M R
Ahmed Mahdy

فيزياء	استاتيكا
دوائر كهربية	الكـــترونيات
ميكانيكا الانشائات	هيدروليكا

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

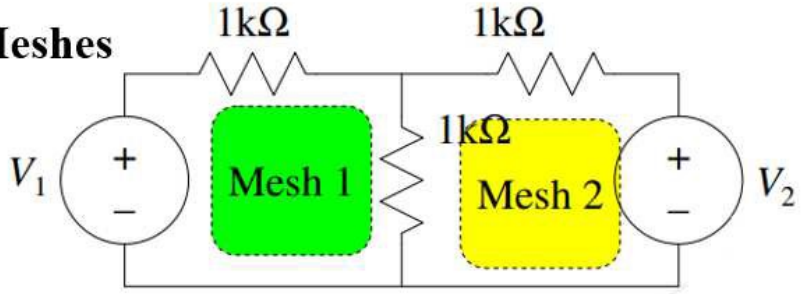
للتواصل

0567630097

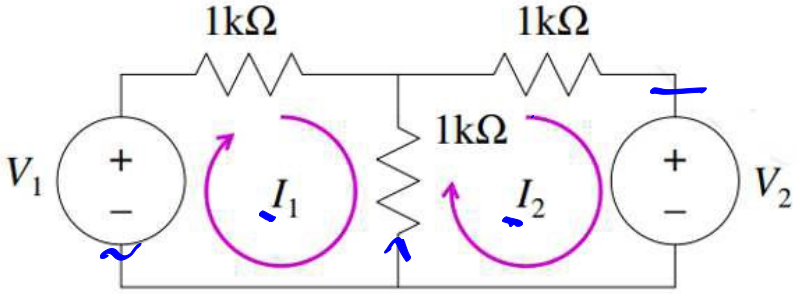
0565657741

Mesh Analysis

1- Identifying the Meshes



2- Assigning Mesh Currents

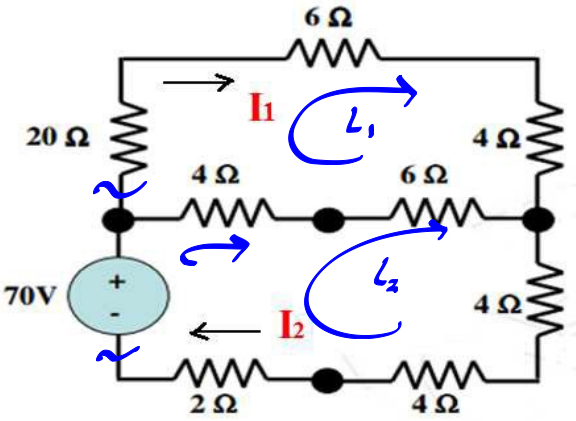


$-V_1 + I_1(1000) + (I_1 - I_2)1000 = 0$

$V_2 + (I_2 - I_1)1000 + I_2(2000) = 0$

Example 1

Use mesh current method to find the currents I_1 and I_2



apply mesh analysis at mesh ①

$20I_1 + 6I_1 + 4I_1 + 6(I_1 - I_2) + 4(I_1 - I_2) = 0$

$20I_1 + 6I_1 + 4I_1 + 6I_1 - 6I_2 + 4I_1 - 4I_2 = 0$

$40I_1 - 10I_2 = 0 \rightarrow ①$

apply mesh analysis at mesh ②

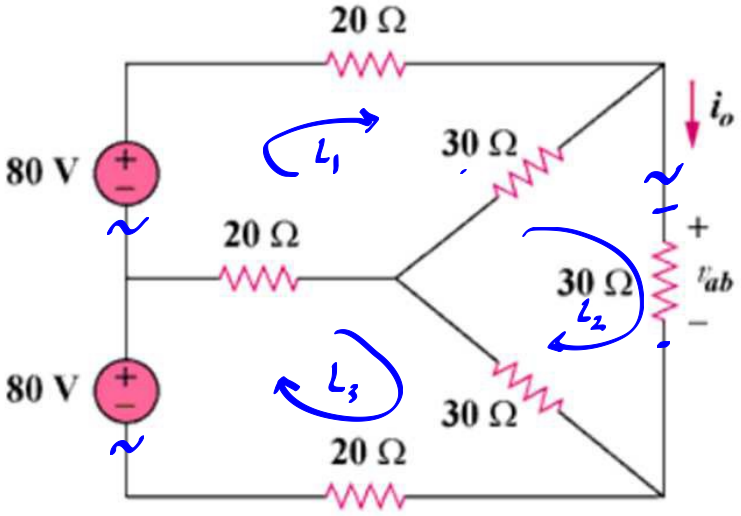
$-70 + 4(I_2 - I_1) + 6(I_2 - I_1) + 4I_2 + 4I_2 + 2I_2 = 0$

