ELEMENTS OF ELECTRICAL ENGINEERING

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Department of Electrical & Electronics Engineering

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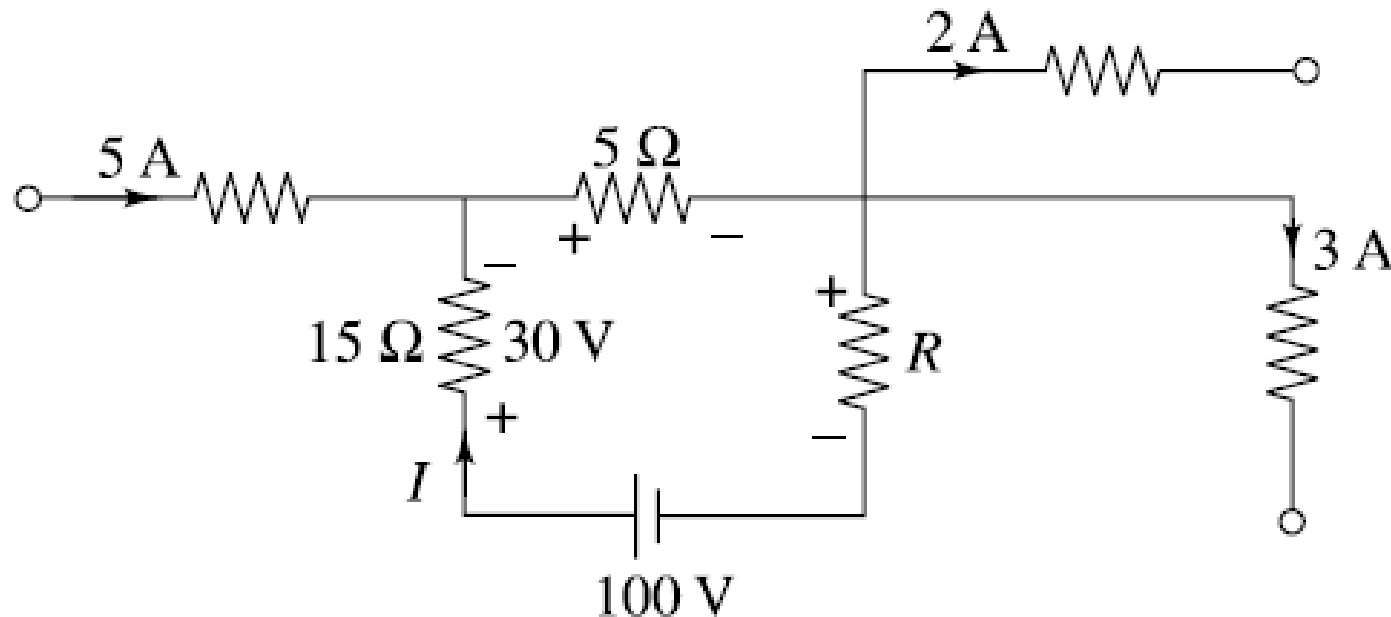## Numerical Examples on Basic Laws

Prof. Jyothi T N & Prof. Kruthika N
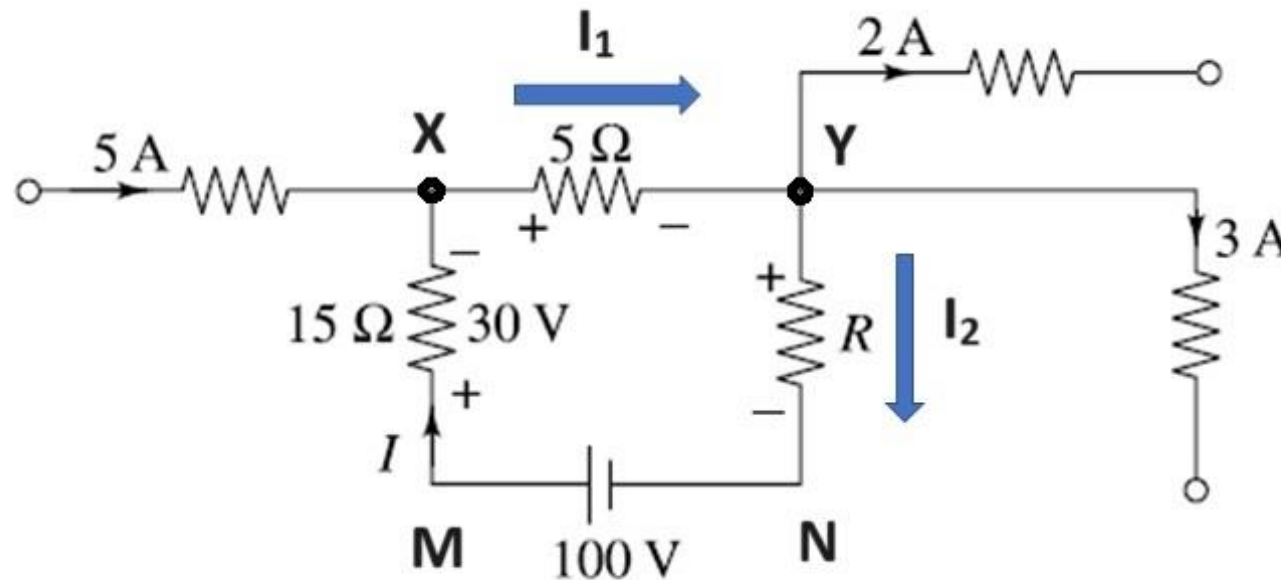
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Question:

