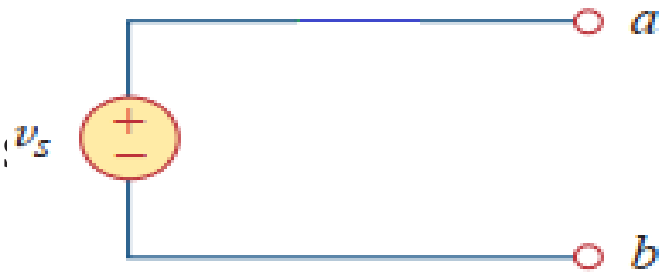
Md. Abdul Malek

Assistant Professor, Dept. of Electrical & Electronic Engineering (EEE)

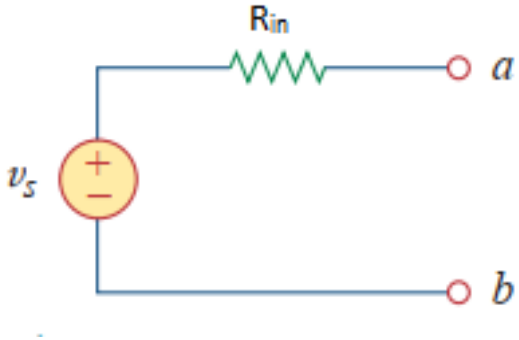
Rajshahi University of Engineering & Technology (RUET)

Source Transformation

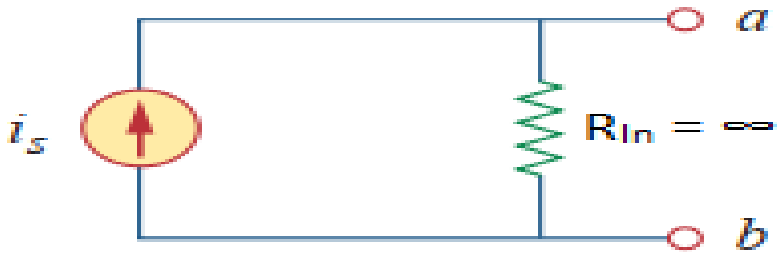
- Ideal voltage source have no internal resistance.



- Practical voltage s ected small internal resistance.



- Idea ve internal resistance. Internal resistance and connected in parallel. Value of internal resi



Source Transformation

- A voltage source in series with a resistor can be transformed to a current source in parallel with a resistor.
- A current source in parallel with a resistor can be transformed to a voltage source in series with a resistor.

