
AHMEDMAHDY
MR
00201024041097
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
00201024041097
00201096019763
Mrahmedmahdy.com

Lecture 2

Fundamentals of Electric Circuits

- ELECTRICAL POWER
- RESISTANCE AND OHM'S LAW
- SERIES RESISTORS AND VOLTAGE DIVIDER RULE
- PARALLEL RESISTORS AND CURRENT DIVIDER RULE

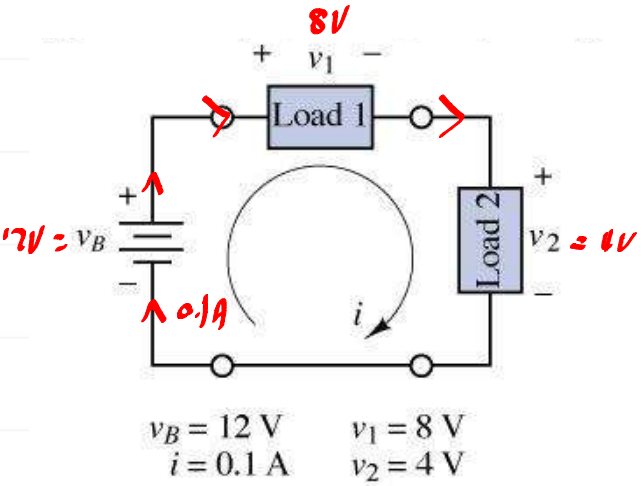
ELECTRICAL POWER

$P = I \cdot V$ W

Power supply	Power absorb
$P = -I \cdot V$	$P = +I \cdot V$

$\Sigma P = 0$

$\Sigma P_{sup} = \Sigma P_{ab}$



$P_B = -0.1 \times 12 = -1.2$ W

$P_1 = 0.1 \times 8 = 0.8$ W

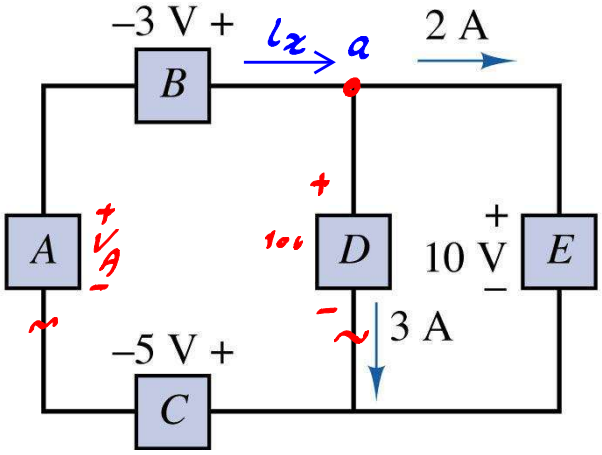
$P_2 = 0.1 \times 4 = 0.4$ W

$\Sigma P_s = \Sigma P_{ab}$

$\Sigma P = 0$

EXAMPLE 2.9

Find : which components are absorbing power; which are supplying power and verify the conservation of power.



apply K.C.L at node a

$+I_x - 2 - 3 = 0 \Rightarrow I_x = 5A$

apply K.V.L loop 1

$-V_x + 10 = 0 \Rightarrow V_x = 10V$

apply K.V.L at loop 2

$-V_A - 3 + 10 + 5 = 0 \Rightarrow V_A = 12V$

P_A supply power $= -5 \times 12 = -60$W

P_B supply power $= -5 \times 3 = -15$W

P_C absorb power $= 5 \times 5 = 25$W

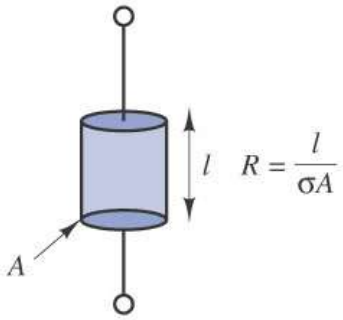
P_D absorb power $= 3 \times 10 = 30$W

P_E = absorb power $= 2 \times 10 = 20$W

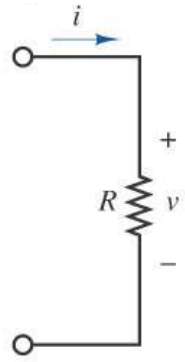
$\Sigma P = -60 - 15 + 25 + 30 + 20 = 0$