Find the value of the unknown resistance R in the given network, if the voltage drop across 15Ω resistor is 30 V, having the polarity as indicated.

Solution: Applying Ohm's Law, current through 15Ω resistor is,

$$I = \frac{30V}{15\Omega} = 2A$$

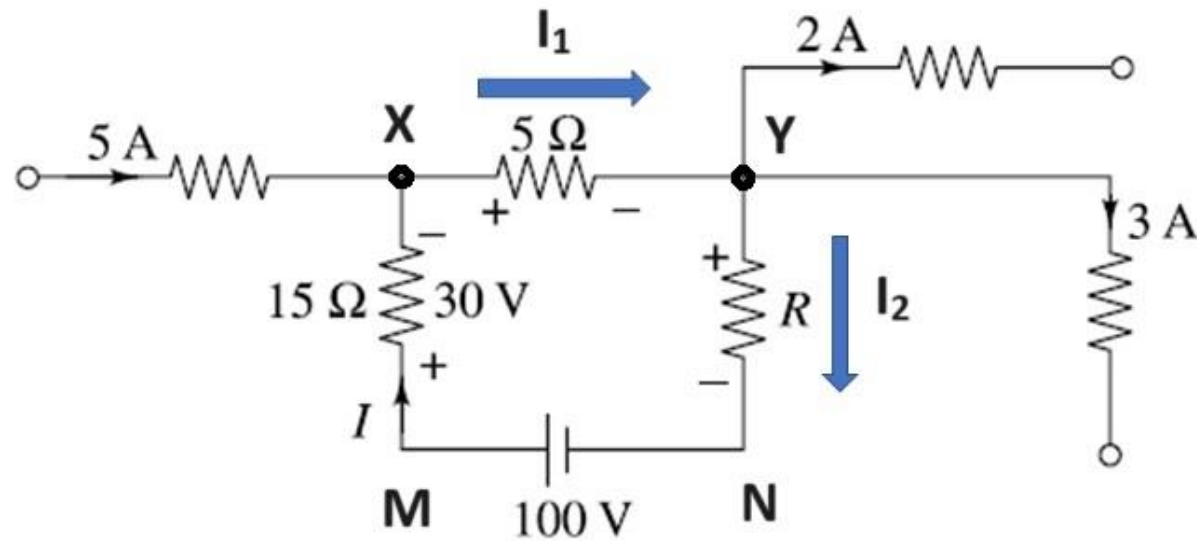By KCL at node X, I_1 = 5 A + 2 A = 7 A

By KCL at node Y, I_2 = 7 A - 2 A − 3 A= 2 A
