
M R
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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
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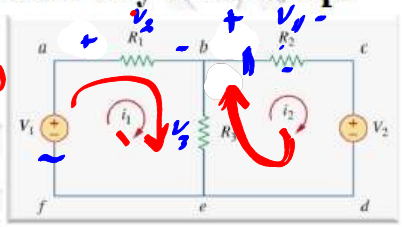
فيزياء
استاتيكا
دوائر كهربية
الكترونيات
ميكانيكا الانشائات
هيدروليكا

Mesh Analysis

- A **mesh** is a loop which does not contain any other loops within it.
- paths *abefa* and *bcdeb* are meshes, but path *abcdefa* is not a mesh.



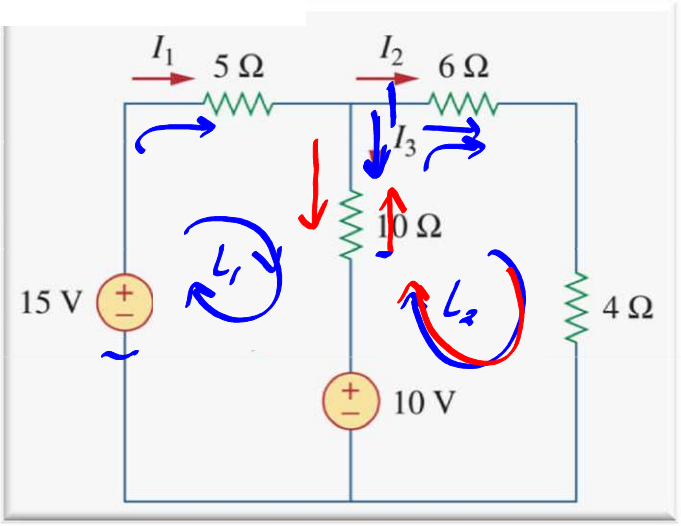
Steps to Determine Mesh Currents:

1. Make a clear diagram.
2. Assign mesh currents $i_1, i_2, i_3, \ldots, i_n$ to the n meshes.
3. Apply KVL to each of the *n* meshes. Use Ohm's law to express the voltages in terms of the mesh currents.
4. Solve the resulting *n* simultaneous equations to get the mesh currents.

- *The direction of the mesh current is arbitrary (clockwise or counterclockwise).*

$I_1 = i_1$ $I_2 = i_2$ $I_3 = i_1 - i_2$

Example 1: For the shown circuit, find the branch currents and using mesh analysis.



$-15 + 5i_1 + 10(i_1 - i_2) + 10 = 0$

$6i_2 + 4i_2 - 10 + 10(i_2 - i_1) = 0$

$5i_1 + 10i_1 - 10i_2 = 5$

$15i_1 - 10i_2 = 5 \longrightarrow (1)$

$6i_2 + 4i_2 + 10i_2 - 10i_1 = 10$

$20i_2 - 10i_1 = 10$

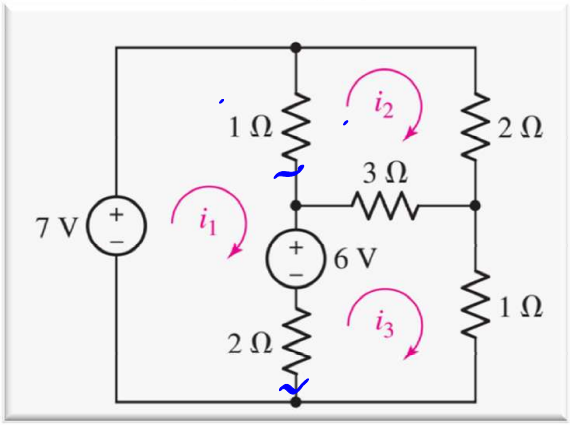
$15i_1 - 10i_2 = 5 \longrightarrow (1)$

$-10i_1 + 20i_2 = 10 \longrightarrow (2)$

$i_1 = 1A$, $i_2 = 1A$

$I_1 = 1A$, $I_2 = 1A$, $I_3 = 0$

Example 2: For the shown circuit, find the mesh currents using mesh analysis.



for mesh 1

$$-7 + 1(i_1 - i_2) + 6 + 2(i_1 - i_3) = 0$$

$$3i_1 - i_2 - 2i_3 = 1 \rightarrow (1)$$

$$1(i_2 - i_1) + 2i_2 + 3(i_2 - i_3) = 0$$

$$-i_1 + 6i_2 - 3i_3 = 0 \rightarrow (2)$$

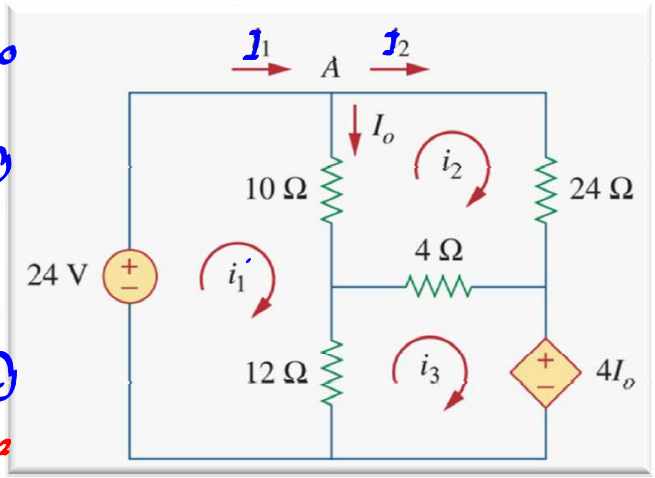
$$2(i_3 - i_1) - 6 + 3(i_3 - i_2) + i_3 = 0$$

$$-2i_1 - 3i_2 + 6i_3 = 6 \rightarrow (3)$$

$i_1 = 3A$, $i_2 = 2A$, $i_3 = 3A$

$I_o = I_1 - I_2$

Example 3: Use mesh analysis to find the current in the circuit of the shown figure.



$-24 + 10(I_1 - I_2) + 12(I_1 - I_3) = 0$

$22I_1 - 10I_2 - 12I_3 = 24 \rightarrow (1)$

$24I_2 + 4(I_2 - I_3) + 10(I_2 - I_1) = 0$

$-10I_1 + 38I_2 - 4I_3 = 0 \rightarrow (2)$

$I_1 - I_2$

$12(I_3 - I_1) + 4(I_3 - I_2) + 4I_o = 0$

$-8I_1 - 8I_2 + 16I_3 = 0 \rightarrow (3)$

$I_1 = \frac{9}{4} A = 2.25A, \quad I_2 = 0.25A, \quad I_3 = 1.5A$

$I_1 = 2.25A, \quad I_2 = 0.25A, \quad I_o = 2.25 - 0.25 = 1.5A$