33.1 (a) Refer the primary voltage

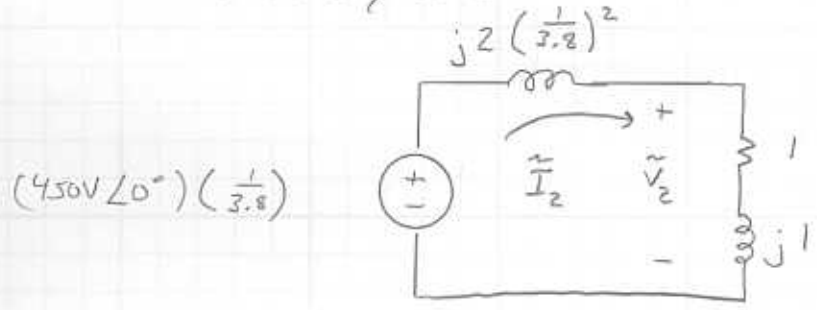
$$\tilde{V}_2 = \frac{N_2}{N_1}\tilde{V}_1 = \frac{1}{3.8}\,450V\angle 0^\circ = 118.42V\angle 0^\circ$$

$$\rightarrow |\tilde{V}_2| = 118.42V$$

$$\tilde{I}_2 = \frac{118.42V\angle 0^\circ}{1+j1} = 83.74A\ \angle -45^\circ$$

$$P_{Load} = |\tilde{I}_2|^2 R_{Load} = 7.012kW$$

(b) Refer the cable and voltage source to the secondary side



so

$$\tilde{I}_2 = \frac{118.42V\angle 0^\circ}{j0.1385 + 1 + j1} = 78.15A\ \angle -48.71^\circ$$

$$\tilde{V}_2 = \tilde{I}_2(1+j1) = 110.5V\ \angle -3.706^\circ$$

$$\rightarrow |\tilde{V}_2| = 110.5V$$

$$P_{Load} = |\tilde{I}_2|^2 R_{Load} = 6.107kW$$

(c)

$$\tilde{V}_2 = 118.42\text{V}\angle 0^\circ \quad \frac{1+j1}{1+j1+j\frac{X_{cable}}{(3.8)^2}}$$

so

$$|\tilde{V}_2| = 118.42 \quad \frac{\sqrt{(1)^2+(1)^2}}{\sqrt{(1)^2+\left(1+\frac{X_{cable}}{14.44}\right)^2}} = 115$$

so

$$\sqrt{1+\left(1+\frac{X_{cable}}{14.44}\right)^2} = \frac{118.42}{115}\sqrt{2} = 1.45627$$

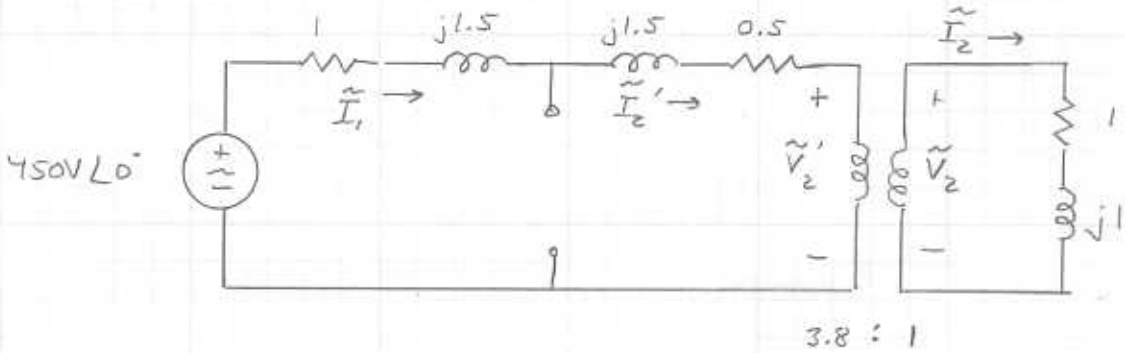
$$1+\left(1+\frac{X_{cable}}{14.44}\right)^2 = 2.12$$

$$1+\frac{X_{cable}}{14.44} = 1.0586$$

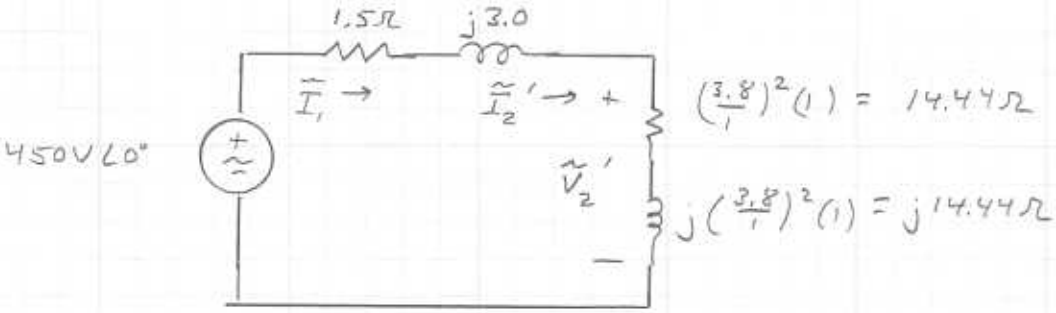
$$X_{cable} = 0.8468\,\Omega$$

33.2

(a)



Reflect the load; combine the transformer series elements



$$\tilde{I}_1 = \tilde{I}_2' = \frac{450V\angle 0^\circ}{1.5 + j3 + 14.44 + j14.44} = 19.05A\angle -47.57^\circ$$

(b) $$\tilde{I}_2 = \frac{N_1}{N_2}\tilde{I}_2' = 3.8\,\tilde{I}_2' = 72.37A\angle -47.57^\circ$$

$$\tilde{V}_2 = \tilde{I}_2(1+j1) = 102.4V\angle -2.57^\circ$$

(c) $$P_{load} = |\tilde{I}_2|^2 R_{load} = (72.37A)^2(1\Omega) = \underline{\underline{5.237kW}}$$

$$P_{LOSS} = |\tilde{I}_1|^2[r_1 + r_2'] = (19.05A)^2[1.5\Omega] = \underline{\underline{544W}}$$