Electrical Technology

Contents

**Start - Delta Transformation
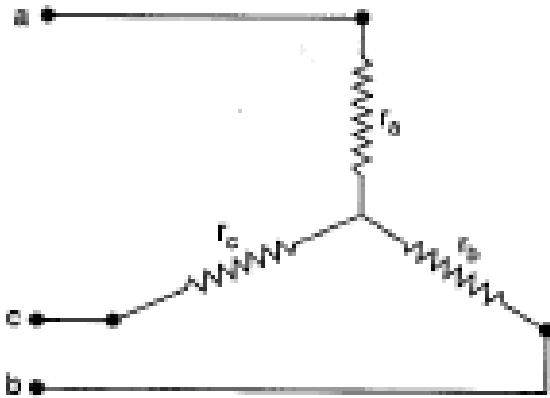Delta – Star Transformation
Test Yourself
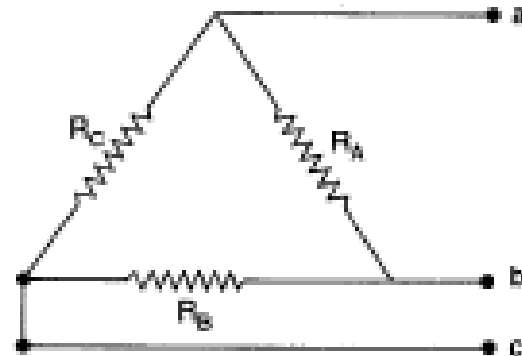NPTEL Link**