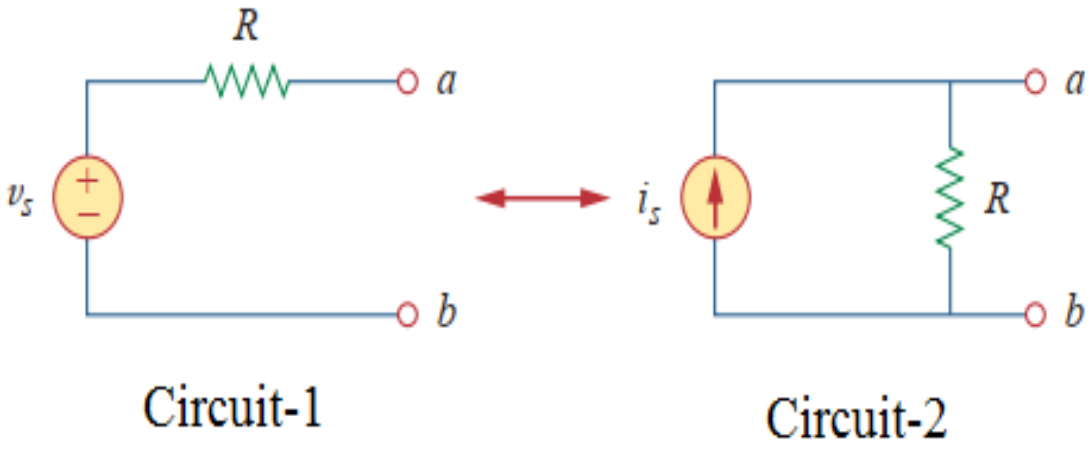
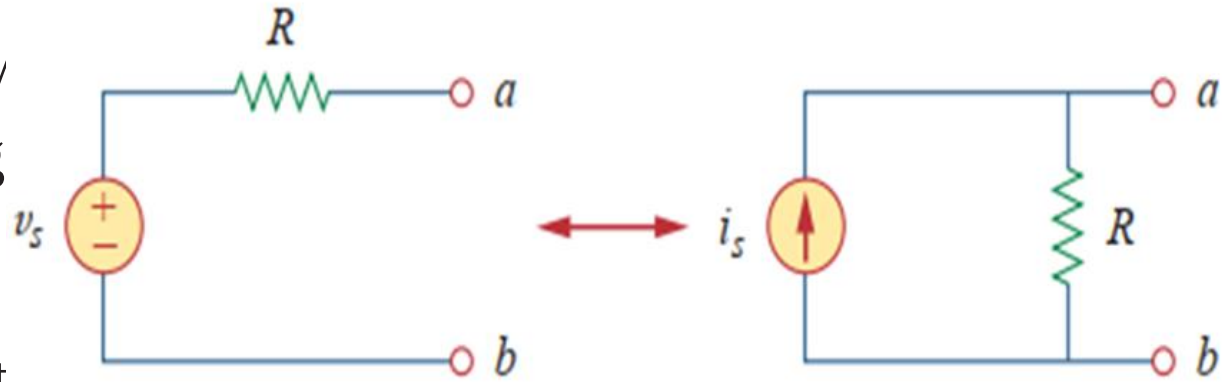


Fig. 4: Transformation of independent sources.

Source Transformation

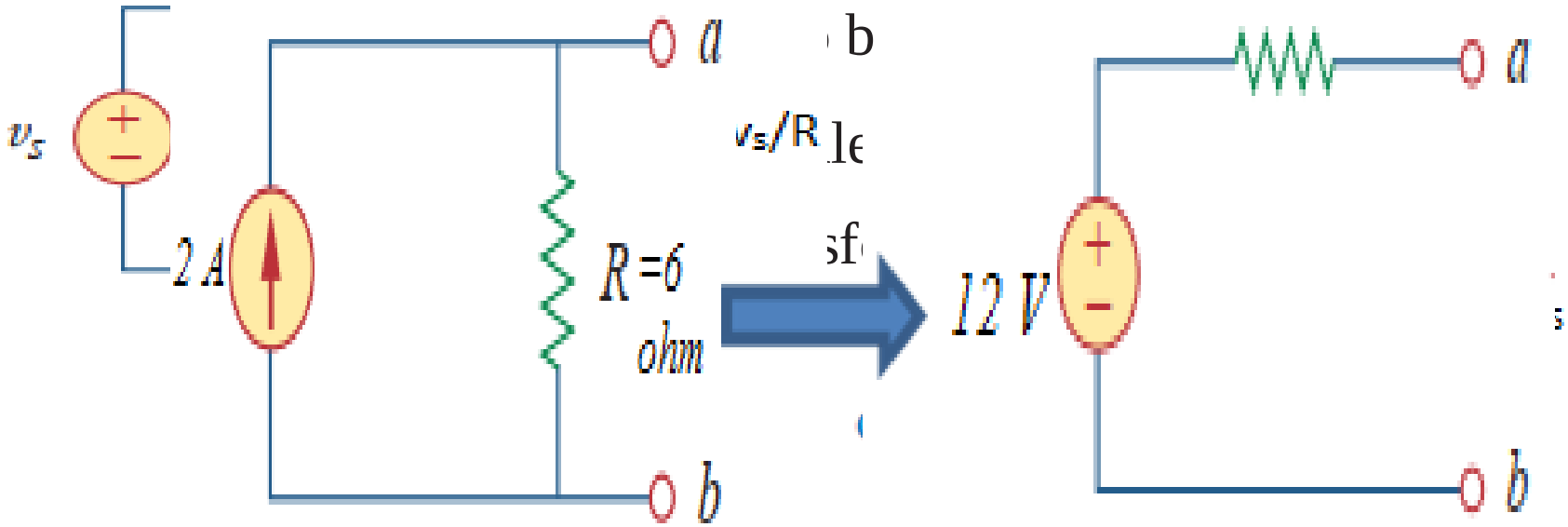
- The tv ıve the same voltag
- When ıd the short-circuit



