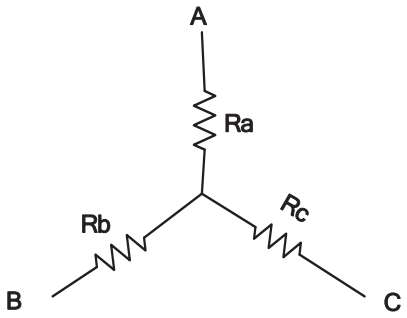
Lecture No. 11,12

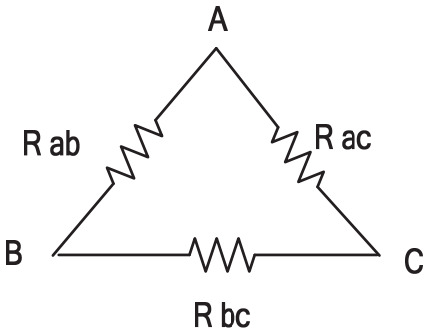
"Star-delta transformation"

Star delta transformation :

In solving complicated networks , it is necessary to transform from star to delta or from delta to star as shown below .



star connection



delta connection

1. Convert from star to delta :

$$R_{ab} = R_a + R_b + \frac{R_a \times R_b}{R_C}$$

$$R_{ac} = R_a + R_c + \frac{R_a \times R_c}{R_b}$$

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

2. Convert from delta to star :

$$R_a = \frac{R_{ab} \times R_{ac}}{R_{ab} + R_{ac} + R_{bc}}$$

$$R_b = \frac{R_{ab} \times R_{bc}}{R_{ab} + R_{ac} + R_{bc}}$$

$$R_c = \frac{R_{ac} \times R_{bc}}{R_{ab} + R_{ac} + R_{bc}}$$

Example : **For the circuit shown in fig. 1 , find the total resistance**

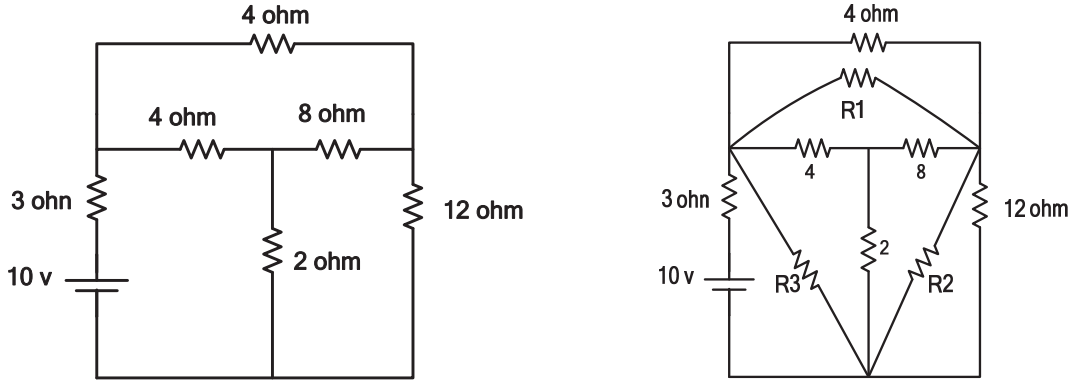


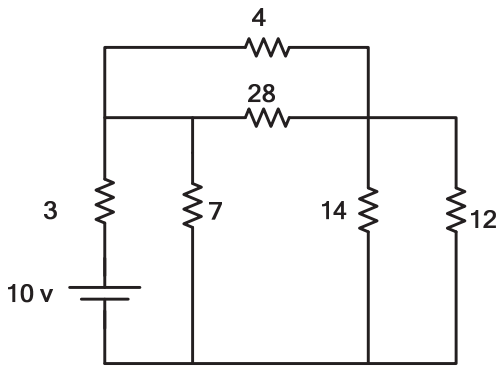
Fig. 1

Convert star to delta

$$R_1 = 4 + 8 + \frac{4 \times 8}{2} = 28\ \Omega$$

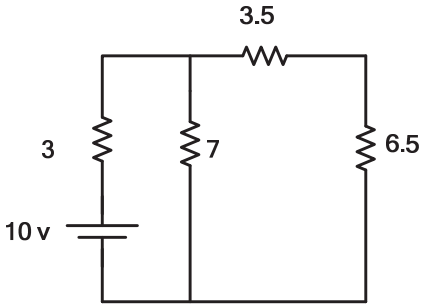
$$R_2 = 2 + 8 + \frac{2 \times 8}{4} = 14\ \Omega$$

$$R_3 = 2 + 4 + \frac{2 \times 4}{8} = 7\ \Omega$$

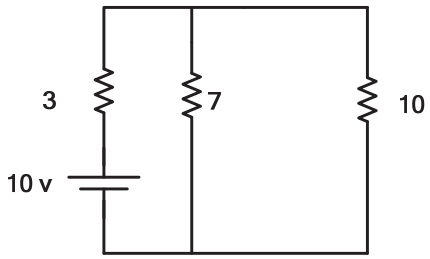


$$4\ \Omega \,//\, 28\ \Omega \ , \quad \frac{4 \times 28}{4 + 28} = 3.5\ \Omega$$

$$14\ \Omega \,//\, 12\ \Omega \ , \quad \frac{14 \times 12}{14 + 12} = 6.5\ \Omega$$



$$3.5 + 6.5 = 10\ \Omega$$



7 Ω // 10 Ω

$$\frac{7 \times 10}{7 + 10} = 4\ \Omega$$

$$R_t = 3 + 4 = 7\ \Omega$$