

## Unit I: DC Circuits

### Notes Class- 4

### Concepts of Open Circuit & Short Circuit:

#### Open Circuit:

An open circuit is characterised by Infinite resistance and hence zero current through it. It is represented as shown below:



Voltage across the Open Circuit can be any finite value.

#### Short Circuit:

A short circuit is characterised by zero resistance and hence zero voltage across it. It is represented as shown below:



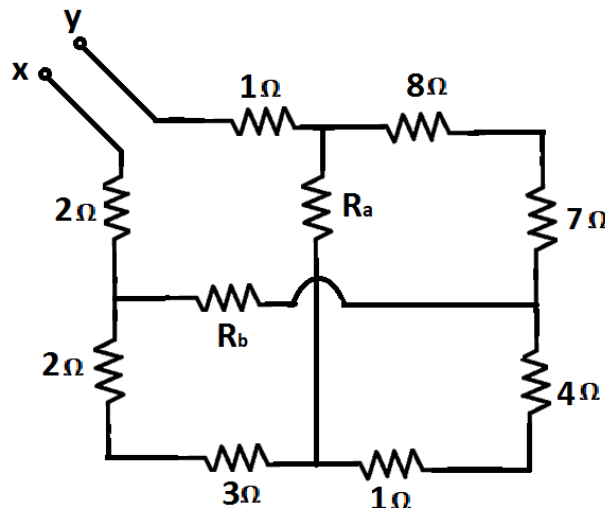
Current through a short circuit can be any finite value.

Current through a Dead Short Circuit is dangerously high.

**Numerical Example: Find the equivalent resistance between X & Y if**

i)  $R_a = \infty$  &  $R_b = \infty$  ii)  $R_a = 0$  &  $R_b = \infty$  iii)  $R_a = \infty$  &  $R_b = 0$

iv)  $R_a = 0$  &  $R_b = 0$

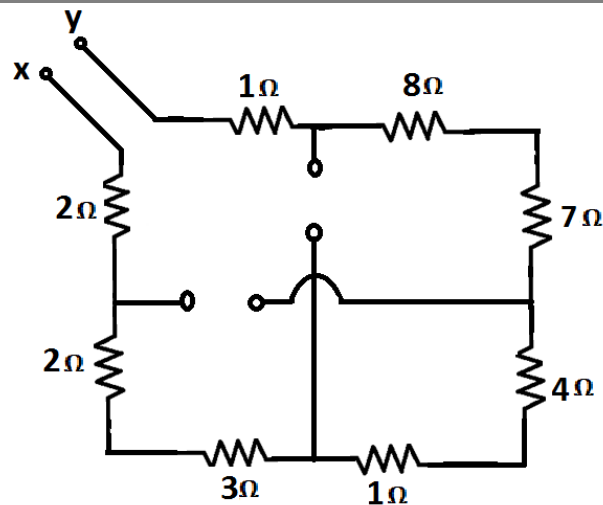


#### Solution:

**Case i)  $R_a = \infty$  &  $R_b = \infty$**

Here, both  $R_a$  and  $R_b$  have been replaced by infinite resistance i.e., open circuit.

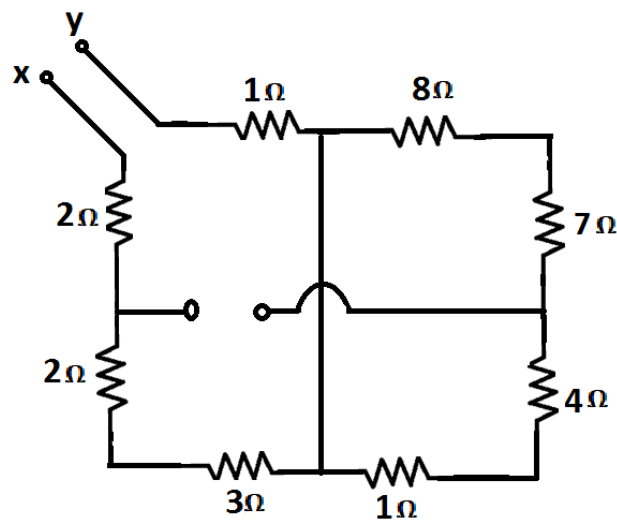
## Unit I: DC Circuits



It can be observed that all the resistors are in series. Hence,  $R_{XY} = 28\Omega$ .

**Case ii)  $R_a = 0$  &  $R_b = \infty$**

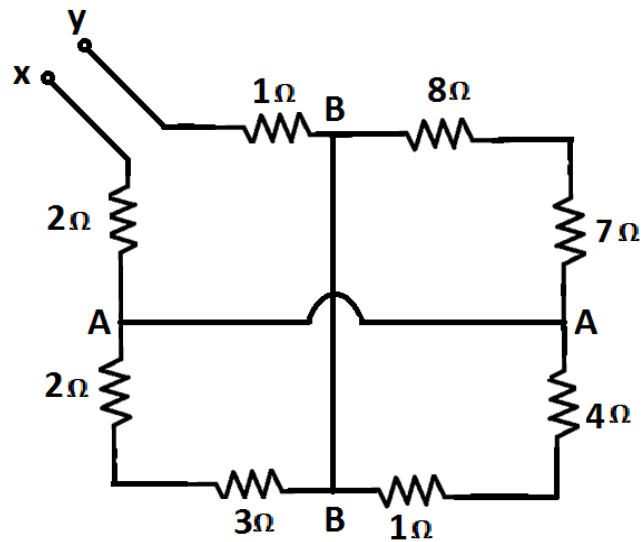
In this case, replace  $R_a$  with zero resistance i.e., short circuit and  $R_b$  with infinite resistance, i.e., open circuit.



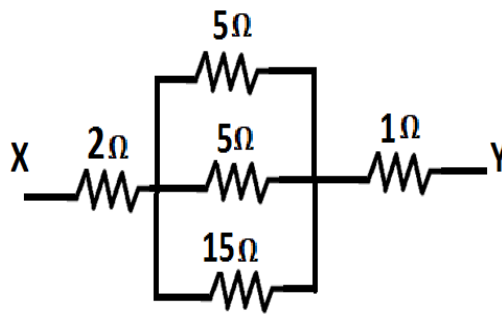
Case iii) can be solved on the similar lines as case ii). By solving,  $R_{XY} = 18\Omega$ .

**Case iv)  $R_a = 0$  &  $R_b = 0$**

## Unit I: DC Circuits



Rearranging this network, it looks as shown below:



Hence,  $R_{xy} = (2\Omega + (5\Omega \parallel 5\Omega \parallel 15\Omega) + 1\Omega) = 5.143\Omega$ .