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*مقاطع فيديوهات لشرح المقرربشكل وافي
*ملخص للمادة للمراجعة النهائية
*محاضرات مباشرة على برنامج Zoom
*تواصل مستمر مع معلم المادة للمناقشة
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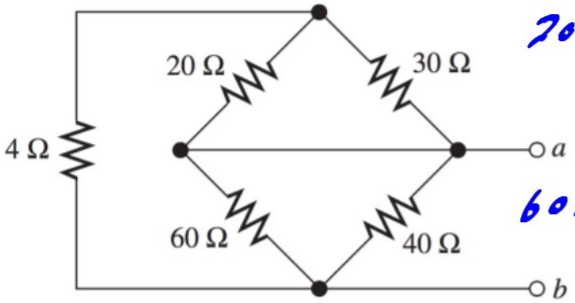
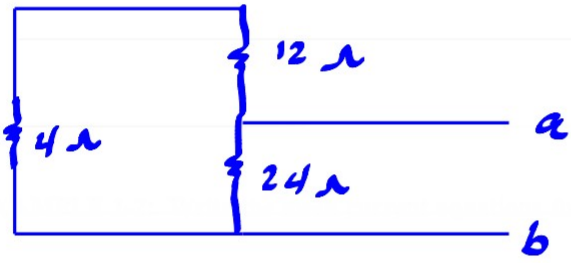
Assignment #2 – AE 232

1- Find the equivalent resistance at terminals a and b.



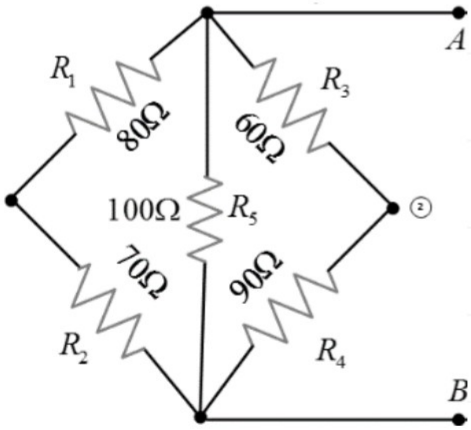
$20\Omega \,//\, 30\Omega = \frac{20*30}{20+30} = 12\Omega$

$60\Omega \,//\, 40\Omega = \frac{60*40}{60+40} = 24\Omega$



$(12+4) \,//\, 24 = \frac{16*24}{16+24}$

$R_{ab} = 9.6\Omega$



$(R_1+R_2) \,//\, R_5 \,//\, (R_3+R_4)$

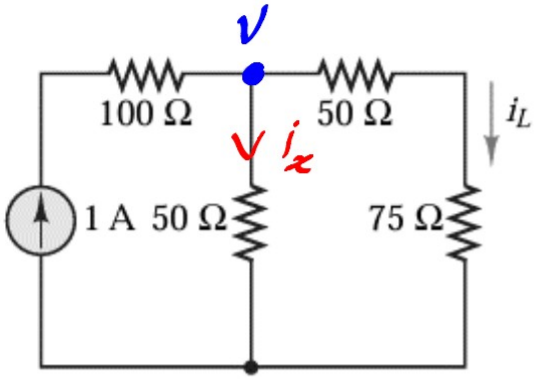
$(80+70) \,//\, 100 \,//\, (60+90)$

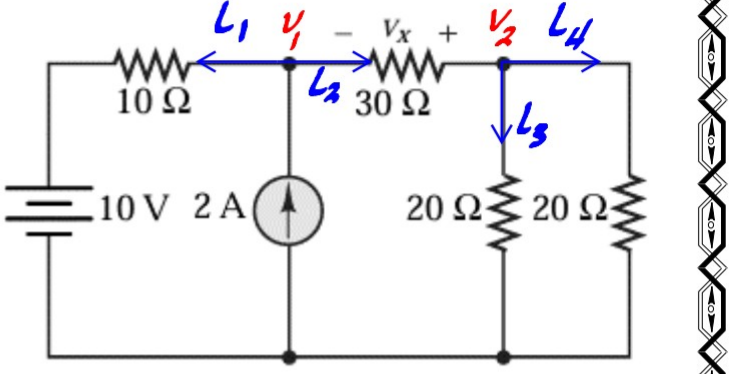
$R_{AB} = \frac{1}{\frac{1}{150}+\frac{1}{100}+\frac{1}{150}} = 42.86\Omega$

2-

Find the current i_L in the circuit shown on the left, using the node voltage method.

