Special Case:

If $R_1 = R_2 = R_3 = R$ or $R_A = R_B = R_C = R$

then,

$$R_A = \frac{R_1 R_2 + R_1 R_3 + R_2 R_3}{R_1} = \frac{3R^2}{R} = 3R$$

$$\therefore R_A = 3R = R_B = R_C.$$

So, $R_\Delta = 3R_Y$

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Ideal Sources

Ideal sources are the imaginary electrical sources that provided constant voltage or current and don't have any internal resistance.

Non-ideal sources

Non-ideal ~~er~~ sources are the practical electrical sources that have internal ~~voltage~~ resistance and show small voltage drop is observed across them.

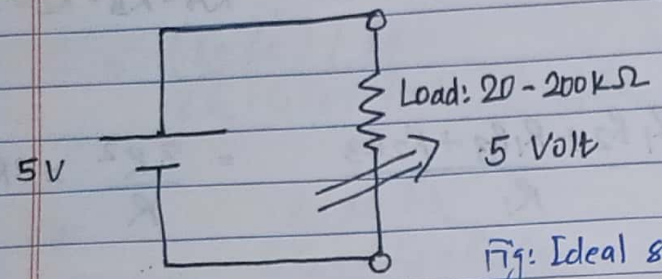
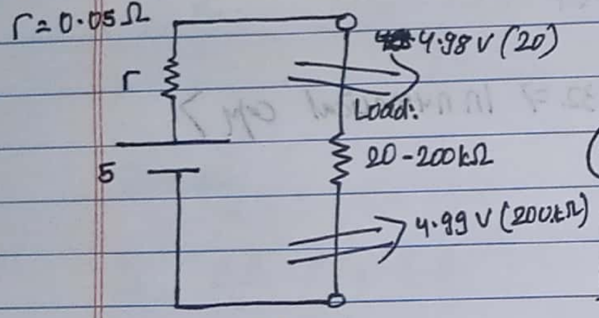
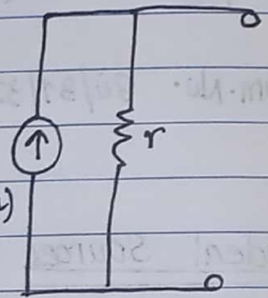


Fig: Ideal source.





(1)

Fig: Non-ideal voltage source

Fig: Non-ideal current source.

In voltage source, the internal resistance connected is in series and small.

In current source, the internal resistance is connected in parallel and large.

We cannot convert ideal circuit from one to another.

In non-ideal sources, ~~to~~ non-ideal voltage source can be converted to non-ideal current source and vice-versa.

For figure (1):

For 20 Ω

$I_{out} = \frac{5V}{20 + 0.05}$

$= 0.25\ A$

$V_{out} = 5V - 0.05 \times 0.25$

$= 4.98\ V.$

For 200 kΩ

$I_{out} = \frac{5V}{200 \times 10^3 + 0.05}$

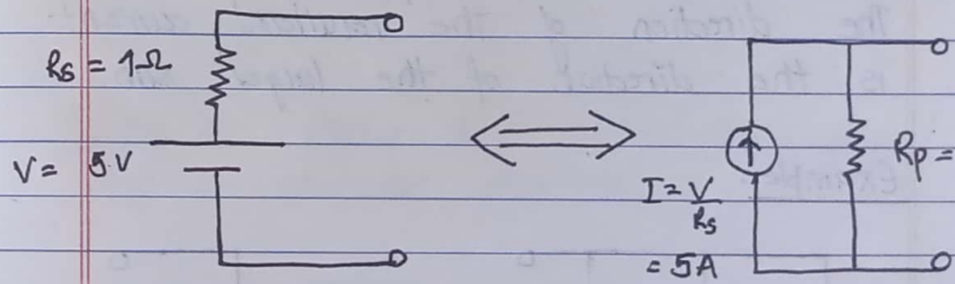
$= 2.5 \times 10^{-5}$

$= 0.025\ mA$

$V_{out} = 5V - 0.05 \times 2.5 \times 10^{-5}$

$= 4.99\ V.$

*) Conversion of voltage source to current source

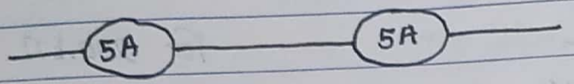


V ⟷ I/R

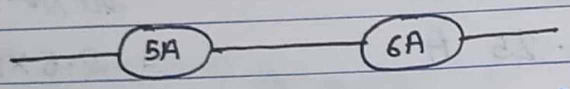
Rs = Rp.

*) Current sources

For current sources, only same current source can be connected in series.



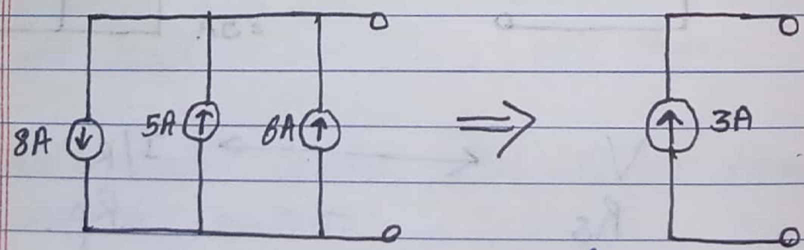
(Possible)



(impossible) {disobey KCL}

If the current sources are connected in parallel, the current sources with same direction are added and then subtracted with the opposite direction. The direction of the resultant current is the direction of the largest sum.

Example:



$I_R = (5+6) - 8$
$= 3A\ (\uparrow)$

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Mesh Analysis

Mesh analysis is a method that is used solve planar circuits for any currents at any place in electrical circuit using KVL.

Steps to solve:

→ Step 1: Assign a distinct current in the clockwise direction to each independent closed loop of the network.

→ Step 2: Indicate the polarities within each loop for each resistor as determined by the assumed direction of loop current for the loop.

→ Step 3: Apply KVL around each closed loop in clockwise direction

a): If a resistor has two or more assumed currents through it, the total current through the resistor is the assumed current of the loop in which KVL is being applied plus the assumed current of the other loops passing through in the same direction minus the assumed current through in the opposite direction.

b) The polarity of a voltage source is unaffected by the direction of the assigned loop currents.

→ Step 4: Solve the resulting simultaneous linear equations for the assumed loop currents.

<Num. No 34 ~~→ In numeri~~ |35|36|37 = In num copy>