Circuit-1

$R = 6\ ohm$

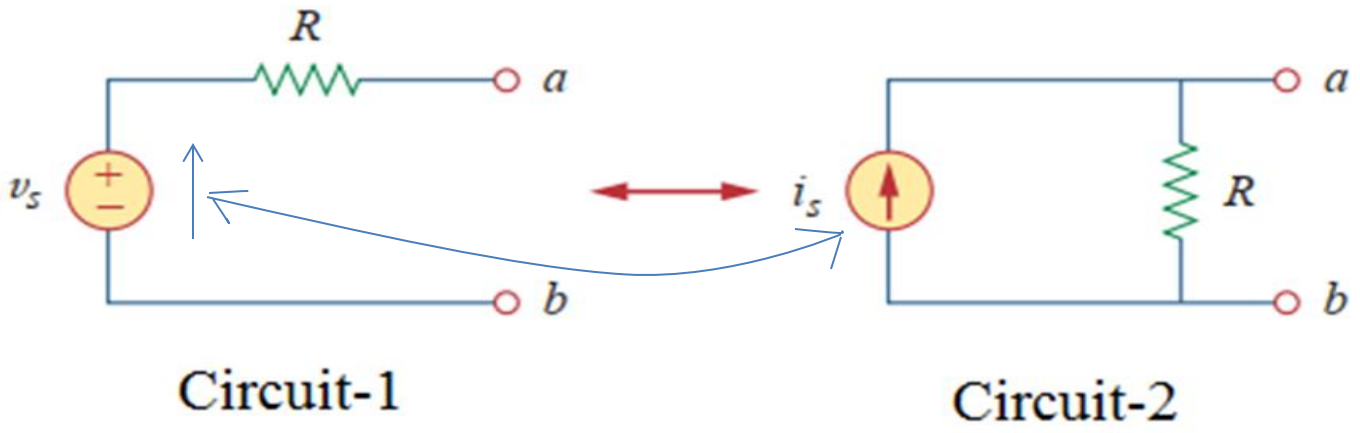
hort-



Source Transformation

A source transformation is the process of replacing a voltage source v_s in series with a resistor R by a current source i_s is in parallel with a resistor R, or vice versa.

- Source transformation is not possible when R=0.
- Arrow of the current source is directed toward the positive terminal of the voltage source.



Source Transformation

Problem: Use source transformation to find v_0 in the circuit of Fig. 5.

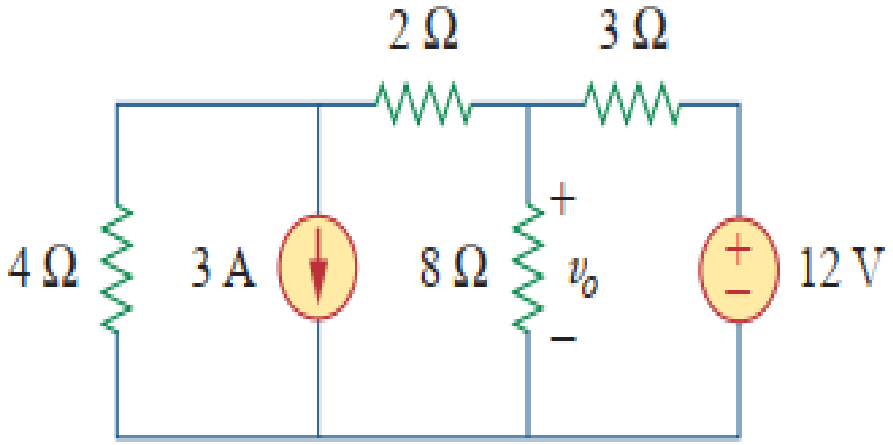


Fig. 5.

