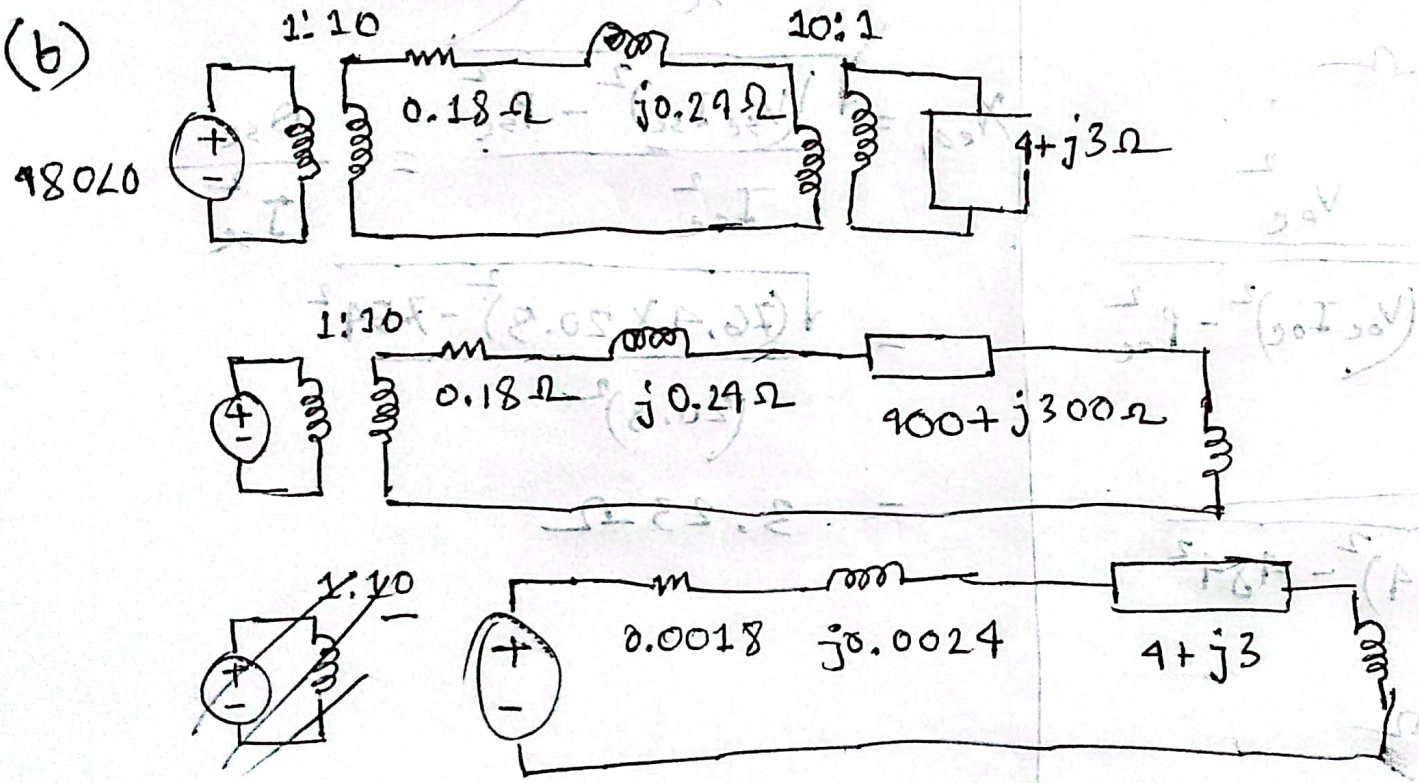
3| (a)

$$I = \frac{480\angle 0}{4+j3+0.18+j0.24} = 90.76\angle -41.98 \text{ A}$$

Loss, $P = I^2R = 90.76^2 \times 0.18 = 1482.73 \text{ w}$

(b)



$$I = \frac{480\angle 0}{0.0018+j0.0024+4+3j} = 95.94\angle -40.97$$

$$P_{loss} = I^2R = 95.94^2 \times 0.0018 = 16.57 \text{ W}$$

Open circuit test

$$R_c = \frac{V_{oc}^2}{P_{oc}} = \frac{600^2}{484}$$

$$= 743.80\,\Omega$$

$$X_m = \frac{V_{oc}^2}{Q_{oc}} = \frac{V_{oc}^2}{\sqrt{(V_{oc}I_{oc})^2 - P_{oc}^2}}$$

$$= \frac{600^2}{\sqrt{(600 \times 3.34)^2 - 484^2}}$$

$$= 185.12\,\Omega$$

Short circuit test

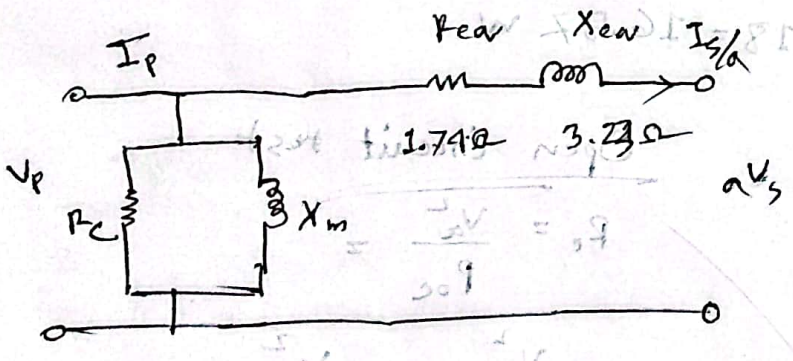
$$R_{eq} = \frac{P_{sc}}{I_{sc}^2} = \frac{754}{(20.8)^2} = 1.74\,\Omega$$

$$X_{eq} = \frac{\sqrt{(V_{sc}I_{sc})^2 - P_{sc}^2}}{I_{sc}^2} = \frac{Q_{sc}}{I_{sc}^2}$$

$$= \frac{\sqrt{(76.4 \times 20.8)^2 - 754^2}}{(20.8)^2}$$

$$= 3.23\,\Omega$$

Refer to primary



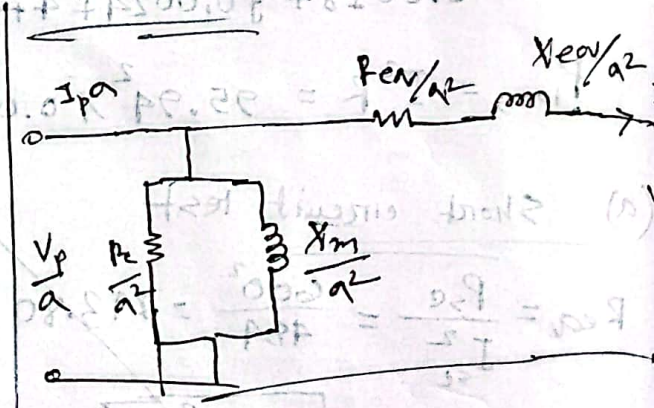
$R_c = 743.80\,\Omega$

$X_m = 185.12\,\Omega$

$R_{eq} = 1.74\,\Omega$

$X_{eq} = 3.23\,\Omega$

Refer to secondary



$$R_c = \frac{743.80}{4^2} = 46.18\,\Omega$$

$$X_m = \frac{185.12}{4^2} = 11.57\,\Omega$$

$$R_{eq} = \frac{1.74}{4^2} = 0.108\,\Omega$$

$$X_{eq} = \frac{3.23}{4^2} = 0.202\,\Omega$$