Start Delta Transformation
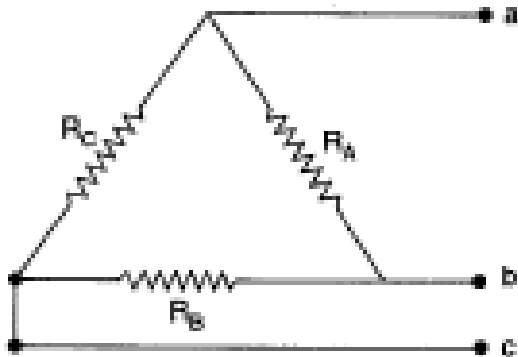
Given Star

Determine Equivalent Delta

Star to
Delta

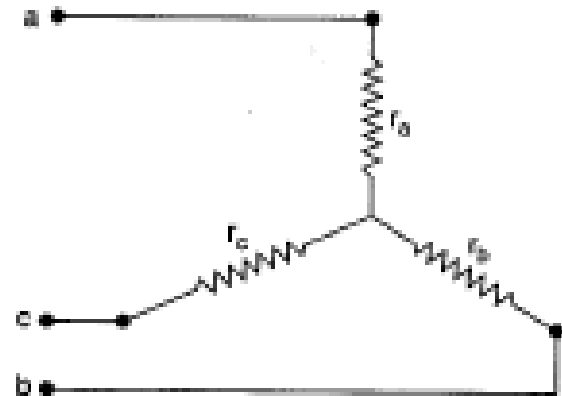**Given Delta**

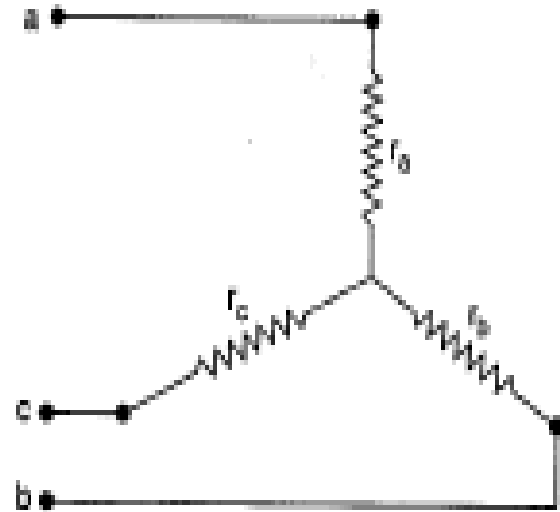**Determine Equivalent Star**

Delta
to Star

3

Start Delta Transformation

Given Delta　　　　　　　　　　**Determine Equivalent Star**
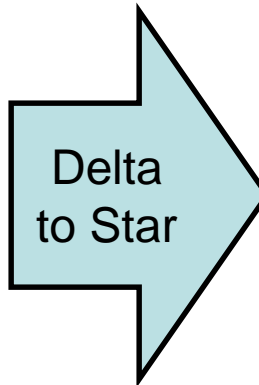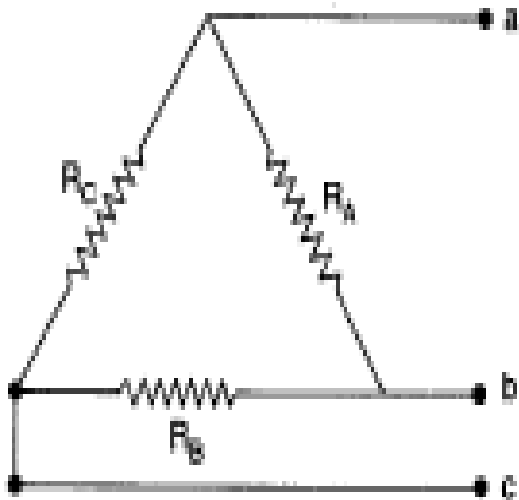
Delta
to Star

- In Delta connection Resistance between terminals 1 and 2

$$= R_{12} \times (R_{23} + R_{31})/ [R_{12} + (R_{23} + R_{31})]$$
$$= R_{12} \times (R_{23} + R_{31})/ [R_{12} + R_{23} + R_{31})]$$

In Star connection Resistance between terminals 1 and 2

$(R_1 + R_2)$. As terminal resistances have to be same

$(R_1 + R_2) = R_{12} \times (R_{23} + R_{31})/ [R_{12} + R_{23} + R_{31}]$ (i)

Similarly for terminals 2 and 3 and terminals 3 and 1 , we have

$R_2 + R_3 = R_{23} \times (R_{31} + R_{12})/ [R_{12} + R_{23} + R_{31}]$ (ii)

$R_3 + R_1 = R_{31} \times (R_{12} + R_{23})/ [R_{12} + R_{23} + R_{31}]$ (iii)

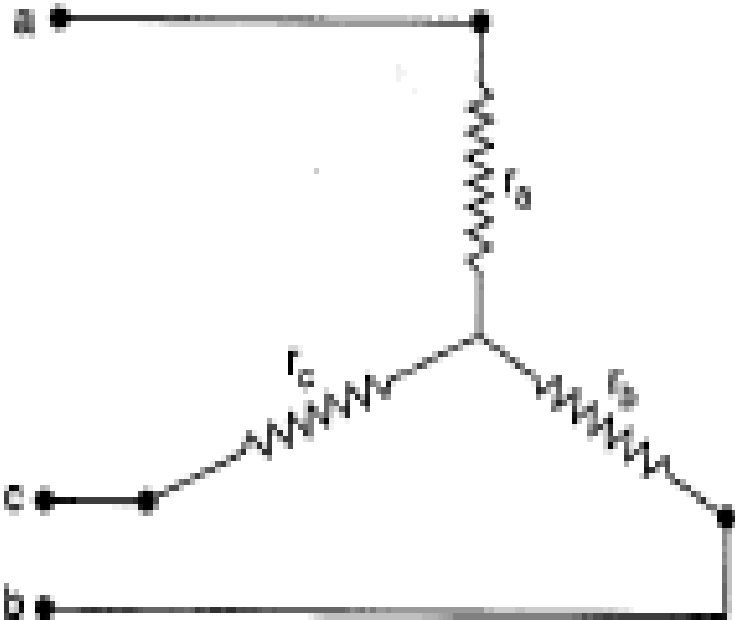Subtracting (ii) from (iii) and adding to (i) we get

Delta to star conversions

$R_1 = (R_{12} \times R_{31}) / [R_{12} + R_{23} + R_{31}]$.   (iv)

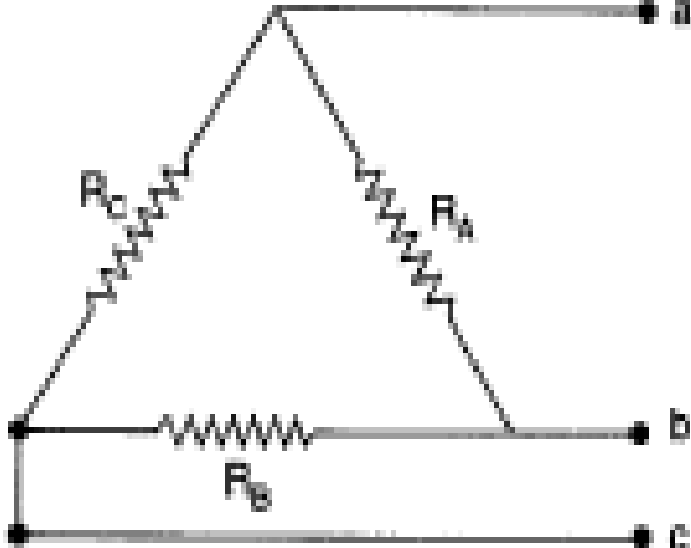Similarly we have

$R_2 = (R_{23} \times R_{12}) / [R_{12} + R_{23} + R_{31}]$ and   (v)

