ELEMENTS OF ELECTRICAL ENGINEERING

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Numerical Examples on Thevenin's Theorem

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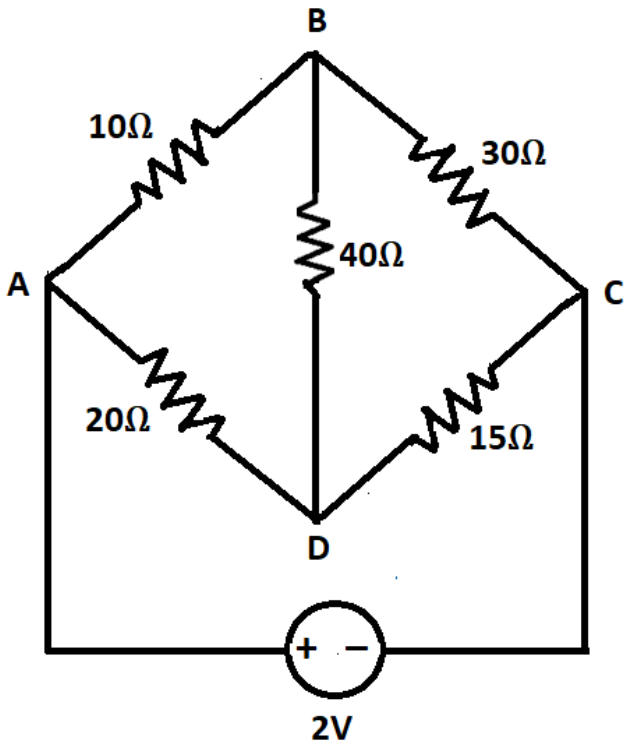
Numerical Example 1

Question:

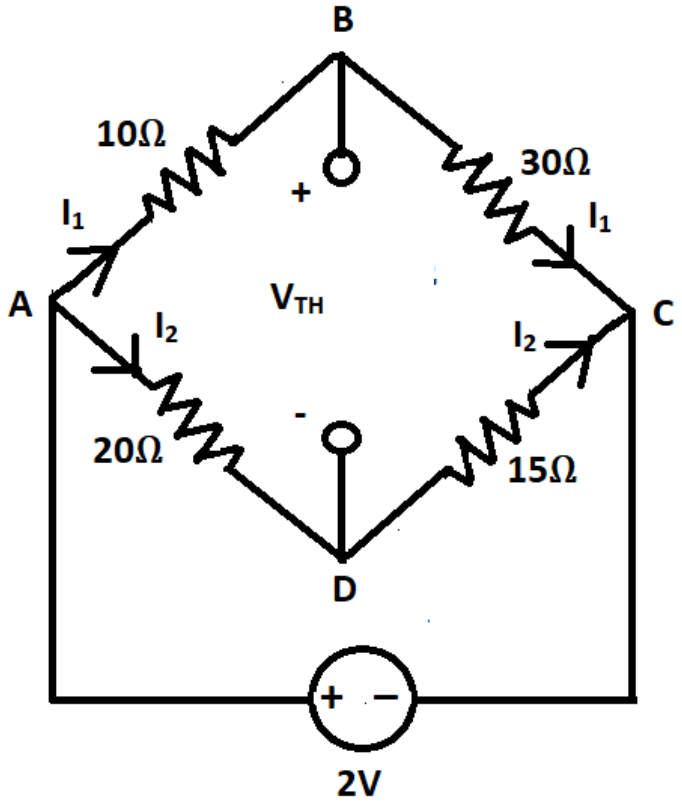
Using Thevenin's Theorem, find the magnitude and direction of current in the branch BD in the network shown.



