NOTES – CLASS 7

Star Delta Transformations:

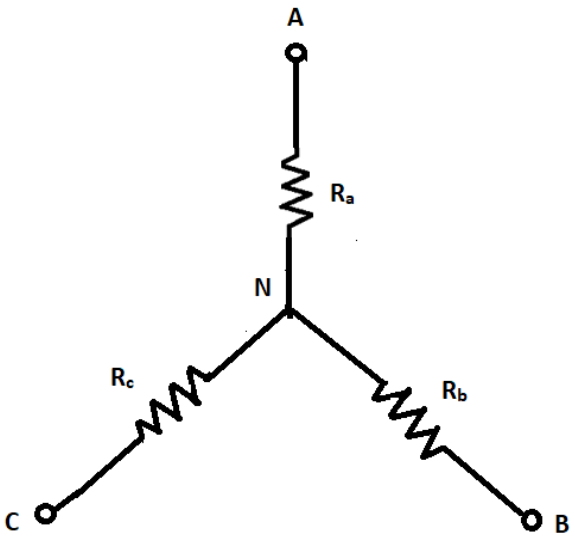
Need for Star Delta Transformation:

Sometimes, we cannot find series or parallel combinations while reducing a given network. In such cases, we can apply star delta transformations to reduce the given network.

Note: Never apply star delta transformation if there exist some series parallel combinations since doing so leads to a lengthy solution.

Star (or) WYE connection:

When three resistors are connected at a common terminal, it makes a star connection of resistors. The common terminal is called 'Neutral' terminal of the star. A star connection is shown below:

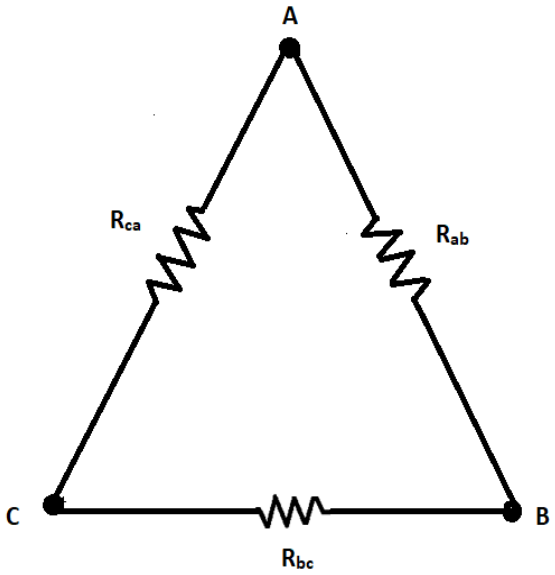


Here, R_a , R_b & R_C represent star resistors and 'N' represents the neutral terminal.

Delta (or) Mesh connection:

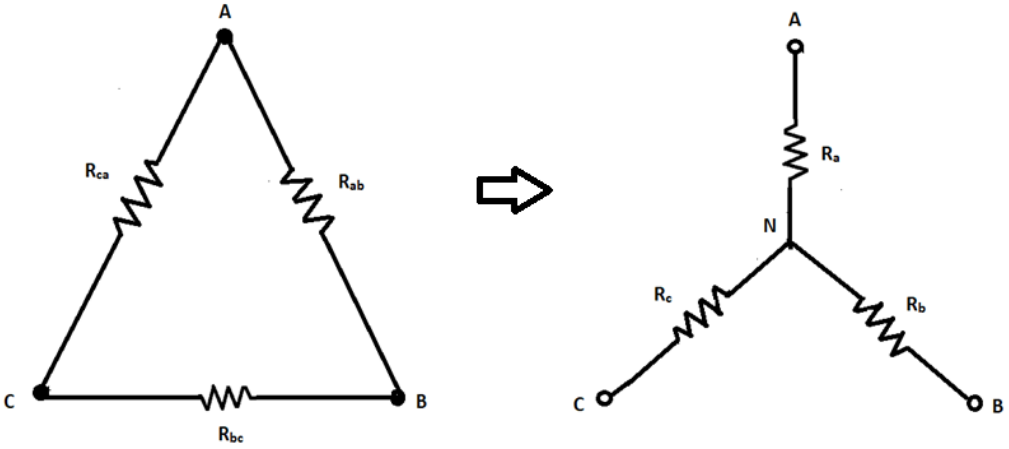
When three resistors are connected end to end, it makes a delta connected system of resistors.

