# M R

## Ahmed Mahdy

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| دوائر كهربية | الكـــترونيات |
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## مدرس خصوصي

اونلاين حضوري

يحصل الطالب علي

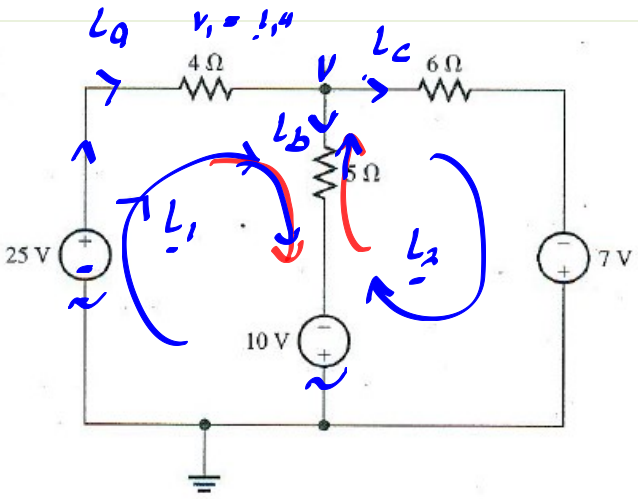
- مقاطع فيديوهات لشرح المقرر بشكل وافي
- ملخص للمادة Pdf للمذكرة والمراجعة
- محاضرات مباشرة علي برنامج زووم
- لمناقشة الأجزاء الغير مفهومة
- تواصل مستمر مع معلم المادة

