RAMA UNIVERSITY

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FACULTY OF ENGINEERING & TECHNOLOGY

Electrical Machine-1

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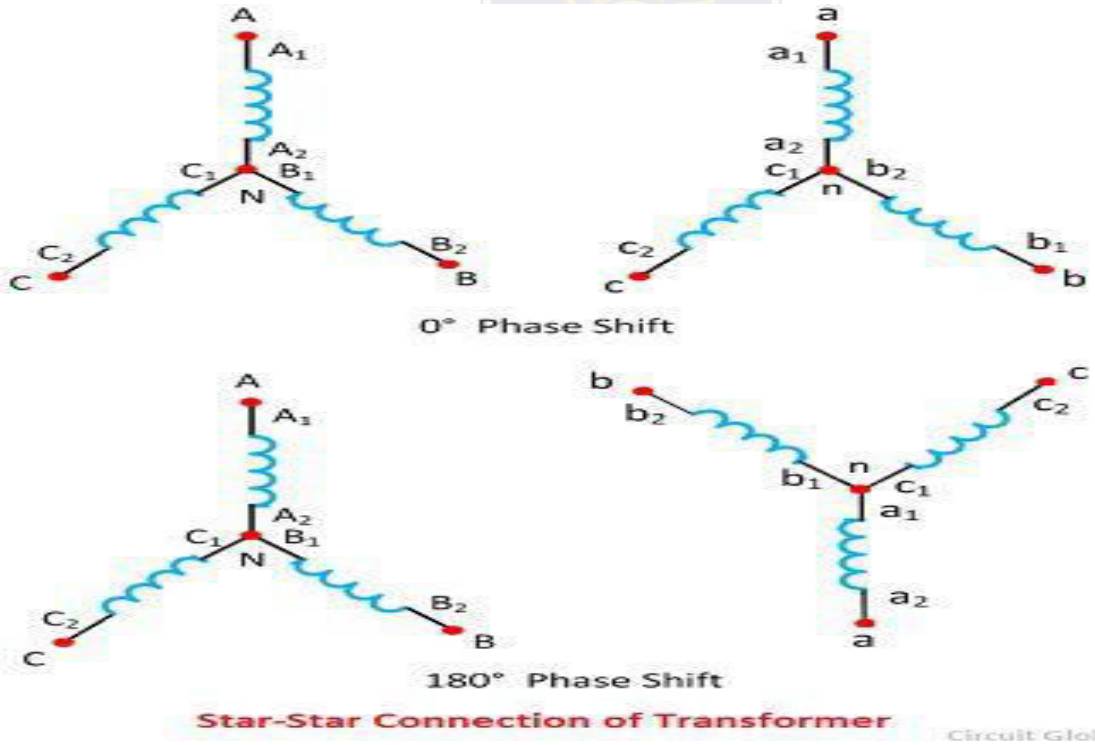
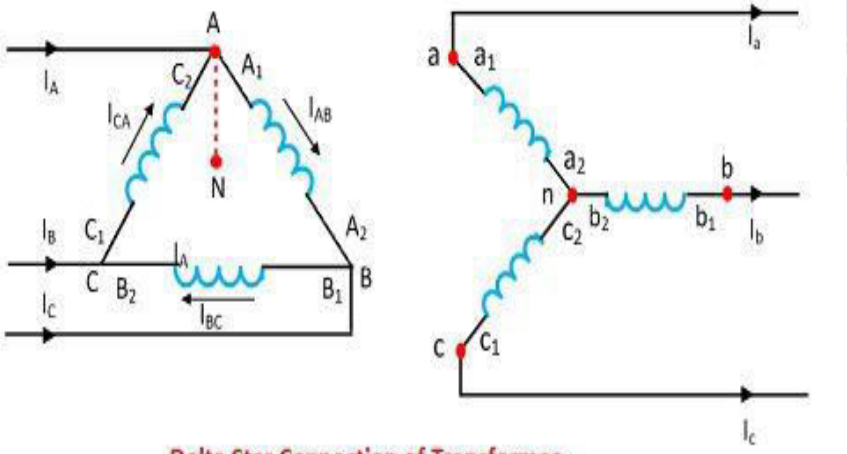
Star-Star (Y-Y) Connection of Transformer

The star-star connection of three identical single phase transformer on each of the primary and secondary of the transformer is shown in the figure. The phasor diagram is similar as in delta-delta connection. The phase current is equal to the line current, and they are in phase. The line voltage is three times the phase voltage. There is a phase separation of 30º between the line and phase voltage.The 180º phase shift between the primary and secondary of the transformer is shown in the figure.

