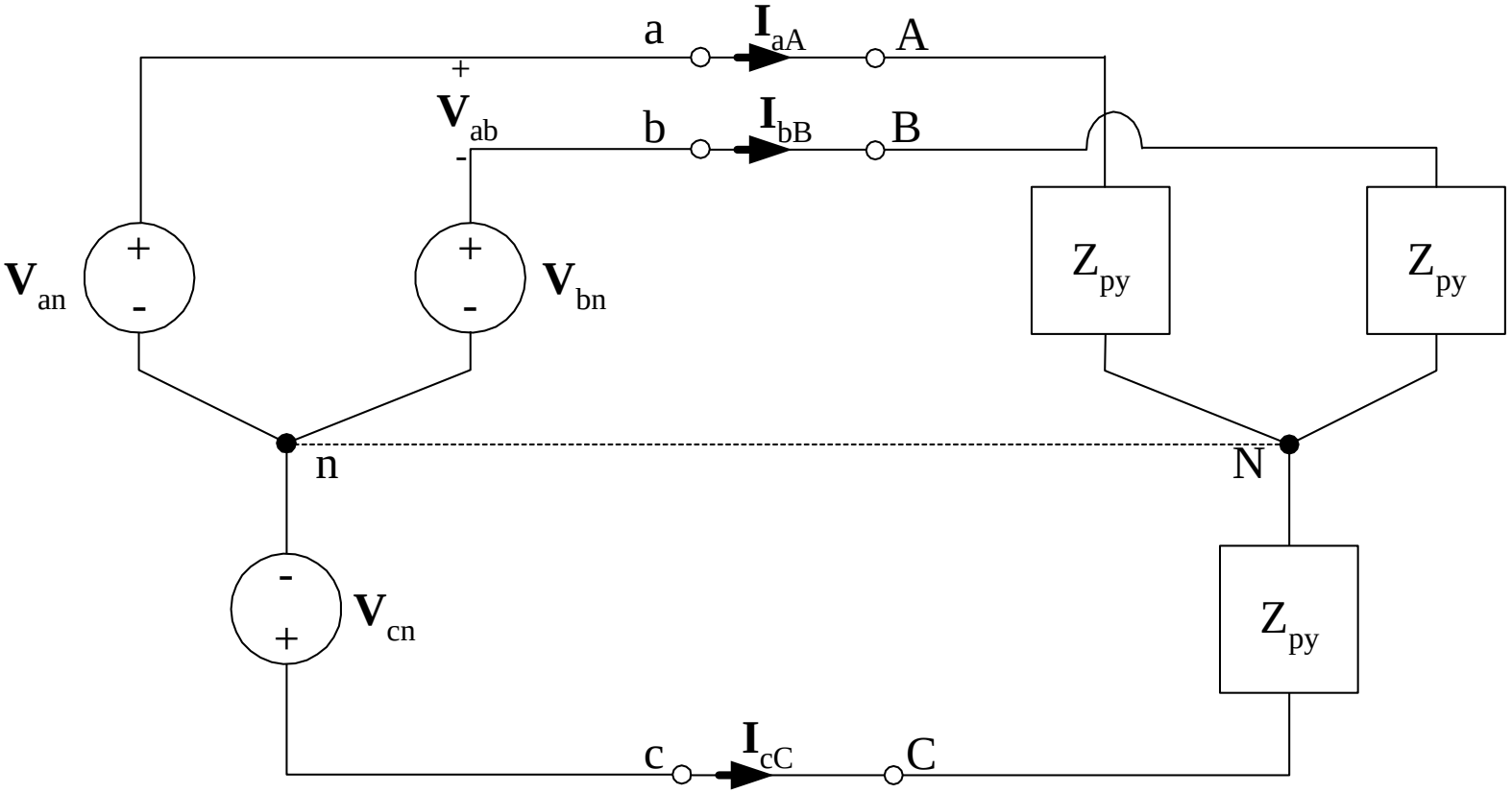
Three Phase, Balanced Y-Y Connected System