Source Transformation

Solution:

- First transform the 3 A current source to voltage sources and 12 V voltage source to current source. This circuit is shown in Fig. 6.

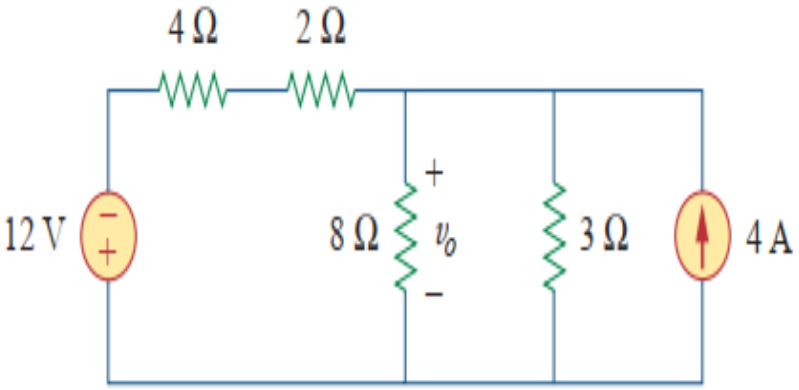
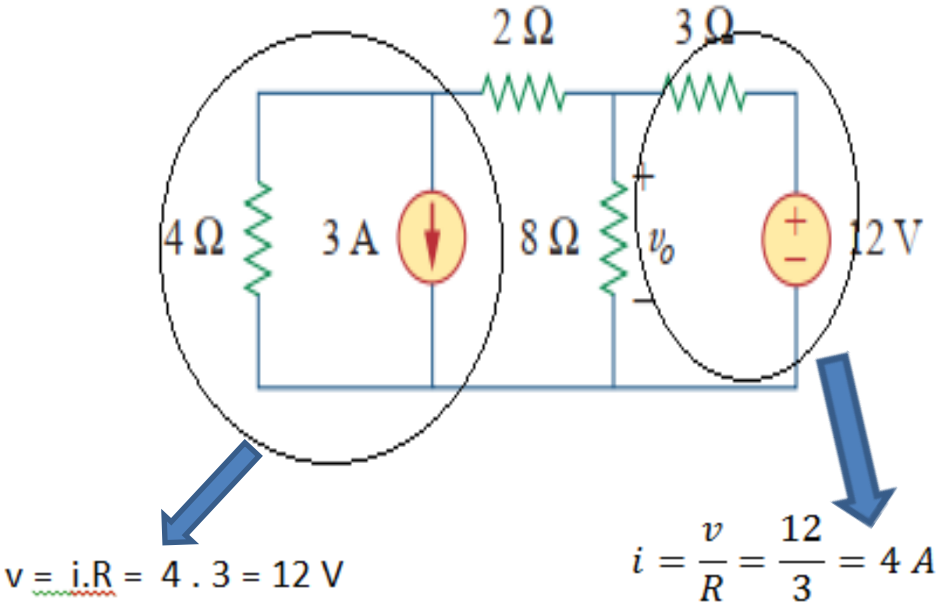


Fig. 6



Source Transformation

- Combining 4 Ω and 2 Ω the resistors and obtain 6 Ω resistors (shown in Fig. 7).

