Basic Electrical Technology

Source Transformation & Star-Delta Transformation

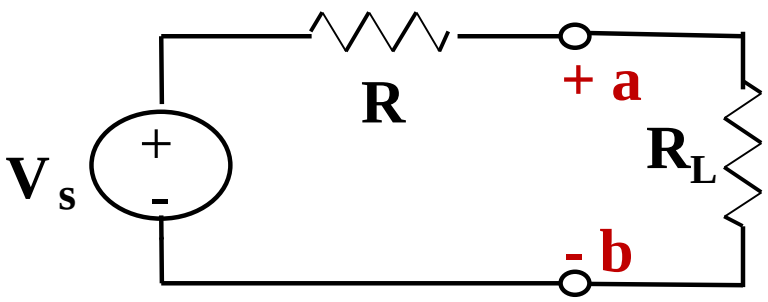
Source Transformation

Practical Voltage Source

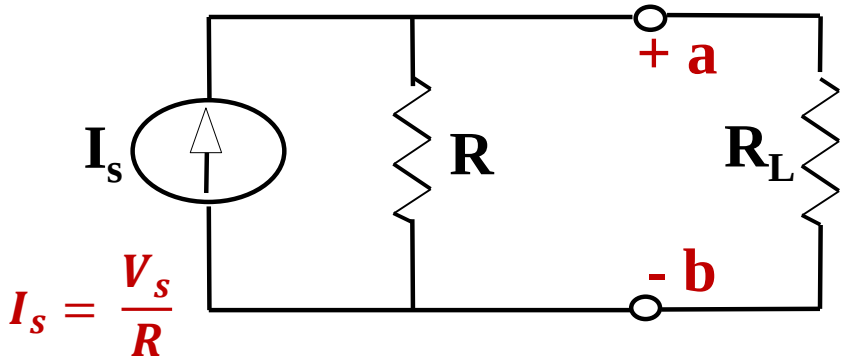
Practical Current Source

Source Transformation

Practical Voltage source



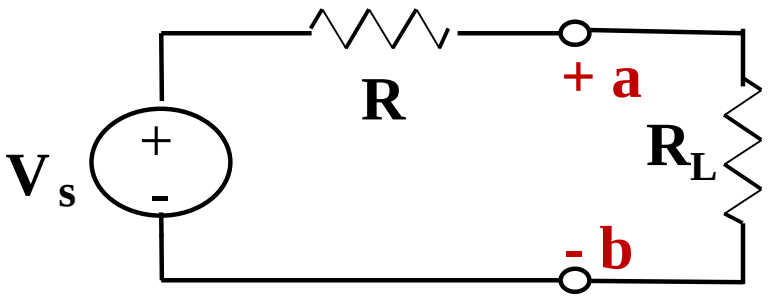
Practical Current source



$$I_s = \frac{V_s}{R}$$

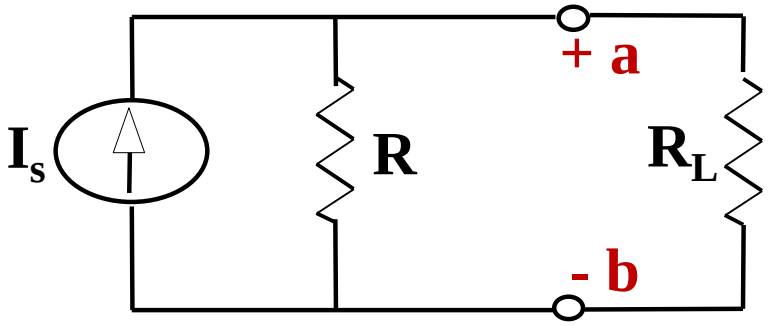
Source Transformation

Practical Voltage source

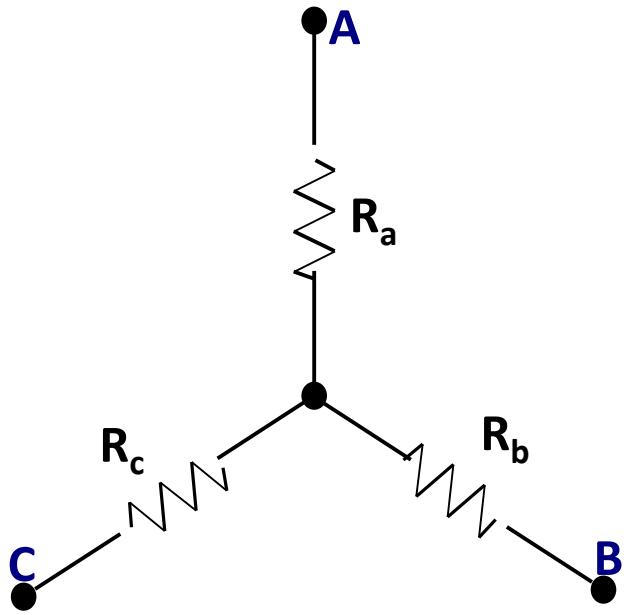