A delta connected system of resistors is shown below:



Here, R_{ab} , R_{bc} & R_{ca} represent delta resistors.

Delta to Star Transformation:



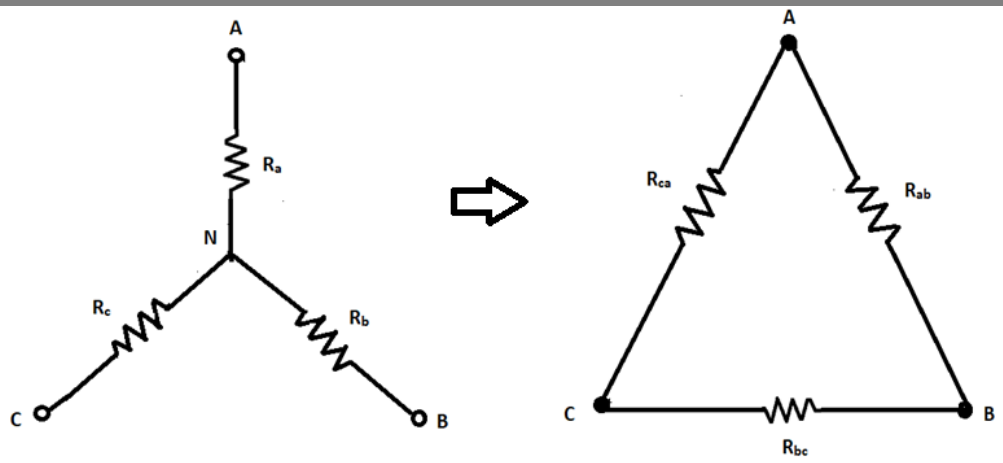
Equations for this transformation are:

$$R_a = \frac{R_{ab} * R_{ca}}{(R_{ab} + R_{bc} + R_{ca})}$$

$$R_b = \frac{R_{bc} * R_{ab}}{(R_{ab} + R_{bc} + R_{ca})}$$

$$R_c = \frac{R_{ca} * R_{bc}}{(R_{ab} + R_{bc} + R_{ca})}$$

Star to Delta Transformation:



Equations for this transformation are:

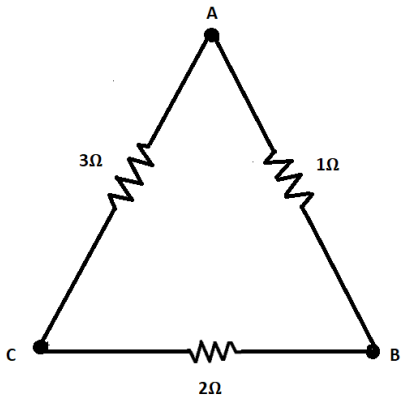
$$R_{ab} = \frac{R_a * R_b + R_b * R_c + R_c * R_a}{R_c}$$