$R_3 = (R_{31} \times R_{23}) / [R_{12} + R_{23} + R_{31}]$ (vi)

Star- Delta Transformation

(a)   (b)

Delta to star conversions we have

$R_1 = (R_{12} \times R_{31}) / [R_{12} + R_{23} + R_{31}]$.   (iv)

$R_2 = (R_{23} \times R_{12}) / [R_{12} + R_{23} + R_{31}]$ and   (v)

$R_3 = (R_{31} \times R_{23}) / [R_{12} + R_{23} + R_{31}]$ (vi)

For Star to Delta Conversion

Multiply (iv) by (v) , (v) by (vi) and (vi) by (iv) and adding

- $R_1 R_2 + R_2 R_3 R_3 R_1 = (R_{12} R_{23} R_{31})/ [R_{12} + R_{23} + R_{31}]$ (vii)
- Dividing (vii) by (iv)
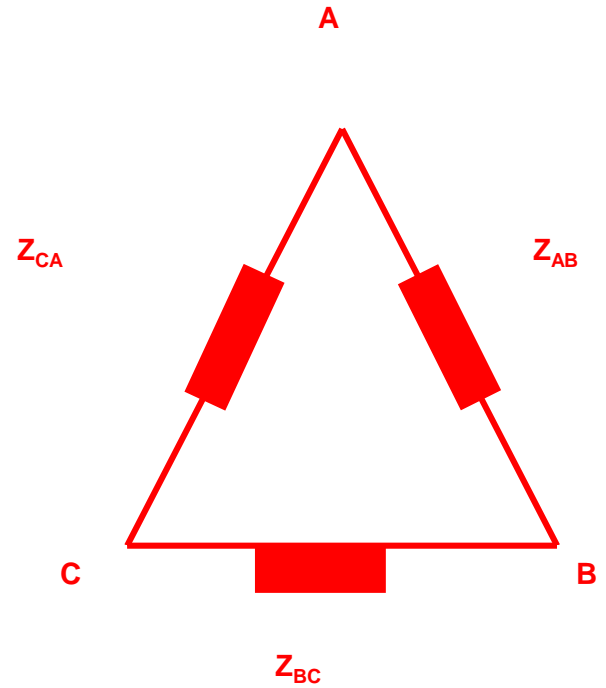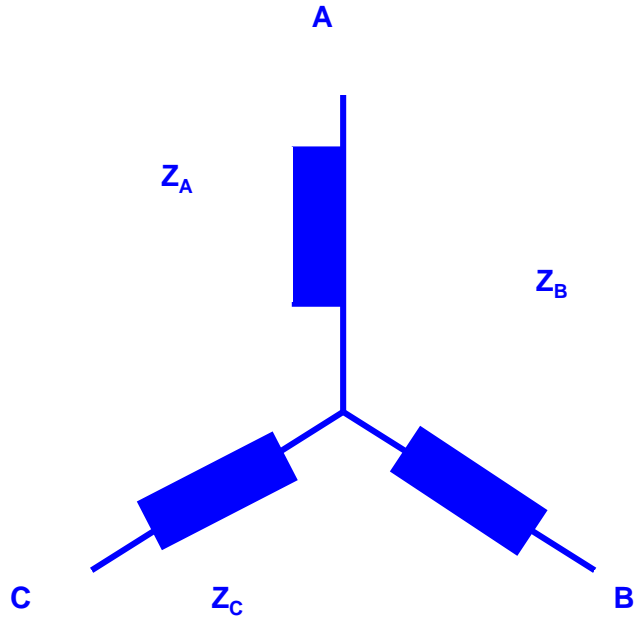- We have $R_{23} = R_2 + R_3 + (R_2 R_3)/R_1$ (viii)
- Similarly we have
-         $R_{31} = R_3 + R_1 + (R_3 R_1)/R_2$ (ix)
-         $R_{12} = R_1 + R_2 + (R_1 R_2)/R_3$
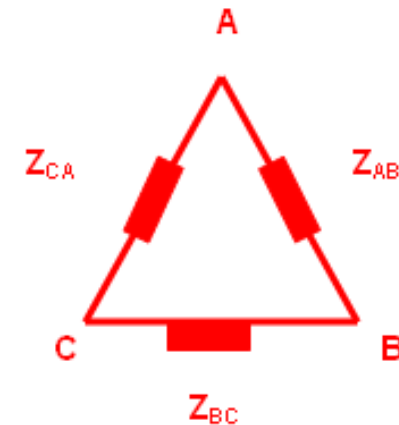
STAR DELTA TRANSFORMATION