Numerical Example 1

Solution :

Finding V_{TH} :



$I_1 = \frac{2V}{40\Omega} = 0.05A$; $I_2 = \frac{2V}{35\Omega} = 0.057A$

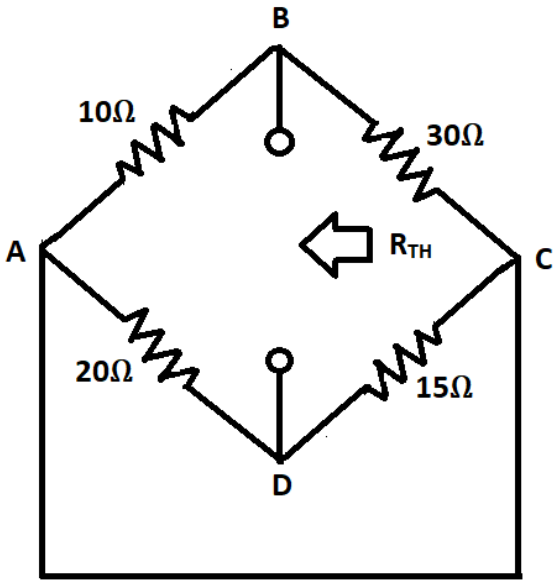
By KVL (ABDA), $-10*I_1 - V_{TH} + 20*I_2 = 0$

$V_{TH} = 0.64V$

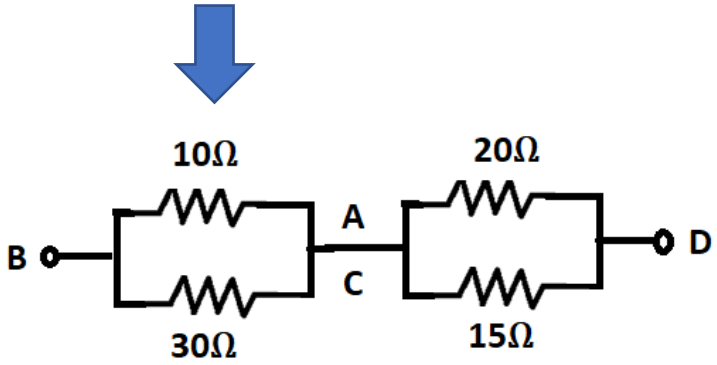
Numerical Example 1

Solution (Continued..) :

Finding R_{TH} :



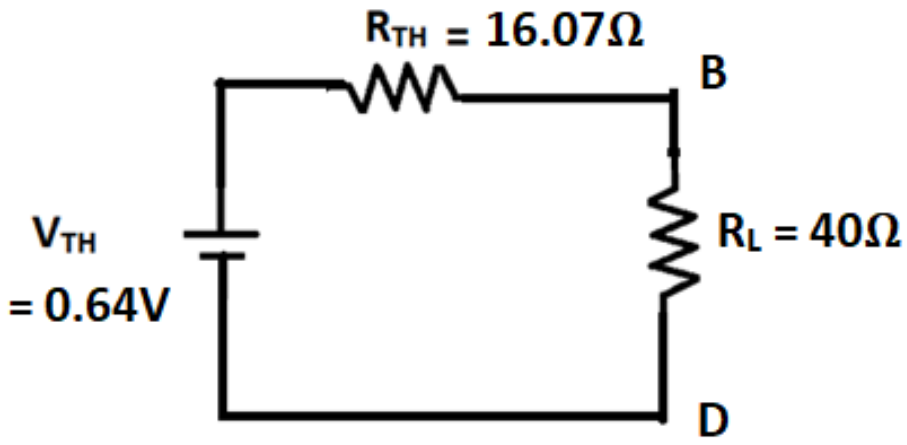
$R_{TH} = (10\Omega \text{ II } 30\Omega) + (20\Omega \text{ II } 15\Omega) = 16.07\Omega$



Numerical Example 1

Solution (Continued..) :

Thevenin's Equivalent Circuit:



$$I_L = \frac{V_{TH}}{R_{TH}+R_L}$$

Hence, current through the branch BD is 11.41mA and flows from terminal B to terminal D