RESISTANCE AND OHM'S LAW

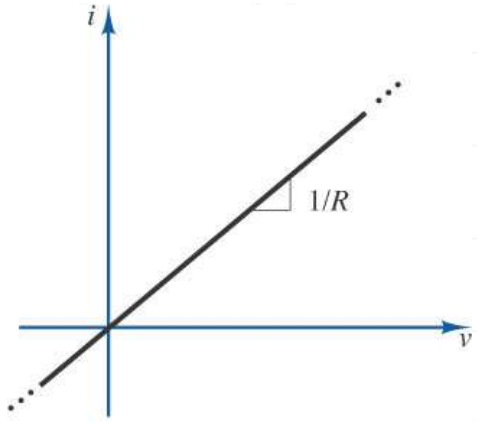
$V = I\ R$



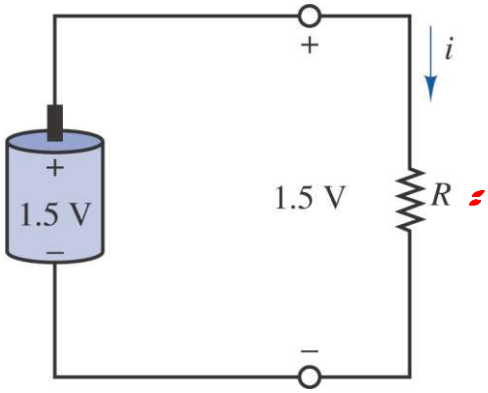
Physical resistors with resistance R. Typical materials are carbon, metal film.



Circuit symbol

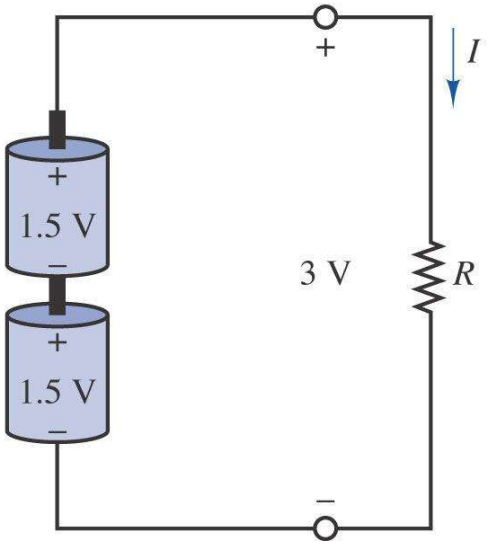


i-v characteristic



$V = IR$

$I = \frac{V}{R} = \frac{1.5}{1} = 1.5A$



Q/ $R = 36\Omega$ find I

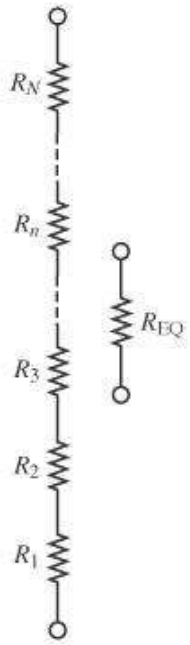
$I = \frac{V}{R} = \frac{3}{36} = 0.083A$

$= 83.33\ mA$

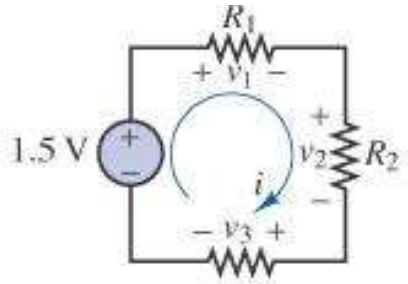
$P = I.V = 0.083 \times 3 = 0.25W$

$V = I\ R$	$P = I.IR = I^2R$
$P = I.V$	$P = \frac{V}{R}.V = \frac{V^2}{R}$

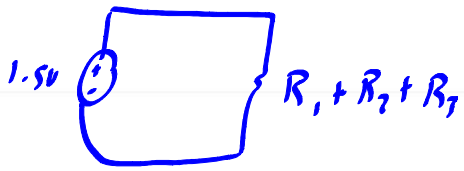
SERIES RESISTORS AND VOLTAGE DIVIDER RULE