STAR

DELTA

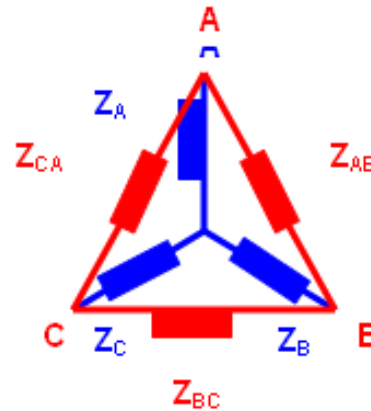$$Z_A = \frac{Z_{AB} Z_{AC}}{Z_{AB} + Z_{BC} + Z_{CA}}$$
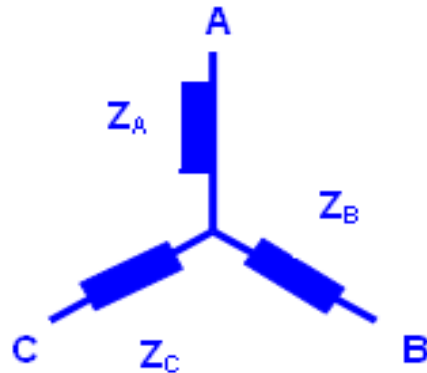
$$Z_{AB} = \frac{Z_A Z_B + Z_B Z_C + Z_C Z_A}{Z_C}$$

$$Z_B = \frac{Z_{BC} Z_{AB}}{Z_{AB} + Z_{BC} + Z_{CA}}$$

$$Z_{BC} = \frac{Z_A Z_B + Z_B Z_C + Z_C Z_A}{Z_A}$$

$$Z_C = \frac{Z_{CB} Z_{CA}}{Z_{AB} + Z_{BC} + Z_{CA}}$$

$$Z_{CA} = \frac{Z_A Z_B + Z_B Z_C + Z_C Z_A}{Z_B}$$

STAR

DELTA

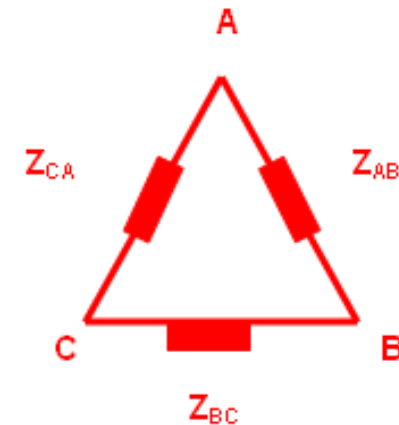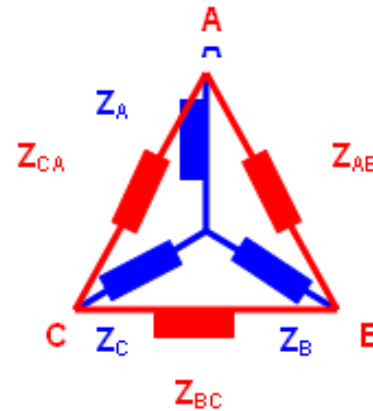

$$Z_A = \frac{Z_{AB} Z_{AC}}{Z_{AB} + Z_{BC} + Z_{CA}}$$

$$Z_{AB} = \frac{Z_A Z_B + Z_B Z_C + Z_C Z_A}{Z_C}$$

$$Z_B = \frac{Z_{BC} Z_{AB}}{Z_{AB} + Z_{BC} + Z_{CA}}$$

$$Z_{BC} = \frac{Z_A Z_B + Z_B Z_C + Z_C Z_A}{Z_A}$$

$$Z_C = \frac{Z_{CB} Z_{CA}}{Z_{AB} + Z_{BC} + Z_{CA}}$$

$$Z_{CA} = \frac{Z_A Z_B + Z_B Z_C + Z_C Z_A}{Z_B}$$