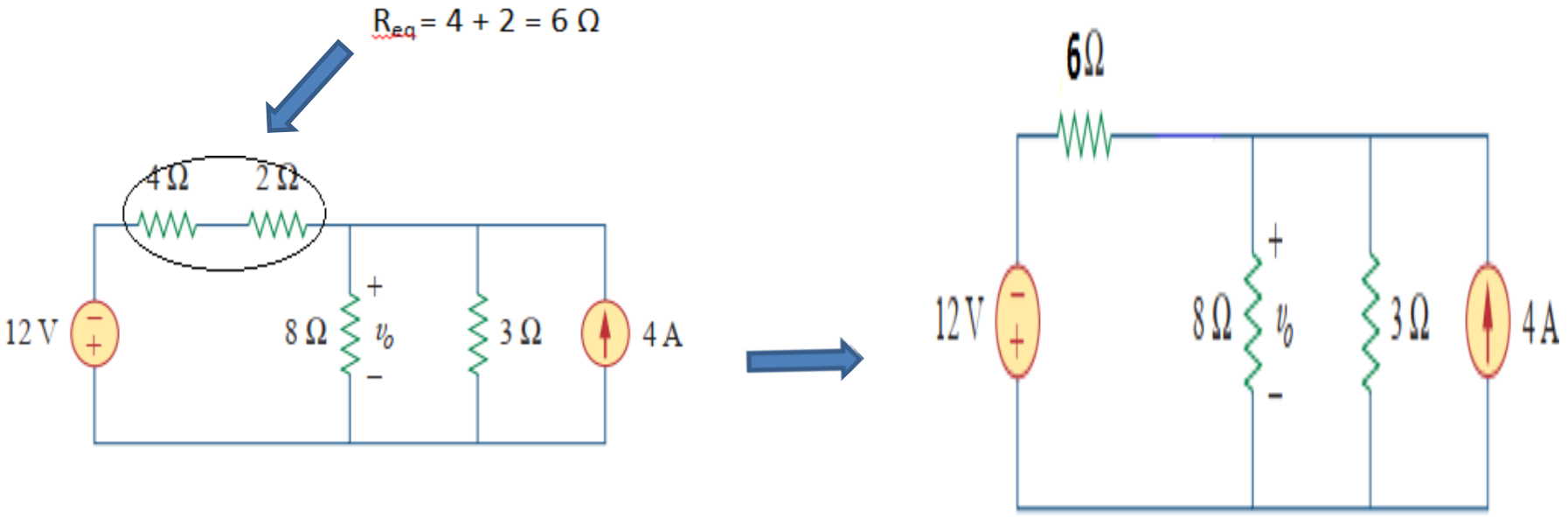
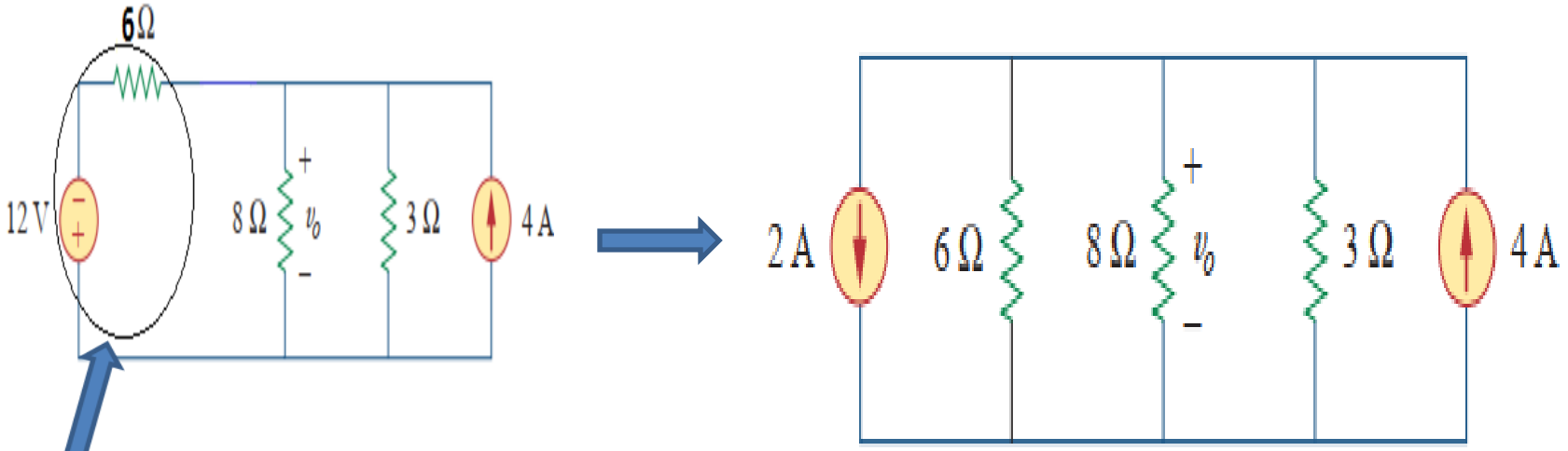