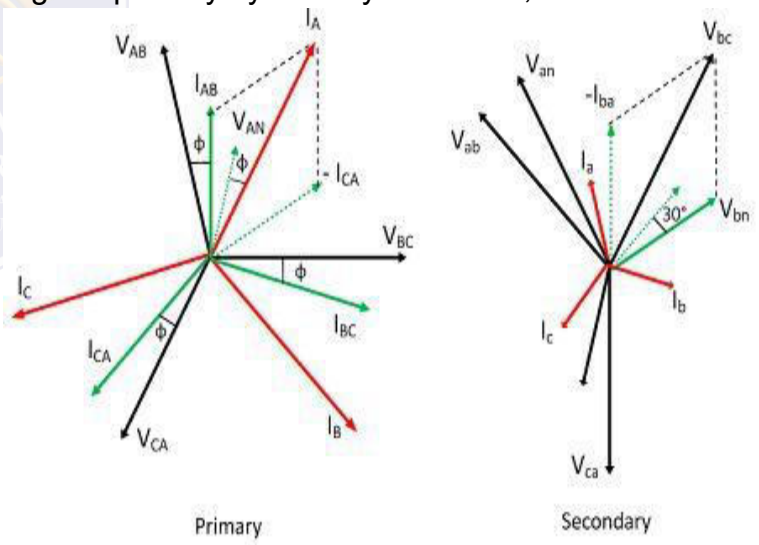


Delta-Star (Δ-Y) Connection

The Δ-Y connection of the three winding transformer is shown in the figure below. The primary line voltage is equal to the secondary phase voltage. The relation between the secondary voltages is $V_{LS} = \sqrt{3}\, V_{PS}$. he phasor diagram of the Δ-Y connection of the three phase transformer is shown in the figure below. It is seen from the phasor diagram that the secondary phase voltage V_{an} leads the primary phase voltage V_{AN} by 30°. Similarly, V_{bn} leads V_{BN} by 30º and V_{cn} leads V_{CN} by 30º.This connection is also called +30º connection. By reversing the connection on either side, the secondary system voltage can be made to lag the primary system by 30°. Thus, the connection is called -30° connection.



Delta Star Connection of Transformer



Phasor Diagram of Delta-Star Connection of Transformer

Star-Delta (Y-Δ) Connection

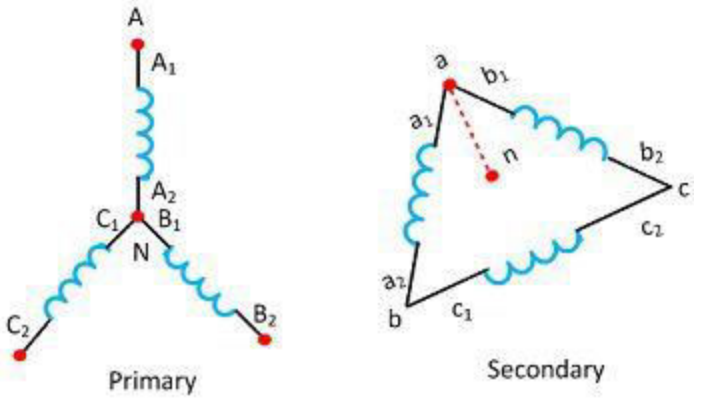
The star-delta connection of three phase transformer is shown in the figure above. The primary line voltage is √3 times the primary phase voltage. The secondary line voltage is equal to the secondary phase voltage. The voltage ratio of each phase is

$$\frac{V_{pP}}{V_{pS}} = a$$

Therefore line-to-line voltage ratio of Y-Δ connection is

$$\frac{V_{lP}}{V_{LS}} = \frac{\sqrt{3}V_{pP}}{V_{pS}} = \sqrt{3}a$$

The phasor diagram of the configuration is shown in the figure above. There is a phase shift of 30 lead exists between respective phase voltage. Similarly, 30° leads exist between respective phase voltage. Thus the connection is called +30° connection.



Star-Delta Connection of Transformer

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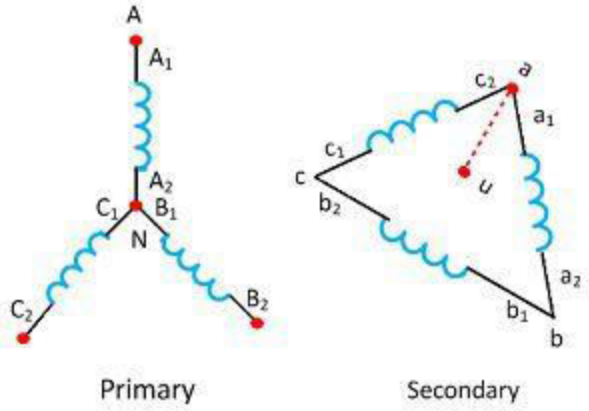

Star-Delta Connetion of a transformer

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