

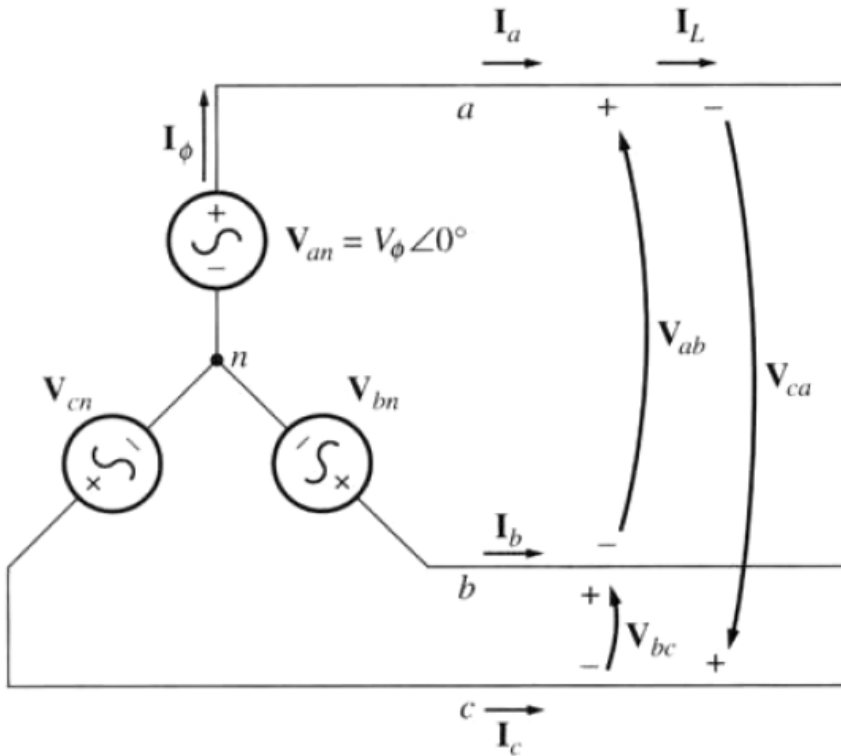
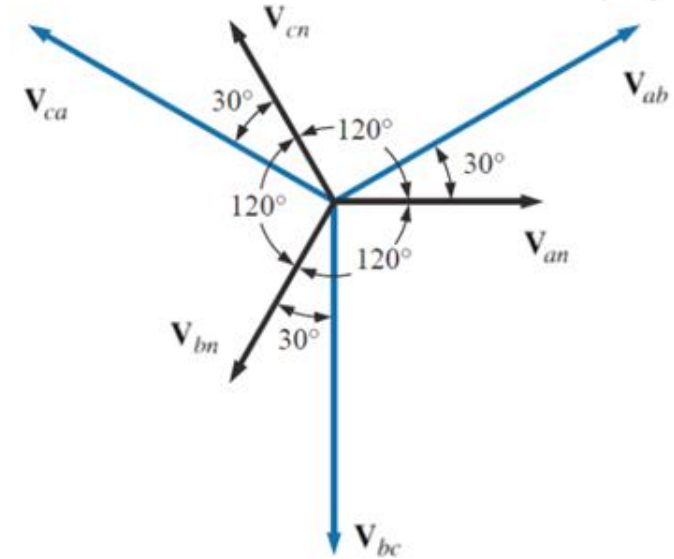
Wye-Network

NCEES® PE Power Reference Handbook Pages 33 - 34



STUDY FOR FE

- Three Phase Wye source configuration has three voltage sources connected to a neutral.
- Loads can be connected in Wye-network using 3 or 4 wires.



$$I_L = I_\phi$$

$$V_{ab} = V_a - V_b = V_\phi \angle 0^\circ - V_\phi \angle -120^\circ$$

$$= V_\phi - \left(-\frac{1}{2} V_\phi - j \frac{\sqrt{3}}{2} V_\phi \right) = \frac{3}{2} V_\phi + j \frac{\sqrt{3}}{2} V_\phi$$

$$= \sqrt{3} V_\phi \left(\frac{\sqrt{3}}{2} + j \frac{1}{2} \right) = \sqrt{3} V_\phi \angle 30^\circ$$

$$V_{LL} = \sqrt{3} V_\phi$$

V_L lead V_p by 30° .