$$V_s = R \times I_s$$

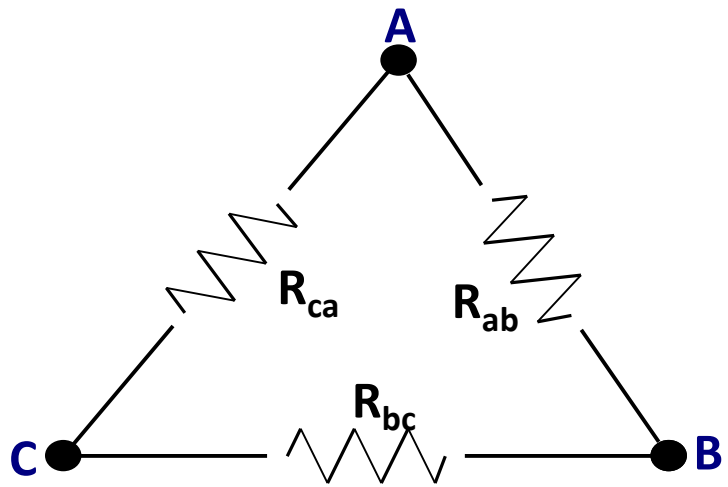
Practical Current source



Star & Delta Connections

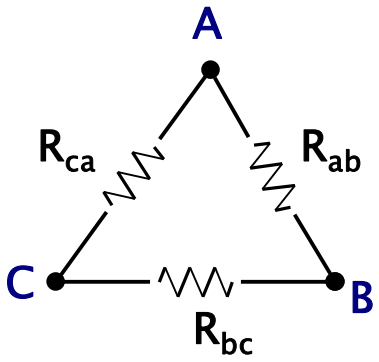


Star Connection



Delta Connection

Star-Delta Transformation

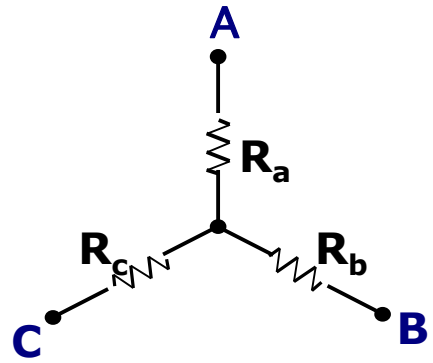


Delta to Star Transformation

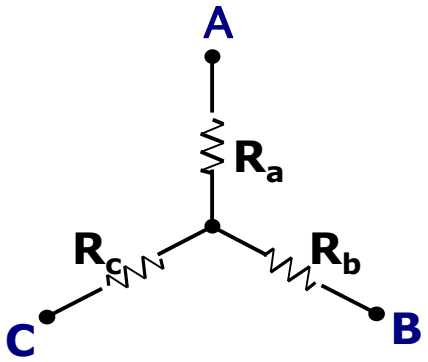
$$R_a = \frac{R_{ab}\,R_{ca}}{R_{ab}+R_{bc}+R_{ca}} = \frac{R_{ab}\,R_{ca}}{\sum R_{ab}}$$

$$R_b = \frac{R_{bc}\,R_{ab}}{R_{ab}+R_{bc}+R_{ca}} = \frac{R_{bc}\,R_{ab}}{\sum R_{ab}}$$