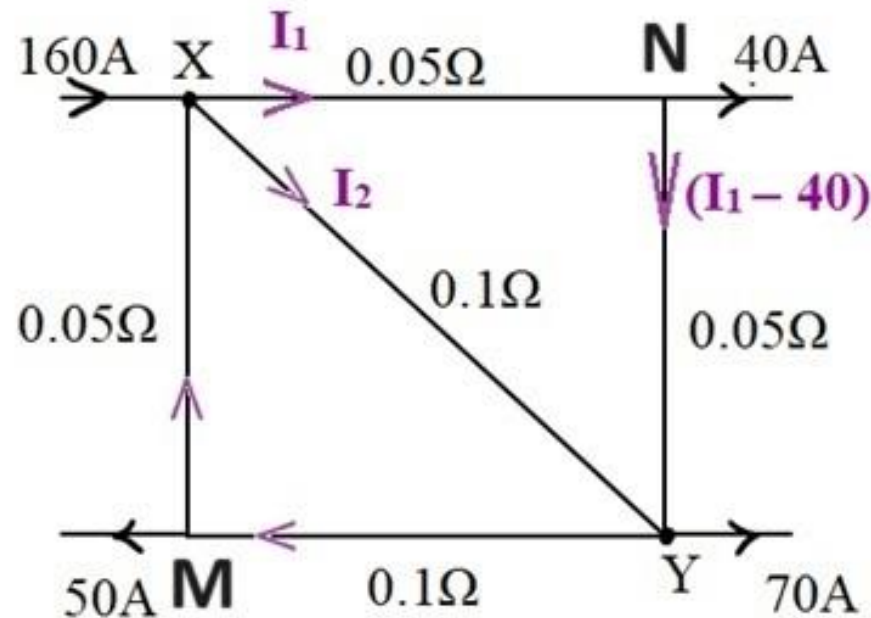
By KVL in the path XYNMX, $-5*I_1 - R*I_2 + 100 - 30 = 0$

Solving, **R = 17.5 Ω**

Question:

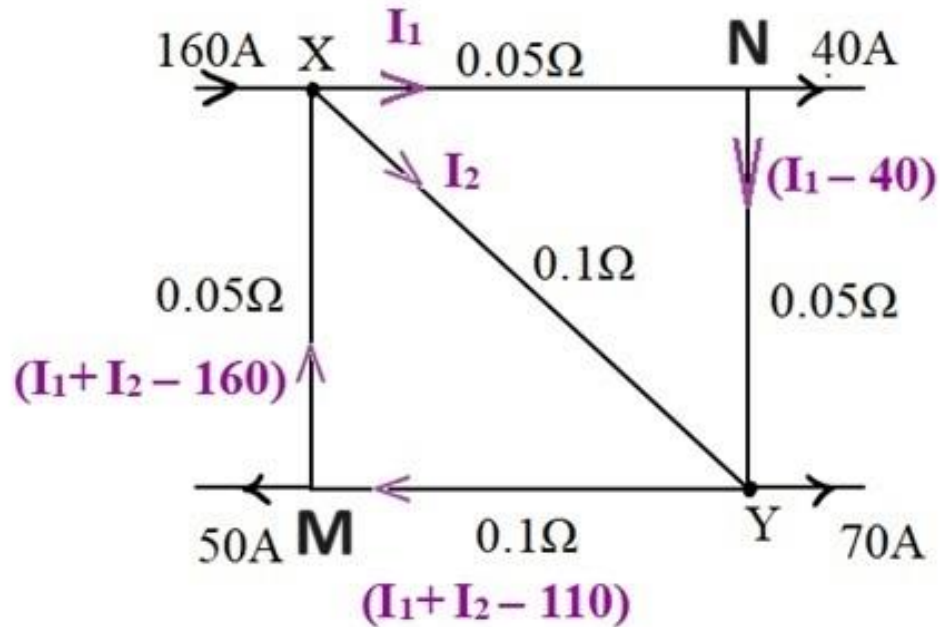**By using Kirchhoff's laws, Find the current in branch XY for the given circuit.**
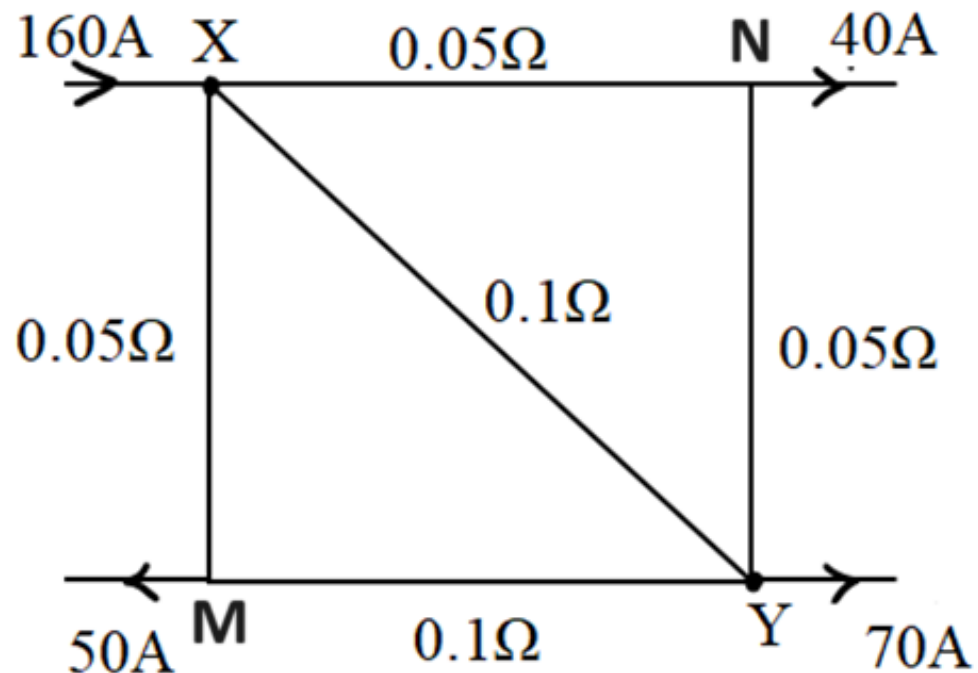
Solution: Let us consider current in branch XN as I_1 and branch XY as I_2