Fig. 7

Source Transformation

Solution:

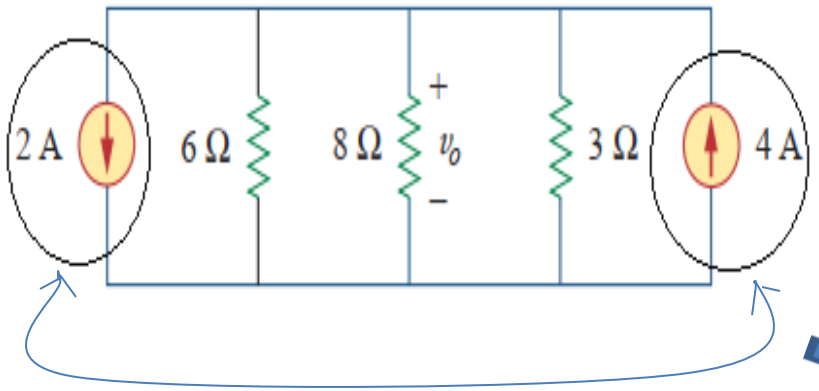
- Transforming the 12-V voltage source and 6 Ω resistor to 2 A Current source in parallel with 6 Ω resistors.



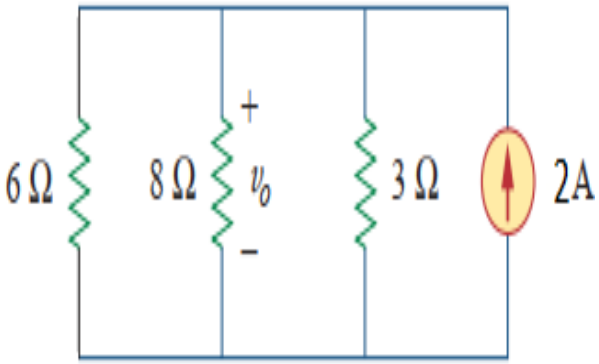
$$i = \frac{v}{R} = \frac{12}{6} = 2\ A$$