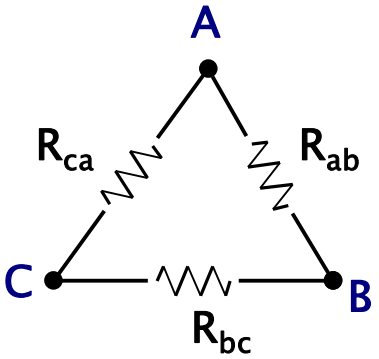
$$R_c = \frac{R_{ca}\,R_{bc}}{R_{ab}+R_{bc}+R_{ca}} = \frac{R_{ca}\,R_{bc}}{\sum R_{ab}}$$



Star-Delta Transformation



Star to Delta Transformation



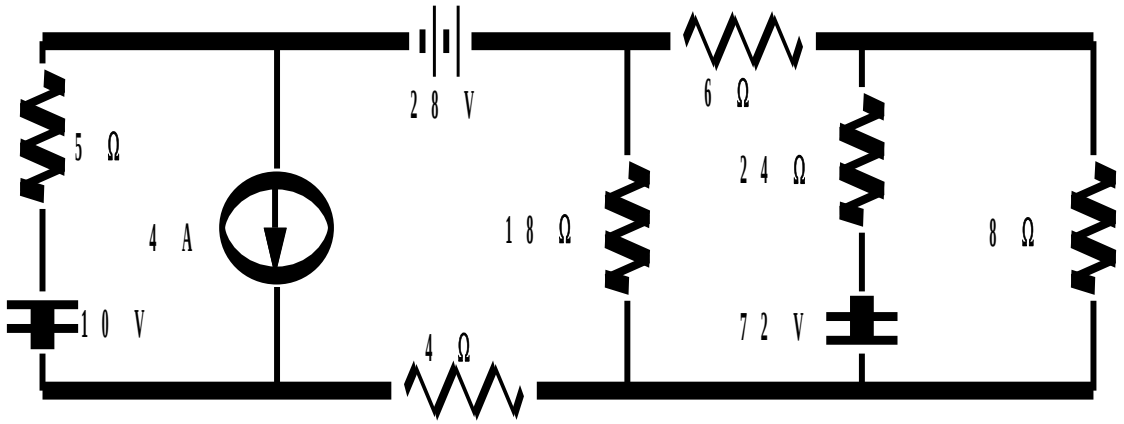
$$R_{ab} = \frac{R_aR_b + R_bR_c + R_cR_a}{R_c} = \frac{\sum R_aR_b}{R_c}$$

$$R_{bc} = \frac{R_aR_b + R_bR_c + R_cR_a}{R_a} = \frac{\sum R_bR_c}{R_a}$$

$$R_{ca} = \frac{R_aR_b + R_bR_c + R_cR_a}{R_b} = \frac{\sum R_cR_a}{R_b}$$

Illustration 1

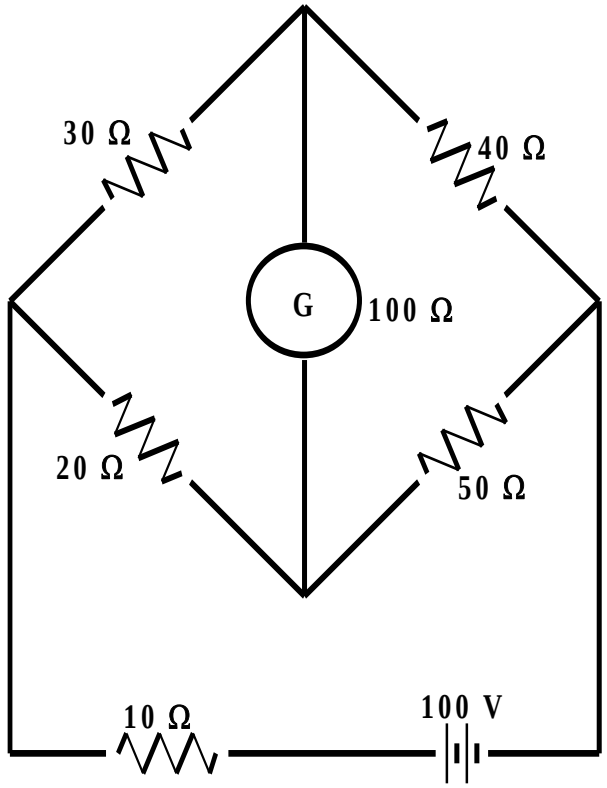
Find the current through 8 Ω resistor by source transformation method.