Find the voltage v_x by the node voltage method for the circuit shown on the right.





apply N.V.M

$$1 = i_x + i_l$$

$$1 = \frac{V}{50} + \frac{V}{50+75}$$

$$250 = 5V + 2V$$

$$V = 35.71\,V$$

$$i_l = \frac{35.71}{50+75} = 0.2777\,A$$

apply N.V.M at node 1

$$-i_1 + 2 - i_2 = 0$$

$$-\frac{V_1 - 10}{10} + 2 - \frac{V_1 - V_2}{30} = 0 \quad *30$$

$$-3V_1 + 30 + 60 - V_1 + V_2 = 0$$

$$-4V_1 + V_2 = -90 \longrightarrow (1)$$

apply N.V.M at node 2

$$i_2 - i_3 - i_4 = 0$$

$$\frac{V_1 - V_2}{30} - \frac{V_2}{20} - \frac{V_2}{20} = 0 \quad *60$$

$$2V_1 - 8V_2 = 0 \longrightarrow (2)$$

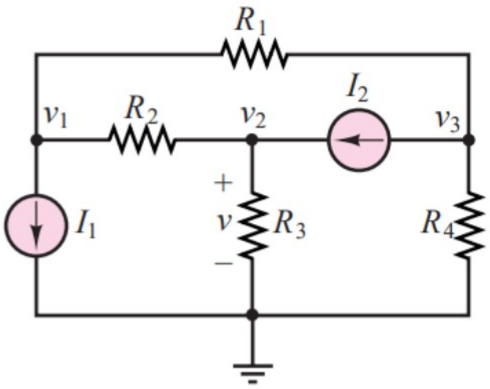
$$V_1 = 24\,V,\ V_2 = 6\,V$$

$$V_x = V_2 - V_1 = 6 - 24 = -18\,V$$

EXAMPLE 3.5

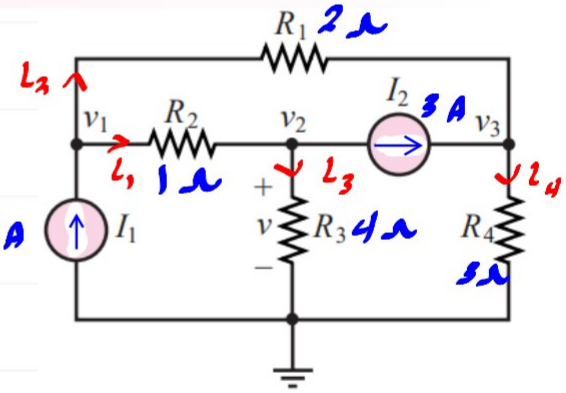
Problem

Use the node voltage analysis to determine the voltage v in the circuit of Figure 3.9. Assume that $R_1 = 2\ \Omega$, $R_2 = 1\ \Omega$, $R_3 = 4\ \Omega$, $R_4 = 3\ \Omega$, $I_1 = 2$ A, and $I_2 = 3$ A.



Repeat the exercise of Example 3.5 when the direction of the current sources becomes the opposite. Find v.

