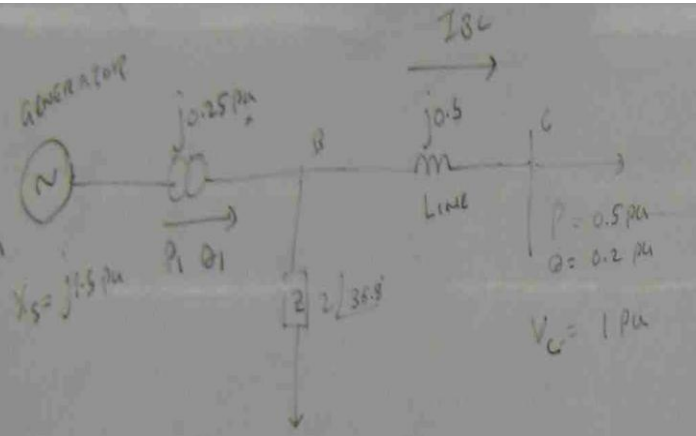
Ph



FIND THE VOLTAGE AT A

FIND CURRENT FLOW TO Z.

$V_B = ?$

$$V_B = \sqrt{\left(V_C + \frac{Q X_{BC}}{V_C}\right)^2 + \left(\frac{P X_{BC}}{V_C}\right)^2}$$

$$V_B = \sqrt{\left(1 + \frac{0.2 \times 0.5}{1}\right)^2 + \left(\frac{0.5 \times 0.5}{1}\right)^2}$$

$$V_B = \sqrt{(1.1)^2 + (0.25)^2}$$

$$= 1.12 \text{ pu}$$

$$V_A = \sqrt{\left(V_B + \frac{Q_1 X_{AB}}{V_B}\right)^2 + \left(\frac{P_1 X_{AB}}{V_B}\right)^2}$$

(P_1, Q_1) = Power Flow To Z + Power Loss In BC + Power Flow To Load

$P_Z = \frac{V^2}{Z}\cos\theta_Z$ $\quad Q_{BC} = I_{BC}^2 X_{BC}$ $\quad + \; 0.5 = P$

$Q_Z = \frac{V^2}{Z}\sin\theta_Z$ $\quad\quad\quad\quad\quad\quad\quad\quad + \; 0.2 = Q$

$$P_Z = \frac{V_B^2}{Z}\cos\theta_Z = \frac{1.12^2}{2}\cos 36.8 = 0.5 \text{ pu}$$

$$Q_Z = \frac{V_B^2}{Z}\sin\theta_Z = \frac{1.12^2}{2}\sin 36.8 = 0.37 \text{ pu}$$

$$I_{BC} = \frac{P + jQ}{V_C} = \frac{0.5 + j0.2}{1} = \frac{\sqrt{0.5^2 + 0.2^2}}{1} = 0.53$$

$$Q_{BC} = I_{BC}^2 X_{BC} = (0.53)^2 \times 0.5 = 0.145$$

$$P_1 = P_2 + P = 0.5 + 0.5 = 1 \text{ pu}$$

$$Q_1 = Q_2 + Q_{BC} + Q = 0.37 + 0.145 + 0.2$$

$$= 0.72 \text{ pu}$$

$$E_A = \sqrt{\left(V_B + \frac{Q_1 X_{AB}}{V_B}\right)^2 + \left(\frac{P_1 X_{AB}}{V_B}\right)^2}$$

$$= \sqrt{\left(1.12 + \frac{0.72 \times 0.25}{1.12}\right)^2 + \left(\frac{1 \times 0.25}{1.12}\right)^2}$$