Ans: 1 A

Illustration 2

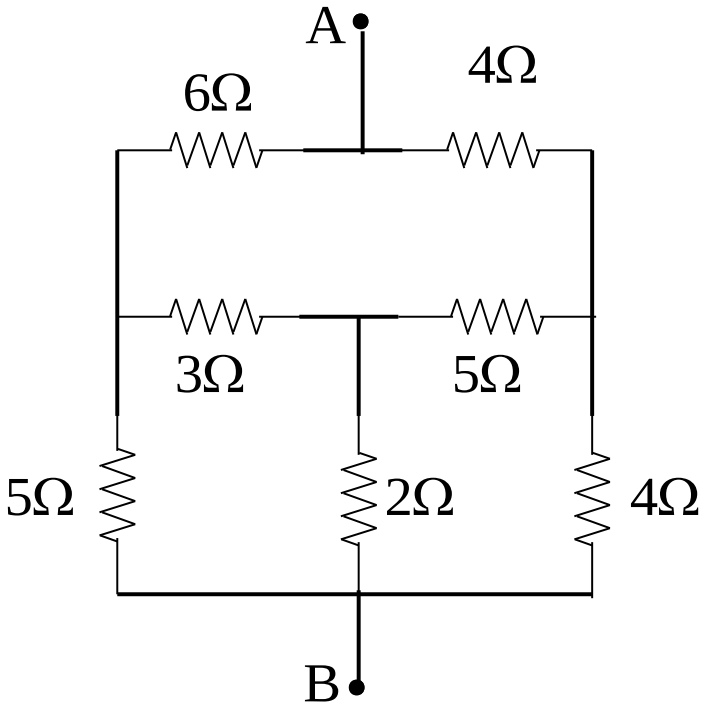
For the circuit shown, determine the total power supplied by the source using star-delta transformation



Ans: $P_{supplied}$ = 223.12 W

Illustration 3

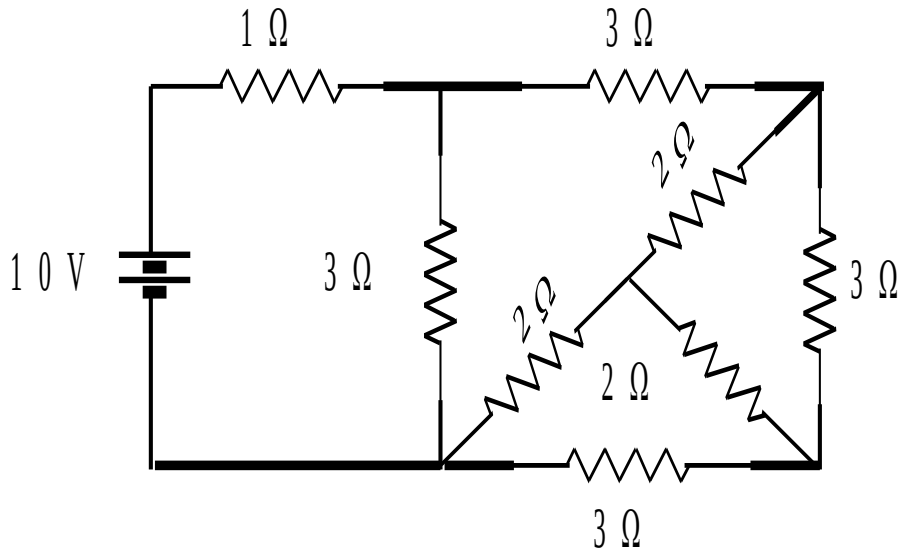
Determine the equivalent resistance between the terminals A and B.



Ans: 3.85 Ω

Homework 1

Find the power dissipated in 1Ω resistor and the power delivered by 10V source using network reduction technique



Ans: $P_{1\Omega}$ = 11.65 W, P_{10V}= 34.2 W