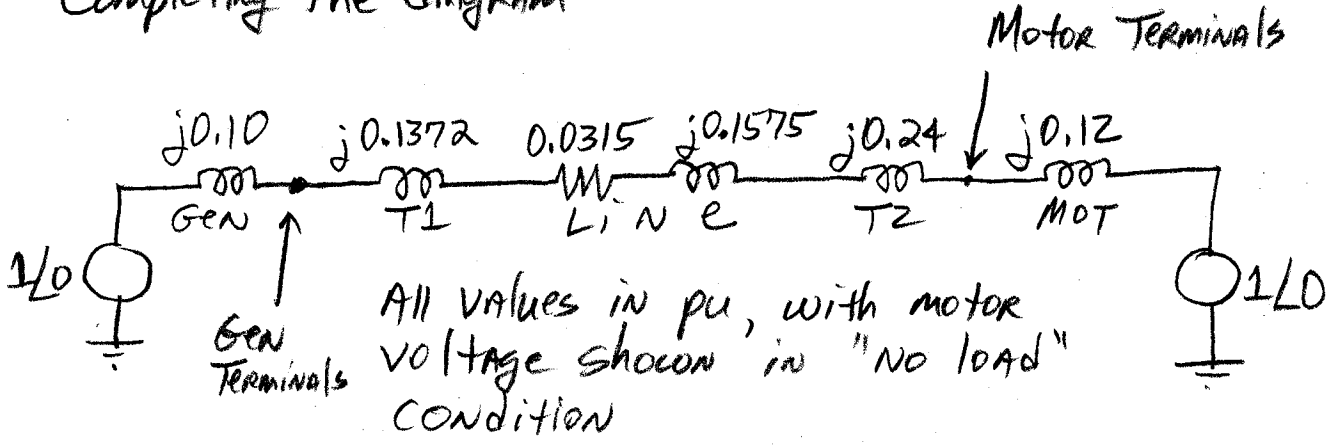
$Z_{Line} = \frac{20 + j100}{634.8} = 0.0315 + j0.1575$

$Z_{T2} = j0.12\left(\frac{30MVA}{15MVA}\right)\left(\frac{138kV}{138kV}\right)^2 = j0.24$

$$Z_{MOT} = j0.08\left(\frac{30MVA}{20MVA}\right)\left(\frac{13.8kV}{13.8kV}\right)^2 = j0.12$$

$$\tilde{V}_{MOT} = \frac{13.8kV}{13.8kV} = 1.0pu$$

Completing the diagram



All values in pu, with motor voltage shocon in "no load" condition

Customarily, we ignore the phase shifts in these calculations, which is OK As long As we don't have parallel paths with different phase shifts