
AHMEDMAHDY
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مدرس خصوصى
اونلاين
يحصل الطالب على ...
*مقاطع فيديوهات لشرح المقرربشكل وافي
*ملخص للمادة للمراجعة النهائية
*محاضرات مباشرة على برنامج Zoom
*تواصل مستمر مع معلم المادة للمناقشة
للتواصل
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ELECTRICAL CIRCUITS

SYSTEMS OF UNIT

Table 1.2 SI units

Quantity	Unit	Symbol
Length	Meter	m
Mass	Kilogram	kg
Time	Second	s
Electric current	Ampere	A
Temperature	Kelvin	K
Luminous intensity	Candela	cd

Table 1.3 Standard prefixes

Prefix	Symbol	Power
atto	a	10^{-18}
femto	f	10^{-15}
pico	p	10^{-12}
nano	n	10^{-9}
micro	μ	10^{-6}
milli	m	10^{-3}
centi	c	10^{-2}
deci	d	10^{-1}
deka	da	10
kilo	k	10^{3}
mega	M	10^{6}
giga	G	10^{9}
tera	T	10^{12}

3000 m = 3Km

3000000m = 3Mm

$V = \frac{l}{t} \quad \frac{m}{s}$

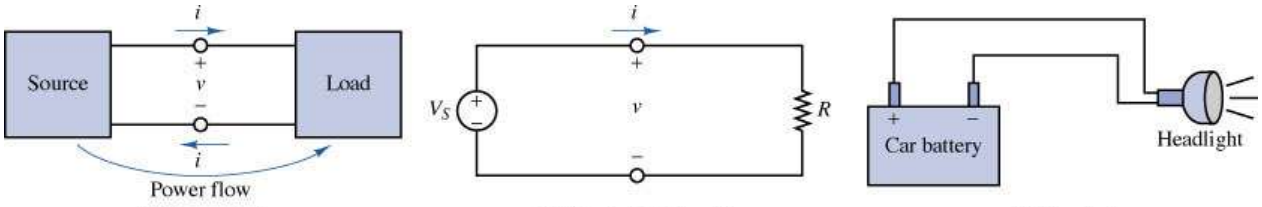
0.03m = 2cm

0.002m = 0.2cm = 2mm

SOURCE-LOAD REPRESENTATION

I V R P

A V Ω W



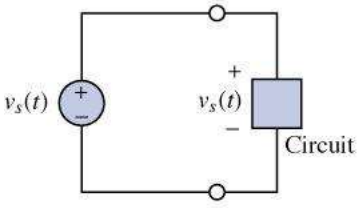
(a) Conceptual representation

(b) Symbolic (circuit) representation

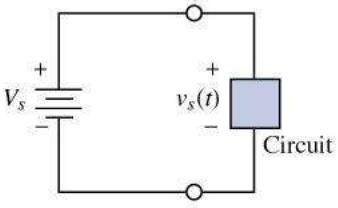
(c) Physical representation

Ideal voltage Source

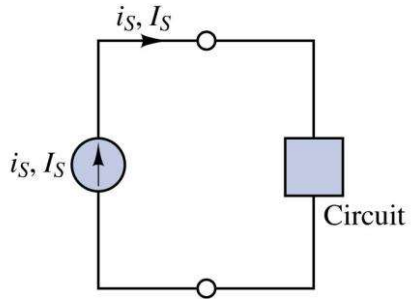
Ideal Current Source



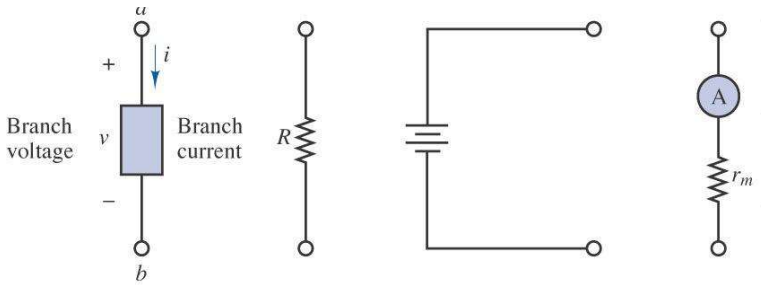
General symbol for ideal voltage source. $v_s(t)$ may be constant (DC source).