$$V_{an} = |V_{an}| \angle 0^{o} \text{ Vrms}$$

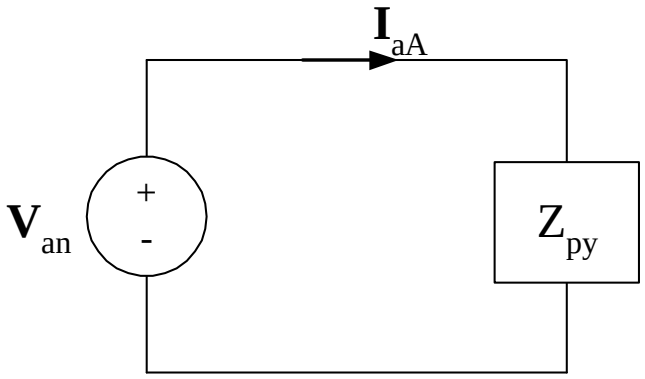
$$V_{ab} = V_L \angle 30^{o} \text{ Vrms}$$

$$Z_{py} = |Z_{my}| \angle Z_{ay}{}^{o} \ \Omega$$

$$I_{aA} = I_L \angle (-Z_{ay}) \text{ Arms}$$

$$PF_L = \cos(Z_{ay})$$

single phase circuit for Y-Y system



$$I_P = \frac{V_P}{Z_{my}} = I_L = |I_{aA}|$$

$$V_p = \frac{V_L}{\sqrt{3}} = |V_{an}|$$

Real and Complex Power

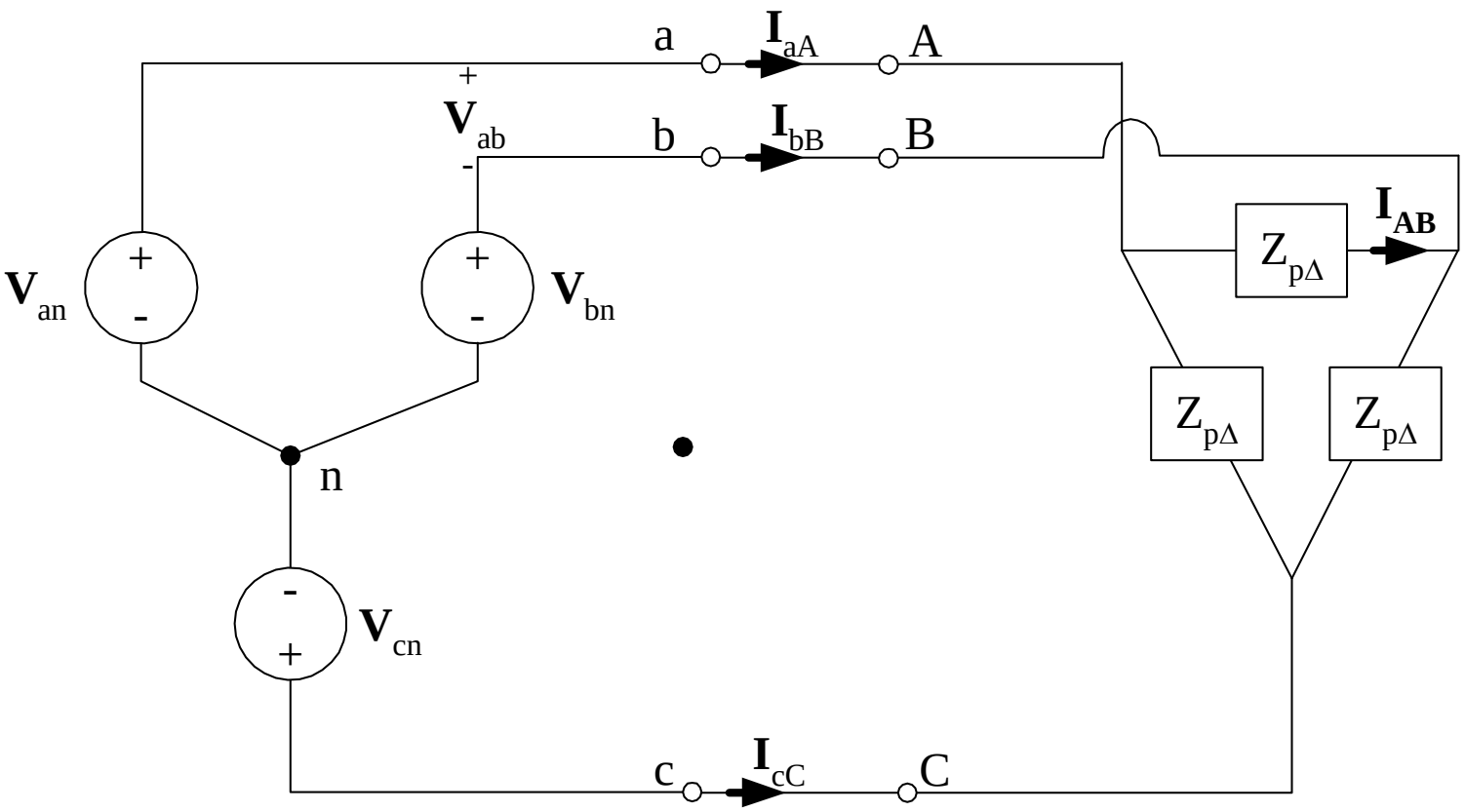
$$(1\phi)\ P_L = V_p \cdot I_L \cdot PF_L = \frac{V_L}{\sqrt{3}} \cdot I_L \cdot PF_L$$