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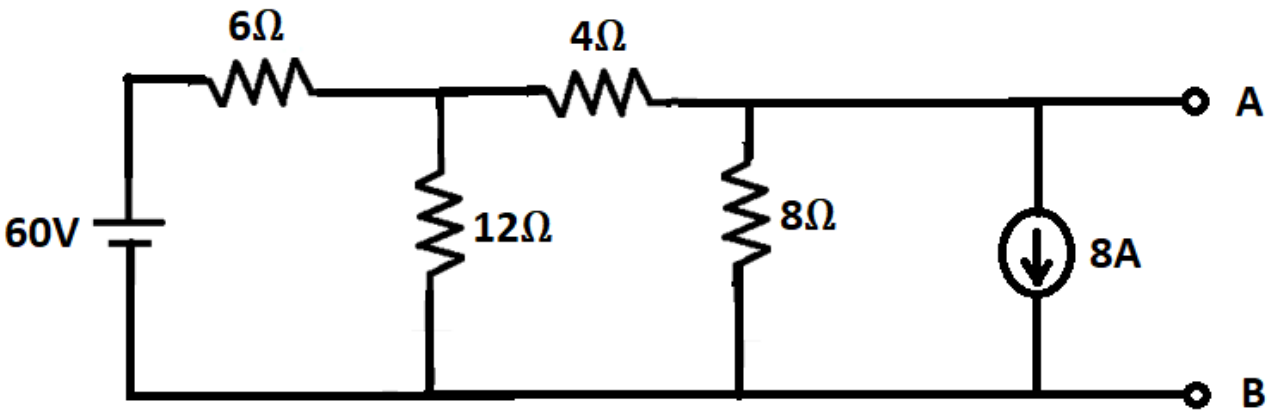
Numerical Example 2

Question:

Obtain the Thevenin's Equivalent across the terminals A & B for the network given.



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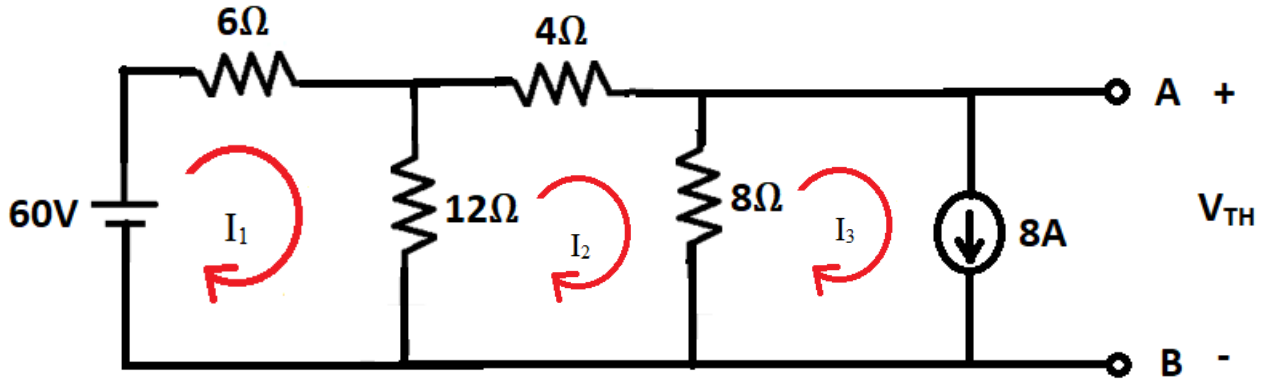
Numerical Example 2

Solution :

Finding V_{TH} :



KVL (Mesh 1) : $18I_1-12I_2-0I_3 = 60$ ---- (1)

KVL (Mesh 2) : $-12I_1+24I_2-8I_3 = 0$ ---- (2)

Current Equation(Mesh 3) : $I_3 = 8$ ---- (3)

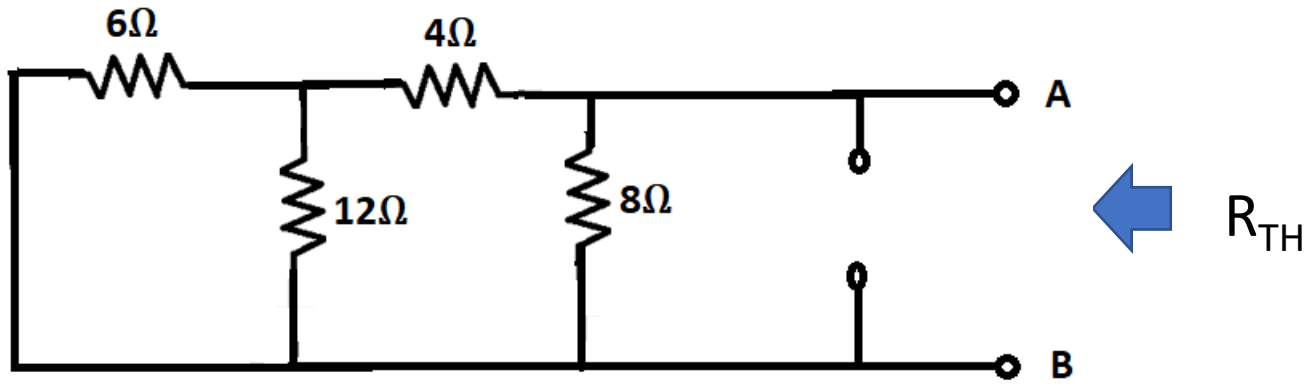
Solving (1), (2) & (3), $I_1 = 7.66A$; $I_2 = 6.5A$

