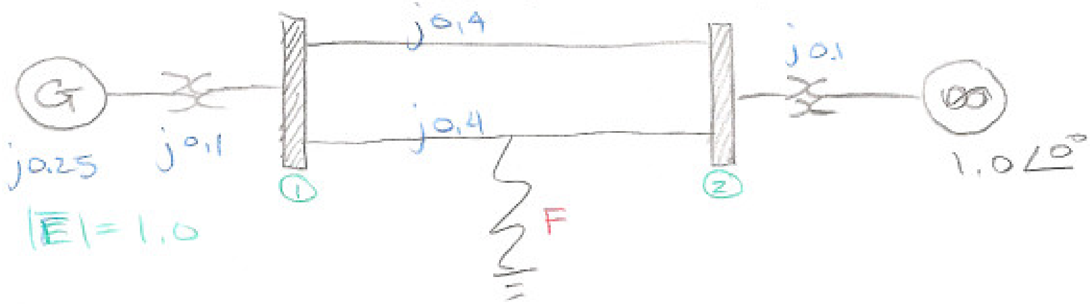
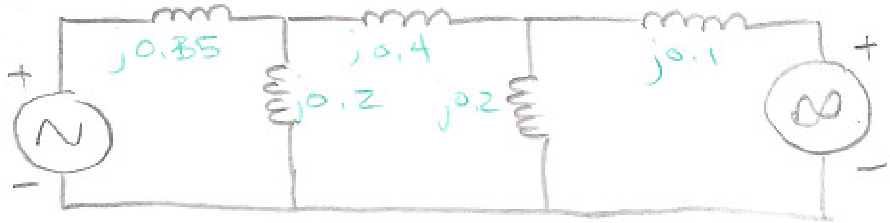
EX: Given the following power system



power delivered to ∞ bus = 0.8

A 3∅ fault occurs at point F in middle of line 2, and the fault is cleared at 70° by isolating line 2. Analysising the stability of the system.

SOL: A 3∅ fault at F will not tranfer the power to zero at bus ①. The reactance diagram...

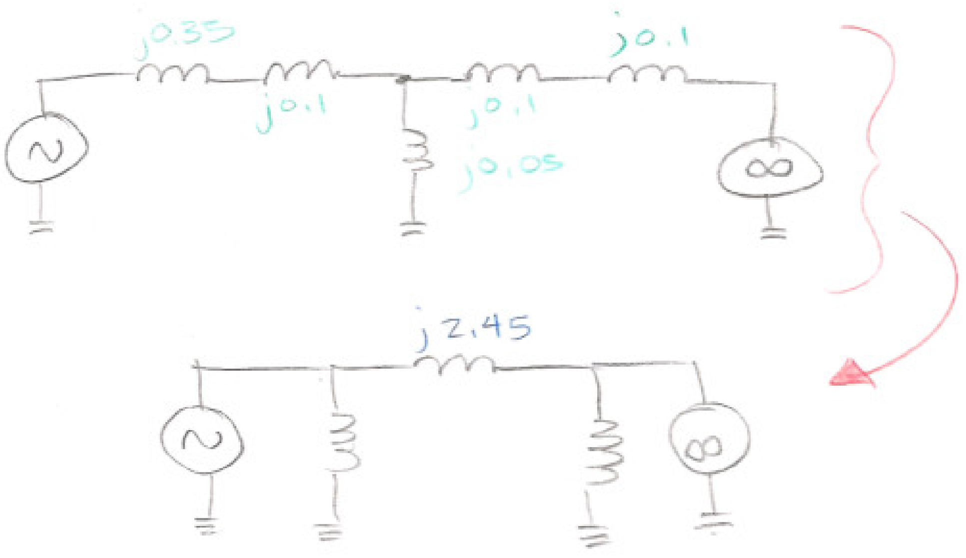


$$Y = \begin{bmatrix} -j7.5 & j2.5 \\ j2.5 & -j7.5 \end{bmatrix} \Rightarrow Z = \begin{bmatrix} j0.15 & j0.05 \\ j0.05 & j0.15 \end{bmatrix}$$