$-10I_1 + 20I_2 = 70 \rightarrow ②$

$I_1 = 1\ A, \quad I_2 = 4\ A$

Example 3

Use mesh analysis to find V_{ab} and i_o in the circuit in Fig



at mesh 1

$-80 + 20L_1 + 30(L_1 - L_2) + 20(L_1 - L_3) = 0$

$70L_1 - 30L_2 - 20L_3 = 80 \rightarrow (1)$

at mesh 2

$30L_2 + 30(L_2 - L_3) + 30(L_2 - L_1) = 0$

$-30L_1 + 90L_2 - 30L_3 = 0 \rightarrow (2)$

at mesh 3

$-80 + 20(L_3 - L_1) + 30(L_3 - L_2) + 20L_3 = 0$

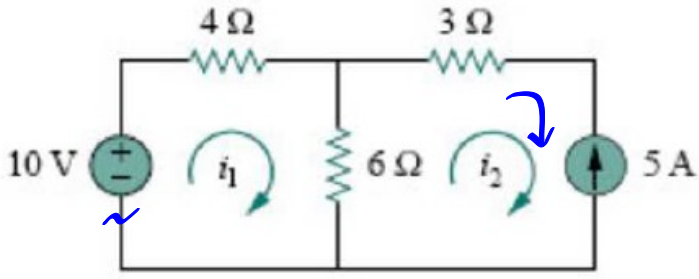
$-20L_1 - 30L_2 + 70L_3 = 80 \rightarrow (3)$