Answer: $v = 0.4$ V



apply N.V.M at node 1

$2 - I_1 - I_2 = 0$

$2 - \frac{v_1 - v_2}{1} - \frac{v_1 - v_3}{2} = 0$

$-3v_1 + 2v_2 + v_3 = -4 \rightarrow (1)$

apply N.V.M at node 2

$I_1 - I_3 - 3 = 0$

$\frac{v_1 - v_2}{1} - \frac{v_2}{4} - 3 = 0$

$4v_1 - 5v_2 = 12 \rightarrow (2)$

apply N.V.M at node 3

$I_2 + 3 - I_4 = 0$

$\frac{v_1 - v_3}{2} + 3 - \frac{v_3}{3} = 0$

$3v_1 - 5v_3 = -18 \rightarrow (3)$

$v_1 = 3.5V$, $v_2 = 0.4V$

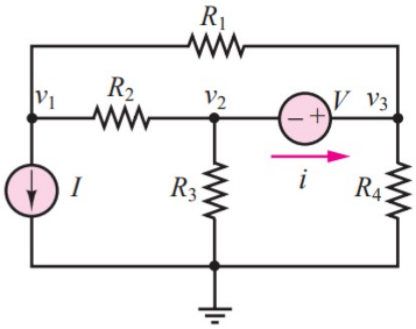
, $v_3 = 5.7V$

$V = v_2 = 0.4V$

EXAMPLE 3.6

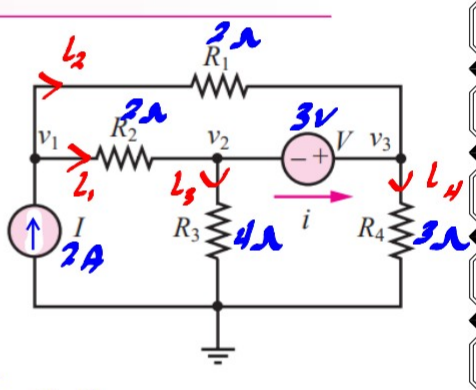
Problem

Use node analysis to determine the current i flowing through the voltage source in the circuit of Figure 3.11. Assume that $R_1 = 2\ \Omega$, $R_2 = 2\ \Omega$, $R_3 = 4\ \Omega$, $R_4 = 3\ \Omega$, $I = 2$ A, and $V = 3$ V.



Repeat the exercise of Example 3.6 when the direction of the current source becomes the opposite. Find the node voltages and i.

Answer: $v_1 = 5.21$ V, $v_2 = 1.71$ V, $v_3 = 4.71$ V, and $i = 1.32$ A



$V_3 - V_2 = 3 \Rightarrow$ super node

$-V_2 + V_3 = 3 \rightarrow (1)$

apply N.V.H at node 1

$2 - I_1 - I_2 = 0 \Rightarrow 2 - \frac{V_1 - V_2}{2} - \frac{V_1 - V_3}{2} = 0$

$-2V_1 + V_2 + V_3 = -4 \rightarrow (2)$

apply N.V.H at node (2)

$I_1 - I_3 - I = 0 \Rightarrow \frac{V_1 - V_2}{2} - \frac{V_2}{4} - I = 0$

$2V_1 - 3V_2 - 4I = 0 \rightarrow (3)$

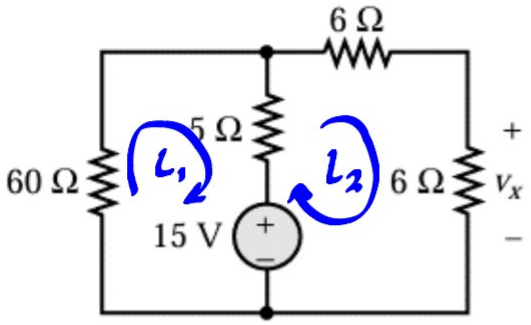
apply N.V.H at node (3)

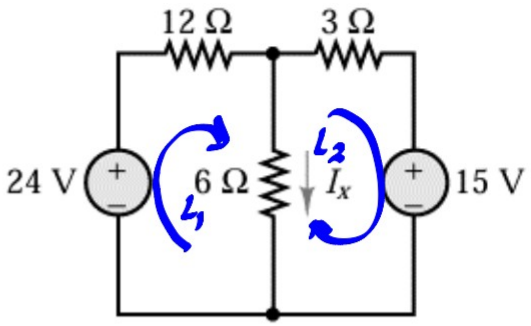
$I_2 + I - I_4 = 0 \Rightarrow \frac{V_1 - V_3}{2} + I - \frac{V_3}{3} = 0$

$3V_1 - 5V_3 + 6I = 0 \rightarrow (4)$

$V_1 = \frac{73}{14}$ V, $V_2 = \frac{12}{7}$ V, $V_3 = \frac{33}{7}$ V, $I = \frac{37}{28}$ A

5- Find the unknown voltage v_x by mesh current analysis in the circuit on the left.
Find the unknown current I_x, using the mesh current method in the circuit on the right.





apply M.C.M at mesh 1

$60I_1 + 5(I_1 - I_2) + 15 = 0$

$65I_1 - 5I_2 = -15 \rightarrow (1)$

apply M.C.M at mesh 2

$-15 + 5(I_2 - I_1) + 6I_2 + 6I_2 = 0$

$-5I_1 + 17I_2 = 15 \rightarrow (2)$

$I_1 = -0.1667\,A = -166.7\,mA$

$I_2 = 0.8333\,A = 833.3\,mA$

$V_x = 6 * 0.8333 = 5V$

apply M.C.M at mesh 1

$-24 + 12I_1 + 6(I_1 - I_2) = 0$

$18I_1 - 6I_2 = 24 \rightarrow (1)$

apply M.C.M at mesh 2

$6(I_2 - I_1) + 3I_2 + 15 = 0$

$-6I_1 + 9I_2 = -15 \rightarrow (2)$

$I_1 = 1A$

$I_2 = -1A$

$I_x = I_1 - I_2 = 2A$