$V_{TH} = (I_2-I_3)*8\Omega = -12V$

Numerical Example 2

Solution (Continued..) :

Finding R_{TH} :

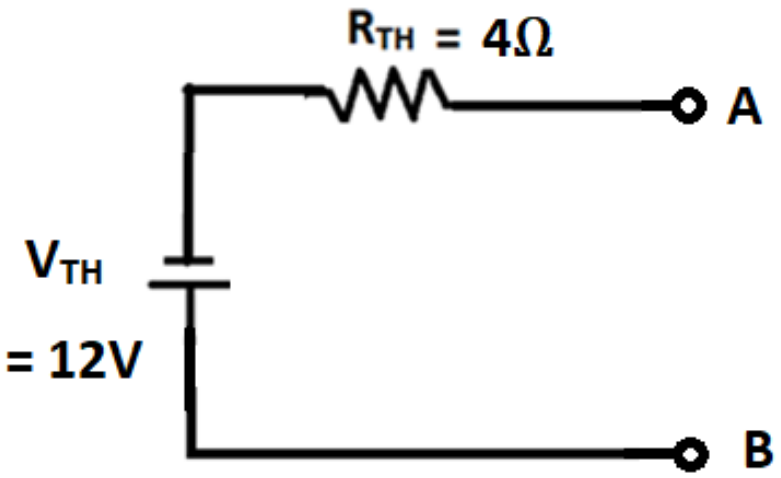


$R_{TH} = \{(6\Omega \text{ II } 12\Omega) + 4\Omega) \text{ II } 8\Omega\} = 4\Omega$

Numerical Example 2

Solution (Continued..) :

Thevenin's Equivalent Circuit:



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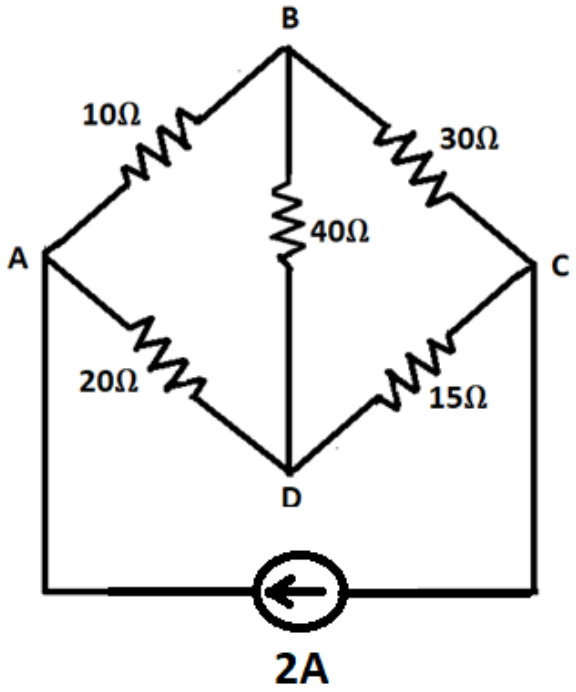
Assignment Question

Question:

Using Thevenin's Theorem, find the magnitude and direction of current in the branch BD in the network shown.



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Text Book & References

Text Book:

"Electrical and Electronic Technology" E. Hughes (Revised by J. Hiley, K. Brown & I.M Smith), 11th Edition, Pearson Education, 2012.

Reference Books:

1. "Basic Electrical Engineering", K Uma Rao, Pearson Education, 2011.
2. "Basic Electrical Engineering - Revised Edition", D. C. Kulshreshta, Tata- McGraw-Hill, 2012.
3. "Engineering Circuit Analysis", William Hayt Jr., Jack E. Kemmerly & Steven M. Durbin, 8th Edition, McGraw-Hill, 2012.

THANK YOU

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