$$R_{bc} = \frac{R_a * R_b + R_b * R_c + R_c * R_a}{R_a}$$

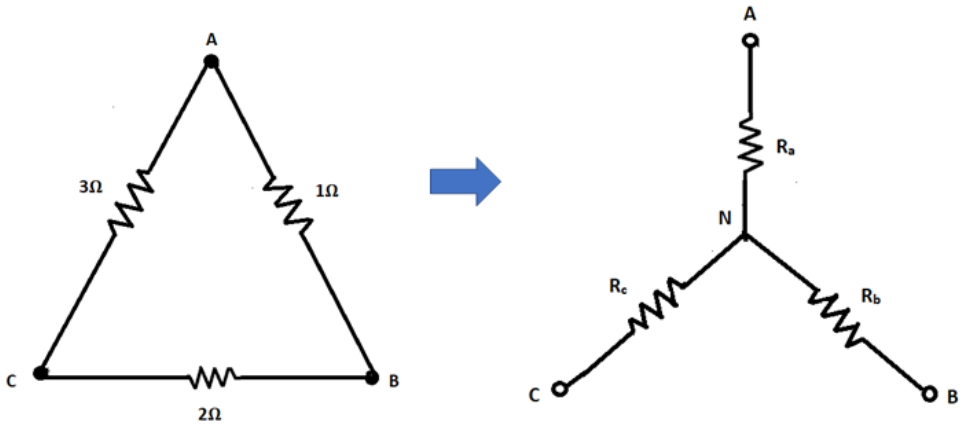
$$R_{ca} = \frac{R_a * R_b + R_b * R_c + R_c * R_a}{R_b}$$

Numerical Examples on Star Delta Transformation:

Example 1: Transform the given delta to equivalent star.



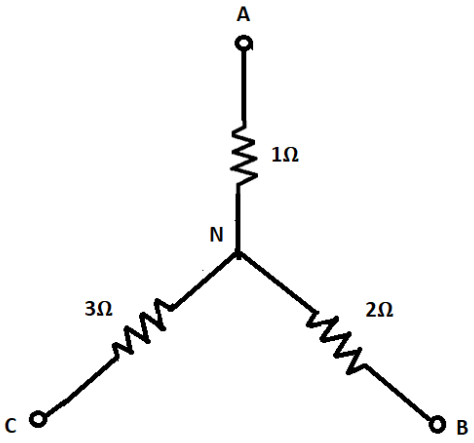
Solution:



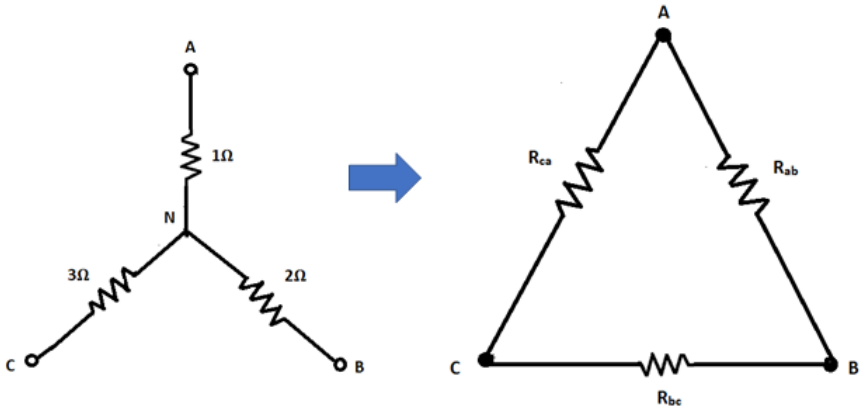
$$R_a = \frac{R_{ab} * R_{ca}}{(R_{ab}+R_{bc}+R_{ca})} = \frac{1*3}{(1+2+3)} = \frac{1}{2}\,\Omega$$

Similarly, $R_b = \frac{1*2}{(1+2+3)} = \frac{1}{3}\,\Omega$ & $R_c = \frac{2*3}{(1+2+3)} = 1\Omega$

Example 2: Transform the given star to equivalent delta.



Solution:



$$R_{ab} = \frac{R_a * R_b + R_b * R_c + R_c * R_a}{R_c} = \frac{1*2+2*3+3*1}{(3)} = \frac{11}{3}\ \Omega$$

Similarly, $R_{bc} = \frac{11}{(R_a)} = 11\ \Omega$ & $R_{ca} = \frac{11}{(R_b)} = \frac{11}{2}\ \Omega$