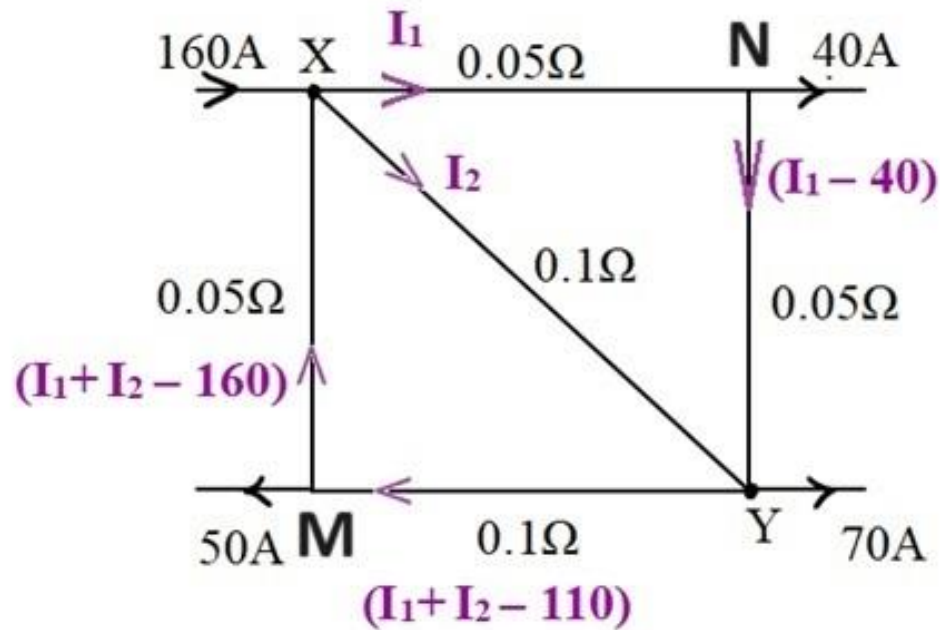By KCL at N, current in branch NY will be (I_1 - 40)

By KCL at Y, current in branch YM will be ($I_1 + I_2 - 110$)

By KCL at M, current in branch MX will be ($I_1 + I_2 - 160$)

By KVL in the path XNYX, $-0.05*I_1 - 0.05*(I_1 - 40) + 0.1*I_2 = 0$

By KVL in the path XYMX,

$-0.1*I_2 - 0.1*(I_1 + I_2 - 110) + 0.05*((I_1 + I_2 - 160) = 0$

By Solving above KVL equations, $I_{XY} = I_2 = \textbf{40 A}$

Text Book:

1."Basic Electrical Engineering", D. C. Kulshreshta, 2ndEdition, McGraw-Hill. 2019

Reference Books:

1. "Engineering Circuit Analysis" William Hayt, Jack Kemmerly, Jamie Phillips and Steven Durbin, 10th Edition McGraw Hill, 2023

2. "Electrical and Electronic Technology" E. Hughes (Revised by J. Hiley, K. Brown & I.M Smith), 12th Edition, Pearson Education, 2016.

THANK YOU

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