$Z_a = j0.1$

$Z_b = j0.1$

$Z_c = j0.05$

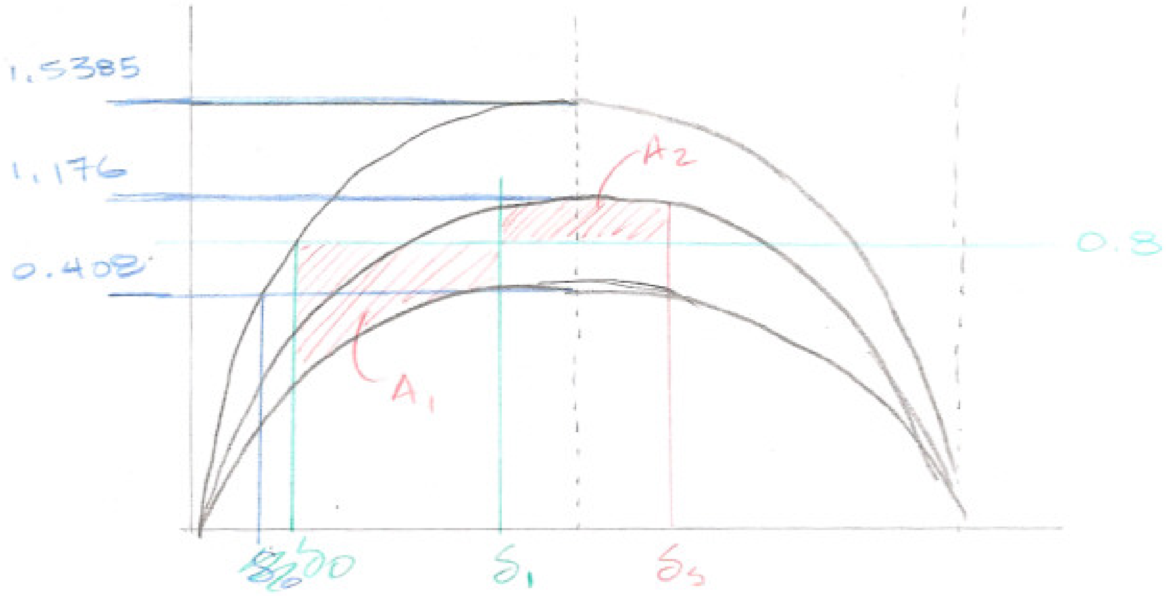


Isolating line 2 after the fault

$$X_{new} = 0.35 + 0.4 + 0.1 = 0.85 \text{ p.u.}$$

$$P_e = \frac{(1)(1)}{0.85} \sin\delta = 1.176 \sin\delta \quad \text{After fault}$$

$$P_e = \frac{(1)(1)}{0.65} \sin\delta = 1.5385 \sin\delta \quad \text{Before fault}$$



Initially the system is stable, and $P_m = P_e = 0.8$

Before the fault $x = 0.65$ pu.

$$\therefore \quad P_e = 0.8 = \frac{(1)(1)}{0.65} \sin\delta_0 \Rightarrow \delta_0 = 31.33^\circ$$

$$\delta_{max} = 180^\circ - \sin^{-1}\left(\frac{0.8}{1.176}\right) = 137.1^\circ = 2.393 \text{ rad.}$$

$$A_1 = P_m(\delta_1 - \delta_0) - \int_{\delta_0}^{\delta_1} 0.408 \sin\delta \, d\delta.$$

$$= 0.331104 \text{ units.}$$

$$A_2 = \int_{\delta_1}^{\delta_s} 1.176 \sin\delta \, d\delta - P_m(\delta_s - \delta_1)$$

$$\therefore \quad 1.380 - 0.8\,\delta_s - 1.176 \cos\delta_s = 0.331104.$$

By trial and error

$$\delta_s \cong 137.1^\circ$$