$$(3\phi)\ P_L = 3V_p \cdot I_L \cdot PF_L = \sqrt{3} V_L \cdot I_L \cdot PF_L$$

$$(1\phi)\ S_L = (V_p \cdot I_L) \angle Z_{ay} = \left(\frac{V_L}{\sqrt{3}} \cdot I_L \right) \angle Z_{ay}$$

$$(3\phi)\ S_L = \left(3V_p \cdot I_L\right) \angle Z_{ay} = \left(\sqrt{3} V_L \cdot I_L\right) \angle Z_{ay}$$

Three Phase, Balanced Y-Δ Connected System



$$V_{an} = |V_{an}| \angle 0^{o} \text{ Vrms}$$

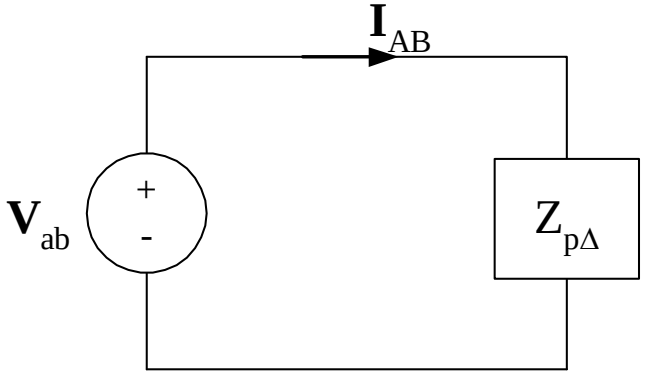
$$V_{ab} = V_L \angle 30^{o} \text{ Vrms}$$

$$Z_{p\Delta} = |Z_{m\Delta}| \angle Z_{a\Delta}{}^{o} \ \Omega$$

$$I_{AB} = I_P \angle (-Z_{a\Delta}) \text{ Arms}$$

$$PF_L = \cos(Z_{a\Delta})$$

single phase circuit for Y-Δ system



$$V_P = V_L = |V_{ab}|$$

$$I_p = \frac{V_L}{Z_{m\Delta}} = \frac{I_L}{\sqrt{3}} = |I_{AB}|$$

Real and Complex Power

$$(1\phi)\ P_L = V_L \cdot I_P \cdot PF_L = V_L \cdot \frac{I_L}{\sqrt{3}} \cdot PF_L$$

$$(3\phi)\ P_L = 3V_L \cdot I_P \cdot PF_L = \sqrt{3} V_L \cdot I_L \cdot PF_L$$

$$(1\phi)\ S_L = (V_L \cdot I_P) \angle Z_{a\Delta} = \left(V_L \cdot \frac{I_L}{\sqrt{3}} \right) \angle Z_{a\Delta}$$

$$(3\phi)\ S_L = (3V_L \cdot I_P) \angle Z_{a\Delta} = \left(\sqrt{3} V_L \cdot I_L \right) \angle Z_{a\Delta}$$