A special case: DC voltage source (ideal battery)



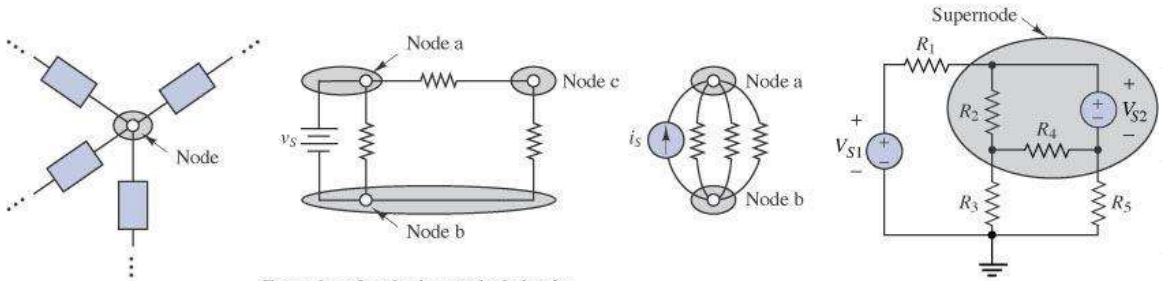
DEFINITION OF A BRANCH



A branch | Ideal resistor | A battery | Practical ammeter

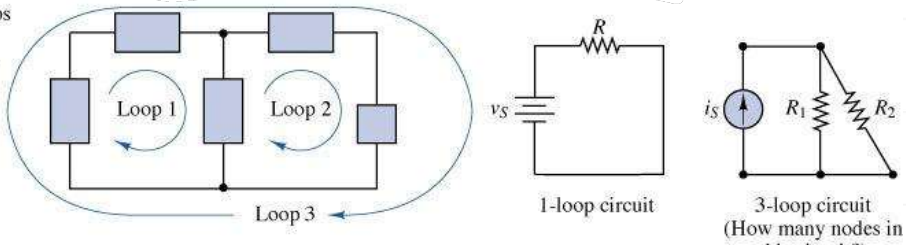
Examples of circuit branches

Definition of node and super node



DEFINITION OF LOOP

Note how two different loops in the same circuit may include some of the same elements or branches.

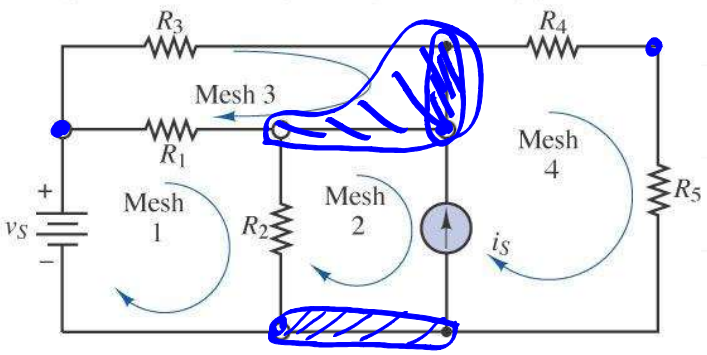


1-loop circuit

3-loop circuit (How many nodes in this circuit?)

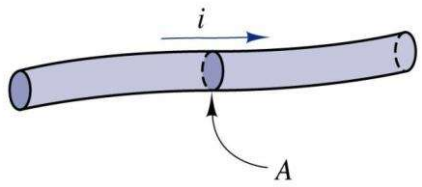
Definition of Mesh

How many loops can you identify in this four-mesh circuit? (Answer: 15)



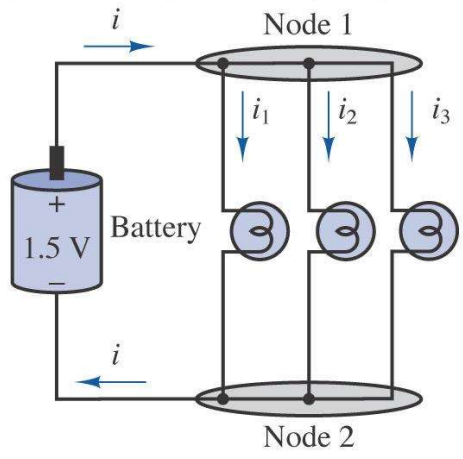
CHARGE, CURRENT & KCL

Current $i = dq/dt$ is generated by the flow of charge through the cross-sectional area A in a conductor.

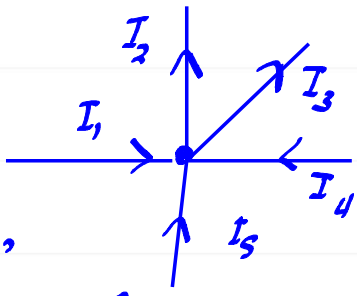


Kirchhoff's Current Law (KCL):