للتواصل

0567630097

0565657741

## 2-1 Mesh Current Analysis




KVL

apply mesh analysis in mesh 1

$$-25 + 4i_1 + 5(i_1 - i_2) - 10 = 0$$

$$4i_1 + 5i_1 - 5i_2 = 35$$

$$\boxed{9i_1 - 5i_2 = 35 \rightarrow (1)}$$

apply mesh analysis in mesh 2

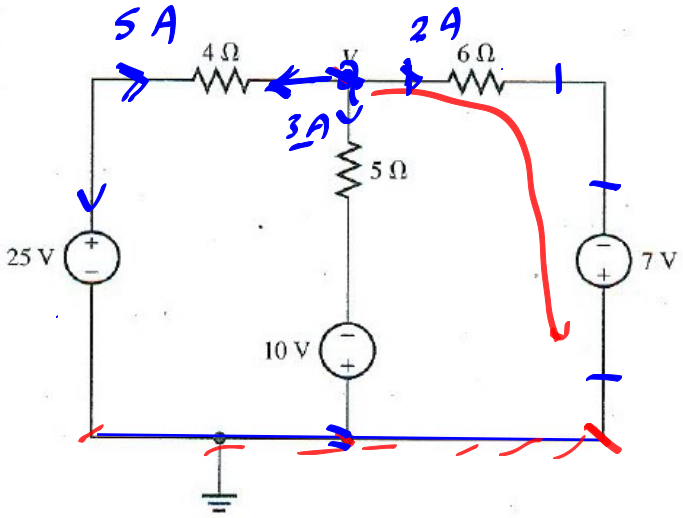
$$10 + 5(i_2 - i_1) + 6i_2 - 7 = 0$$

$$5i_2 - 5i_1 + 6i_2 = -3$$

$$\boxed{-5i_1 + 11i_2 = -3 \rightarrow (2)}$$

$i_1 = 5\ A$ , $i_2 = 2\ A$

$i_a = i_1 = 5\ A$ , $i_c = i_2 = 2\ A$ , $i_b = i_1 - i_2 = 5 - 2 = 3\ A$

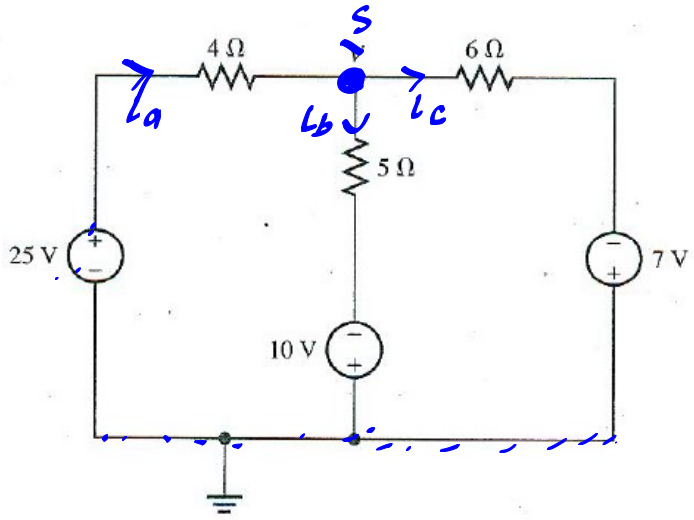



$v = 2 * 6 - 7 = 5\ V$

$v = 3 * 5 - 10 = 5\ V$

$v = -5 * 4 + 25 = 5\ V$

# 2-2 Node Voltage Analysis




نوع الحل
الكفاءة

$$\frac{V-25}{4} + \frac{V+10}{5} + \frac{V+7}{6} = 0$$

$V = 5$ volt

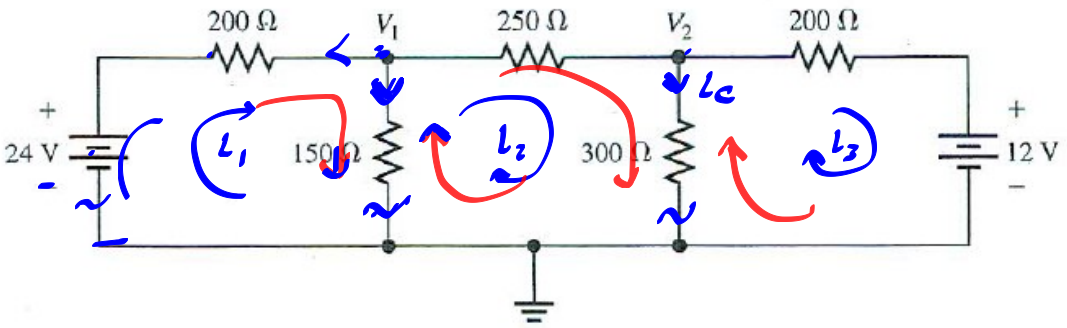
$$I_c = \frac{\Delta V}{R} = \frac{5+7}{6} = 2\ A$$

$$I_b = \frac{5+10}{5} = 3\ A$$

$$I_a = \frac{25-5}{4} = 5\ A$$

**EXAMPLE 2-4** Rework the circuit of Example 2-2 using node voltage analysis.

mesh analysis




apply mesh analysis in mesh (1)

$-24 + 200I_1 + 150(I_1 - I_2) = 0 \Rightarrow 350I_1 - 150I_2 = 24 \rightarrow (1)$

$200I_1 + 150I_1 - 150I_2 = 24$

apply mesh analysis in mesh (2)

$150(I_2 - I_1) + 250I_2 + 300(I_2 - I_3) = 0 \Rightarrow -150I_1 + 700I_2 - 300I_3 = 0 \rightarrow (2)$

apply mesh analysis in mesh 3

$300(I_3 - I_2) + 200I_3 + 12 = 0 \Rightarrow -300I_2 + 500I_3 = -12 \rightarrow (3)$

$I_1 = 0.0715A, \; I_2 = 6.77 \times 10^{-3}A, \; I_3 = -0.0199\,A$

$I_1 = 71.5\,mA, \; I_2 = 6.77\,mA, \; I_3 = -19.9\,mA$

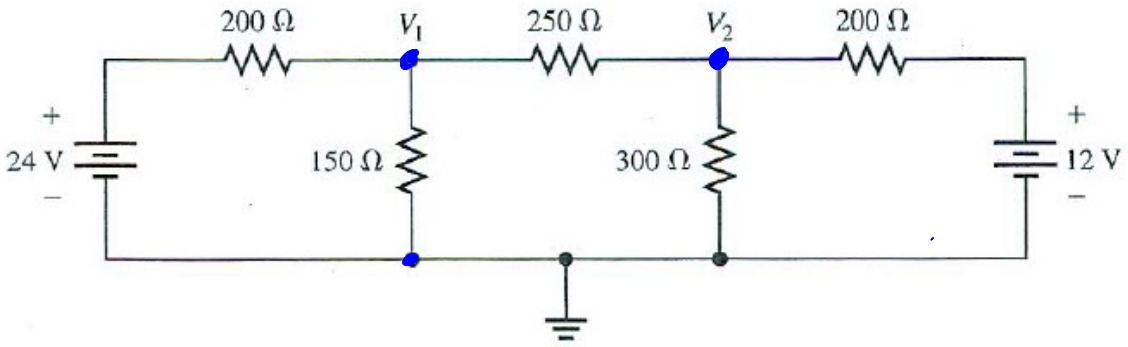
$I_c = I_2 - I_3 = 6.77 - (-19.9) = 26.67\,mA$