$L_1 = \frac{8}{3}A$, $L_2 = \frac{16}{9}A$, $L_3 = \frac{8}{3}A$

$L_o = \frac{16}{9}$, $V_{ab} = \frac{16}{9} \times 30 = 55.33V$

Mesh current Method cases

Case 1 :when a current source exist only in one mesh

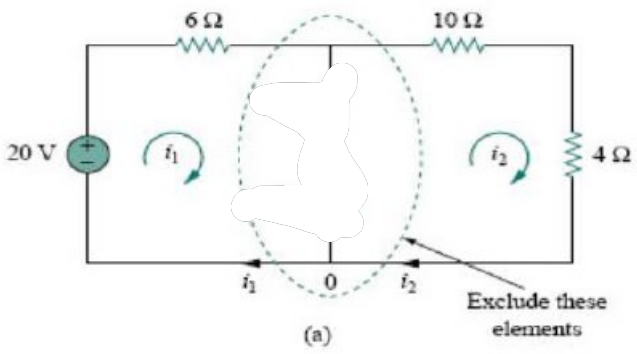


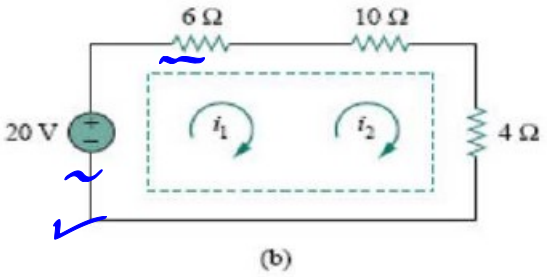
$L_2 = -5A$

$-10 + 4L_1 + 6(L_1 - (-5)) = 0$

$L_1 = -2A$

Case 2 :Super mesh when a current source exists between two meshes





$6 = I_2 - I_1 \Rightarrow -I_1 + I_2 = 6 \rightarrow (1)$

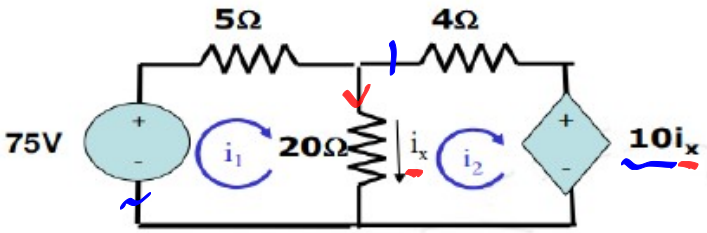
$-20 + 6I_1 + 10I_2 + 4I_2 = 0$

$6I_1 + 14I_2 = 20 \rightarrow (2)$

$I_1 = -\frac{16}{5}\,A = -3.2\,A$, $I_2 = \frac{14}{5}\,A = 2.8\,A$

Case 3 : mesh with dependent source

$I_x = I_1 - I_2$



$-75 + 5I_1 + 20(I_1 - I_2) = 0$

$25I_1 - 20I_2 = 75 \rightarrow (1)$

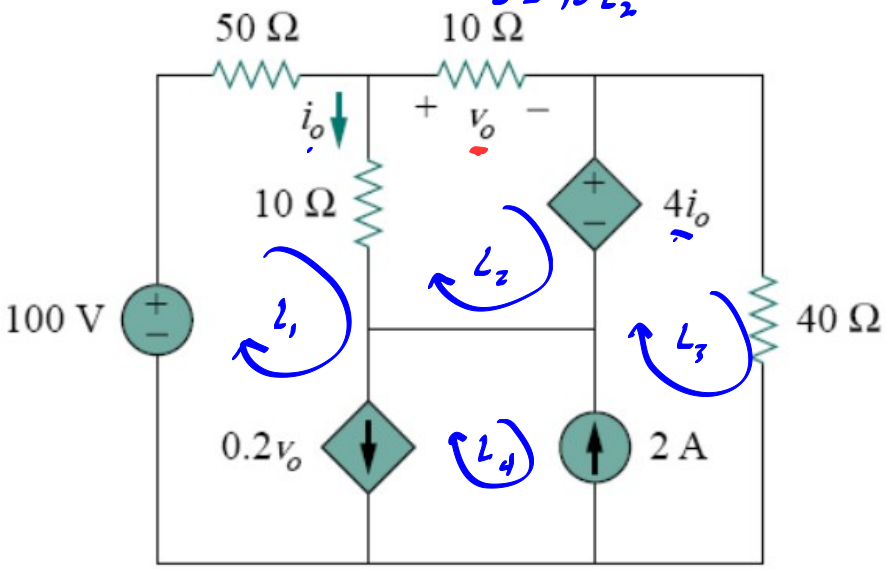
$4I_2 + 10I_x + 20(I_2 - I_1) = 0$ ($I_1 - I_2$)

$-10I_1 + 14I_2 = 0 \rightarrow (2)$

$I_1 = 7\,A$, $I_2 = 5\,A$

Example 5

Use mesh current method to find the current i0

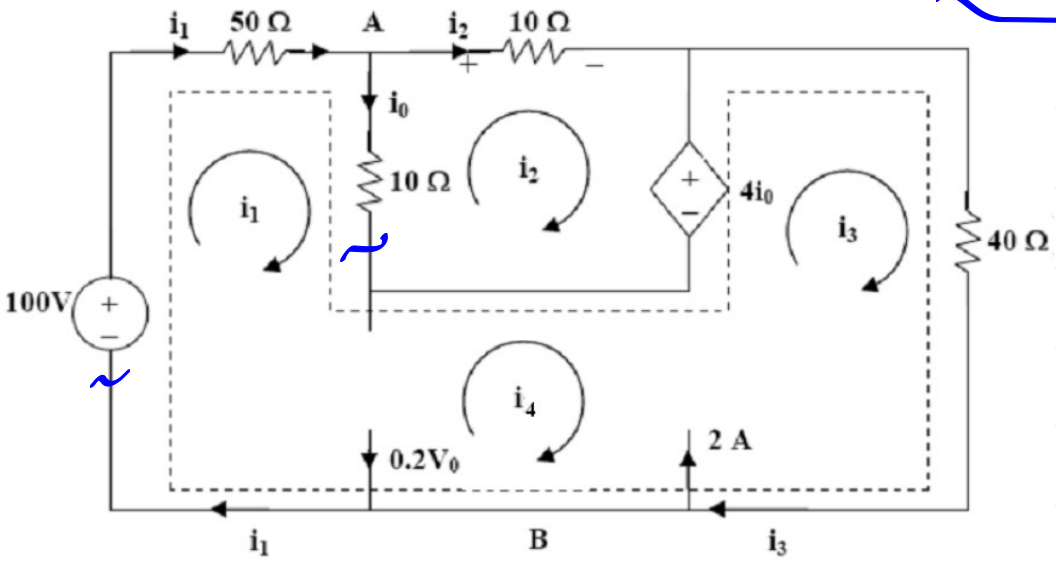


$V_o = 10 L_2$

$L_3 - L_4 = 2$, $L_1 - L_4 = 0.2 V_o = 10 L_2$

$L_1 - L_4 = 2 L_2$

$L_3 - L_1 = 2 - 2L_2$



$i_o = i_1 - i_2$

$-100 + 50 i_1 + 10 (i_1 - i_2) - 4 i_o + 40 i_3 = 0$

$10 i_1 - 10 i_2$, $-4 i_1 + 4 i_2$

$60 i_1 - 6 i_2 + 40 i_3 = 100 \rightarrow (1)$

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

$-6 i_1 + 18 i_2 = 0 \rightarrow (2)$

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

$$I_1 = \frac{16}{51}\,A, \quad I_2 = \frac{2}{17}\,A, \quad I_3 = \frac{10}{51}\,A$$

$$I_0 = \frac{16}{51} - \frac{2}{17} = 0.196\,A$$

$$V_0 = 10 + \frac{2}{17} = 1.176\,V$$