K.C.L
مجموع التيارات الداخلة = مجموع التيارات الخارجة



$I - I_1 - I_2 - I_3 = 0$

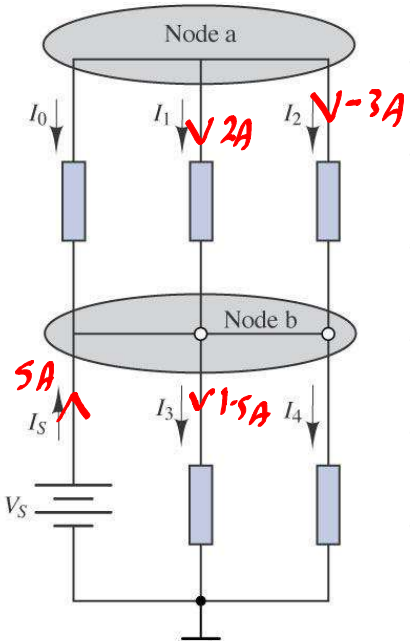


+ الداخل
- الخارج

$\sum_{n=1}^{n} I_n = 0$

$+I_1 - I_2 - I_3 + I_4 + I_5 = 0$

EXAMPLE 2.3
Given: I_S=5A, I_1=2A, I_2=-3A, I_3=1.5A
Calculate I_0 and I_4



apply K.C.L at a

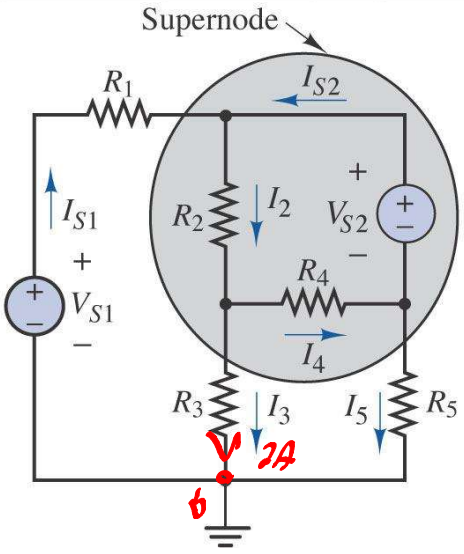
$-I_0 - I_1 - I_2 = 0$

$-2 - (-3) = I_0$

$I_0 = 1A$

$I_S + I_0 + I_1 + I_2 - I_3 - I_4 = 0$

Example 2.4
Given: I_3=2A, I_5=0A
Find I_{s1}

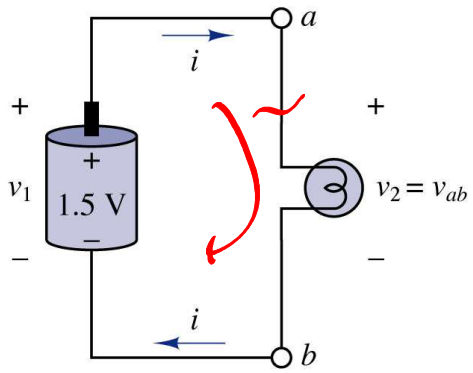


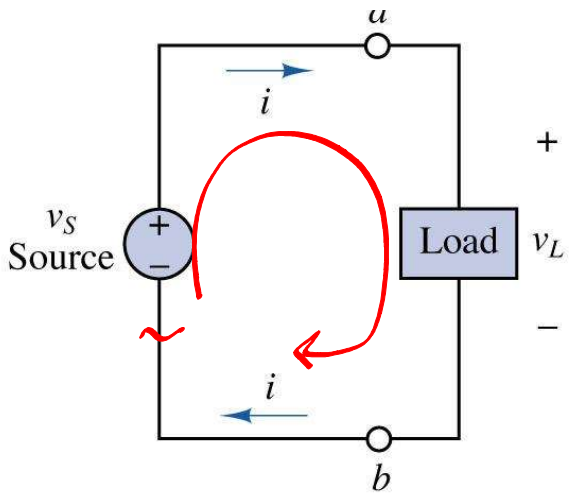
applys K.C.L at b

$+ \cancel{I_5} + I_3 - I_{s_1} = 0$

$I_{s_1} = I_3 = 2A$

Kirchhoff's Voltage Law (KVL):





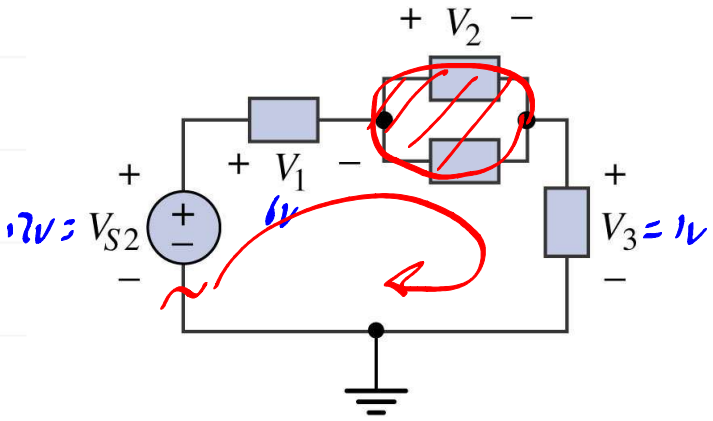
مجموع الجهود على اى loop بساوى صفر

$\sum_{n=1}^{N} V_n = 0$

$-V_S + V_L = 0$

$V_{ab} - V_1 = 0$ (1.5V)

Example 2.6
Given: V_{s2}=12V, V_1=6V, V_3=1V
Find V_2



apply K.V.L

$-V_{s_2} + V_1 + V_2 + V_3 = 0$

$-12 + 6 + V_2 + 1 = 0$

$V_2 = 5V$