Source Transformation

- Combine the 2 A and 4 A current sources to get a 2 A source

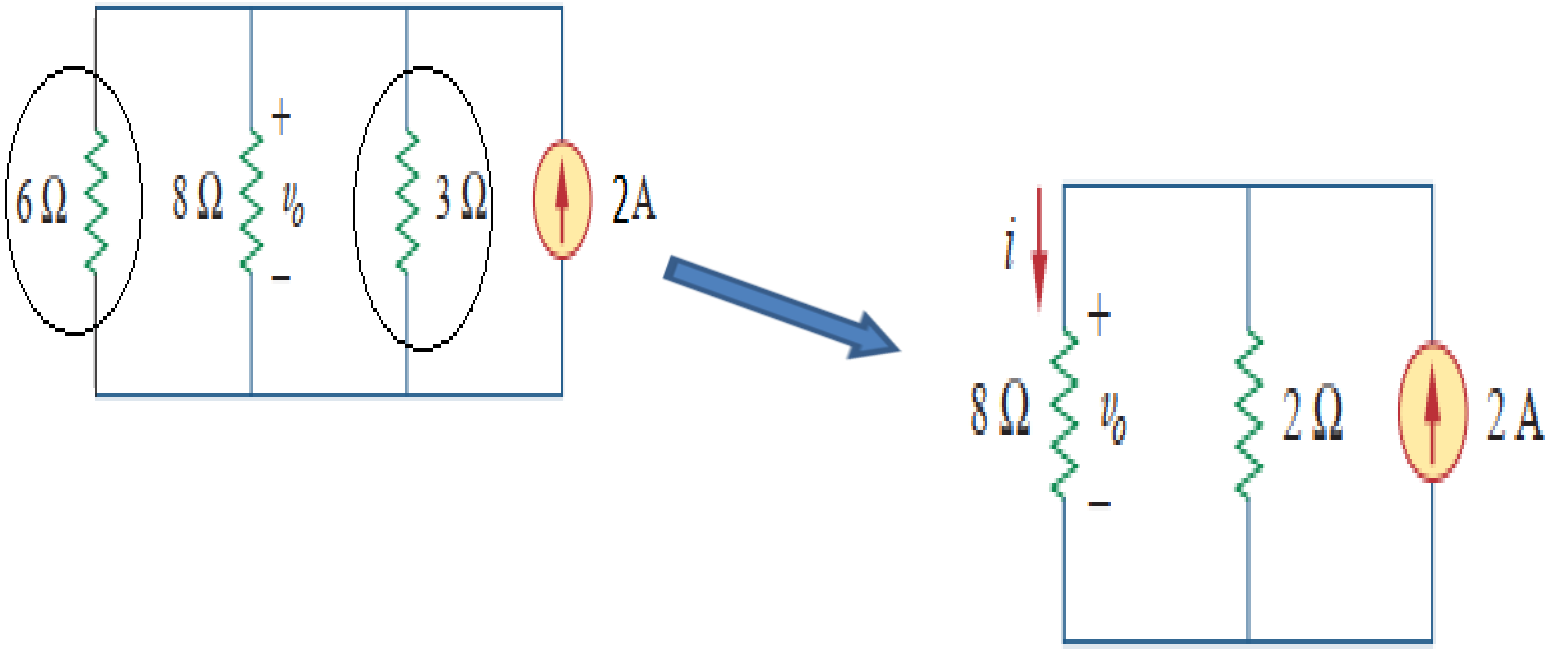


$$i = 4 - 2 = 2\ A$$



Source Transformation

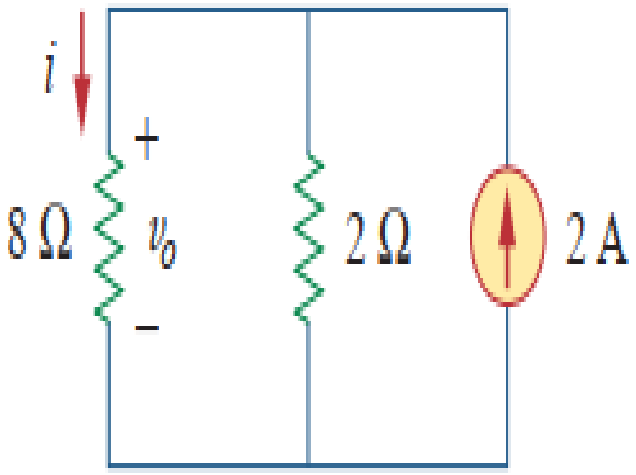
- Combining the parallel connected 6 Ω and 3 Ω the resistors to get 2 Ω resistors.



Source Transformation

- We use current divider rule to get i

$$i = \frac{2}{2+8}(2) = 0.4\ \text{A}$$



- Voltage v_0 is

$$v_0 = 8i = 8(0.4) = 3.2\ \text{V}$$

Thank You