$$V_{ab} = \sqrt{3} V_\phi \angle 30^\circ$$

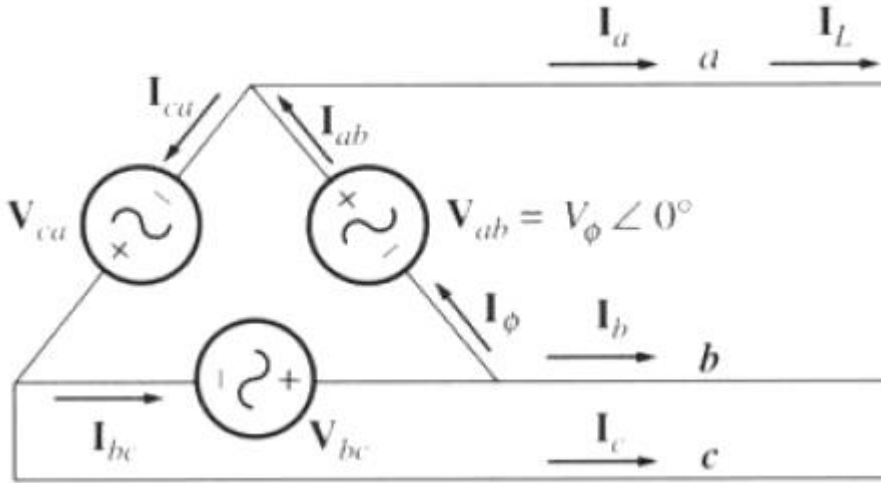
$$V_{bc} = \sqrt{3} V_\phi \angle -90^\circ$$

$$V_{ca} = \sqrt{3} V_\phi \angle -210^\circ$$

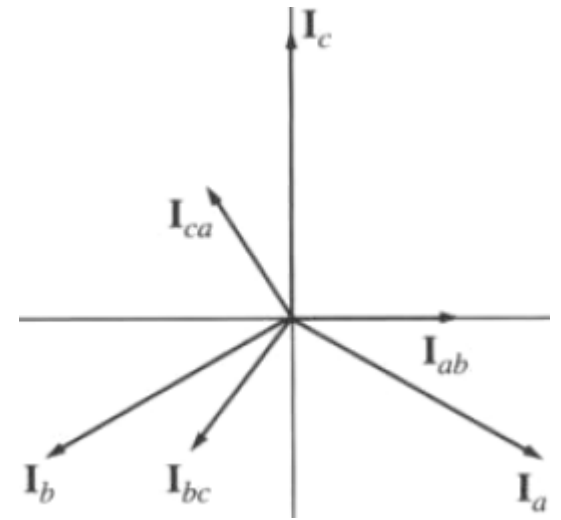
Delta-Network

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- Three Phase Δ source configuration has 3 voltage sources connected in series to form a closed circuit.
- Loads can be connected in Δ -network using 3 wires only as there is no neutral.



$$\begin{aligned}
 I_a &= I_{ab} - I_{ca} = I_\phi \angle 0^\circ - I_\phi \angle 240^\circ \\
 &= I_\phi - \left(-\frac{1}{2} I_\phi + j \frac{\sqrt{3}}{2} I_\phi \right) \\
 &= \frac{3}{2} I_\phi - j \frac{\sqrt{3}}{2} I_\phi
 \end{aligned}$$



$$\begin{aligned}
 V_{ab} &= V_\phi \angle 0^\circ \\
 V_{bc} &= V_\phi \angle -120^\circ \\
 V_{ca} &= V_\phi \angle -240^\circ
 \end{aligned}$$

$$V_{LL} = V_\phi$$

$$\begin{aligned}
 I_{ab} &= I_\phi \angle 0^\circ \\
 I_{bc} &= I_\phi \angle -120^\circ \\
 I_{ca} &= I_\phi \angle -240^\circ
 \end{aligned}$$

I_L lags I_P by 30°

$$I_L = \sqrt{3} I_\phi$$

I_L lags I_P by 30°

$$I_a = \sqrt{3} I_\phi \angle -30^\circ$$

$$I_b = \sqrt{3} I_\phi \angle -150^\circ$$

$$I_c = \sqrt{3} I_\phi \angle -270^\circ$$