$$R_{EQ} = \sum_{n=1}^{N} R_n$$



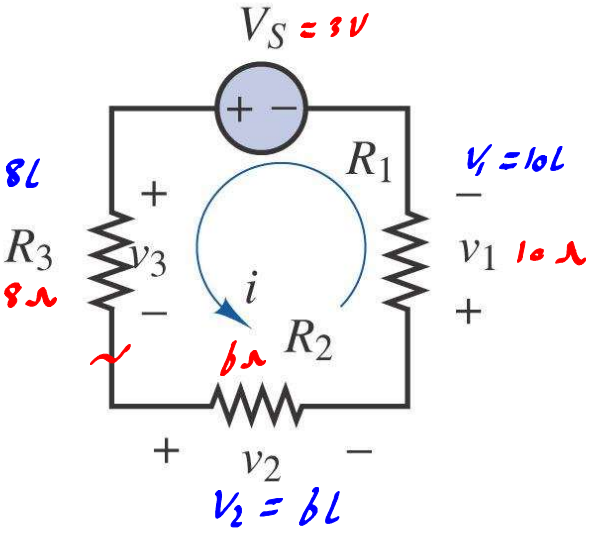
$$\Rightarrow R_{eq} = R_1 + R_2 + R_3$$



EXAMPLE 2.11

Given: V_s=3V, R_1=10Ω, R_2=6Ω, R_3=8Ω

Find v_3



apply K.V.L

$$v_2 + v_1 - v_s + v_3 = 0$$

$$6i + 10i + 8i = 3$$

$$i = \frac{3}{24} = \frac{1}{8}\ A$$

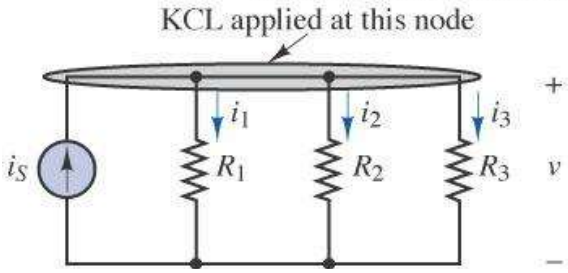
$$V_3 = 8 * \frac{1}{8} = 1V$$

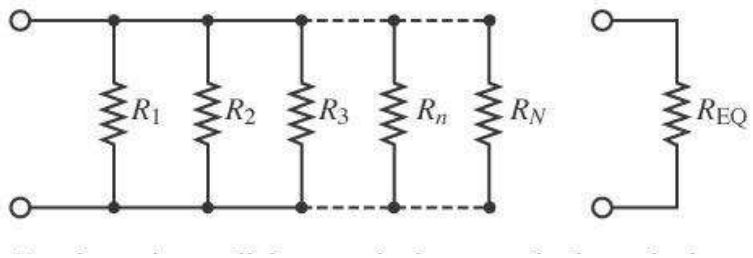
Voltage divider قانون

$$V_n = V_s * \frac{R_n}{R_1 + R_2 + \cdots R_n}$$

$$V_3 = 3 * \frac{8}{10+6+8} = 1V$$

PARALLEL RESISTORS & CURRENT DIVIDER RULE



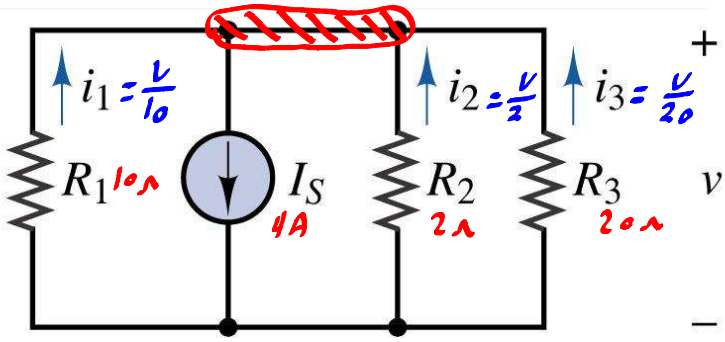


$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$ $\qquad$ $\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots \frac{1}{R_n}$

$I_S = I_1 + I_2 + I_3 \Rightarrow$ ازاي نثبت

EXAMPLE 2.12

Given: I_S=4A, R_1=10Ω, R_2=2Ω R_3=20Ω
Find i_1



apply K.C.L

$I_1 - I_S + I_2 + I_3 = 0$ (I_S = 4A)

$\frac{v}{10} + \frac{v}{2} + \frac{v}{20} = 4$

$v\left(\frac{1}{10} + \frac{1}{2} + \frac{1}{20}\right) = 4$

$v = \frac{80}{13}$

$I_1 = \frac{80/13}{10} = \frac{8}{13}$ A

توازي
Current divider تقسيم التيار

$$I_n = \frac{\frac{1}{R_n}}{\frac{1}{R_1} + \frac{1}{R_2} \cdots \frac{1}{R_n}} I_S$$

$$I_1 = \frac{\frac{1}{10}}{\quad} * 4 = \frac{8}{\quad}$$