$V_1 = 200(-0.0715) + 24 = 9.7\,V$

or $V_1 = (0.0715 - 6.77 \times 10^{-3}) \times 150$

$V_2 = 26.67 \times 10^{-3} \times 300 = 8\,V$

Solve by nodal analysis




~~200~~ + 150 + 250 200 + ~~150~~ + 250 200 + 150 + ~~250~~

$$\frac{V_1 - 24}{200} + \frac{V_1}{150} + \frac{V_1 - V_2}{250} = 0$$

$$150 \times 250 (V_1 - 24) + 200 \times 250 V_1 + 200 \times 150 (V_1 - V_2) = 0$$

$$37500 V_1 - 900\,000 + 50\,000 V_1 + 30\,000 V_1 - 30\,000 V_2 = 0$$

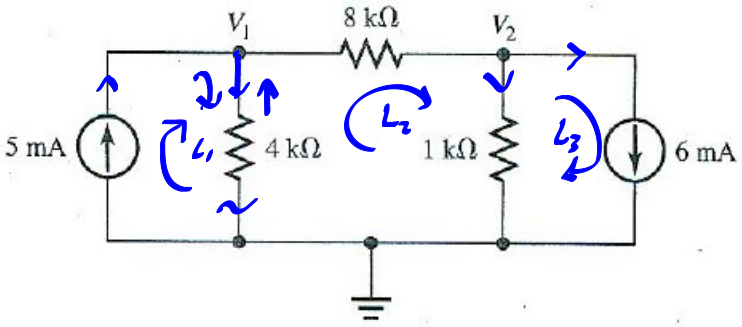
$$117500 V_1 - 30\,000 V_2 = 900\,000 \rightarrow (1)$$

$$\frac{12 (V_2 - V_1)}{250} + \frac{10 V_2}{50} + \frac{15 (V_2 - 12)}{200} = 0$$

$$12 V_2 - 12 V_1 + 10 V_2 + 15 V_2 = 180 \rightarrow -12 V_1 + 37 V_2 = 180 \rightarrow (2)$$

$$V_1 = 9.7 V, \quad V_2 = 8.012 V$$

**EXAMPLE 2-5** Determine the voltages $V_1$ and $V_2$ in Figure 2-8 using node voltage analysis.




$i_1 = 5mA$ , $i_3 = 6mA$

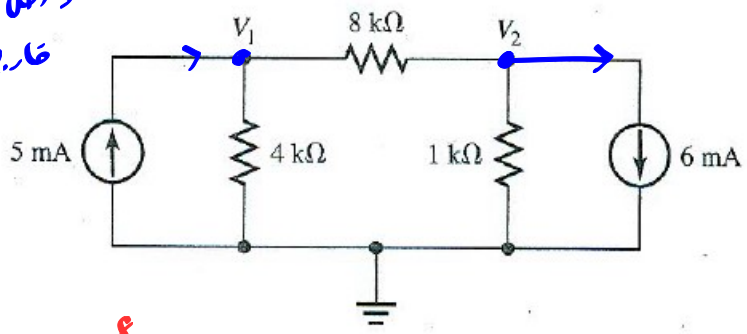
$$4000(i_2 - 5\times10^{-3}) + 8000\,i_2 + 1000(i_2 - 6\times10^{-3}) = 0$$

$$i_2 = 2\times10^{-3}\,A = 2\,mA$$

$$V_1 = (5-2)\times10^{-3} + 4\times10^{3} = 12\,V$$

$$V_2 = (2-6)\times1 = -4\,V$$

**EXAMPLE 2-5** Determine the voltages $V_1$ and $V_2$ in Figure 2-8 using node voltage analysis.




$$-5 * 10^{-3} + \frac{2V_1}{4000} + \frac{V_1 - V_2}{8000} = 0$$

$$2V_1 + V_1 - V_2 = 40 \Rightarrow 3V_1 - V_2 = 40 \rightarrow (1)$$

$$\frac{V_2 - V_1}{8000} + \frac{V_2}{1000} + \frac{6}{1000} = 0$$

$$V_2 - V_1 + 8V_2 + 48 = 0 \Rightarrow -V_1 + 9V_2 = -48 \rightarrow (2)$$

$V_1 = 12\,V$, $V_2 = -4\,V$